

STUDY WORK PLANS

1993-94

NORTHERN FORESTRY CENTRE

NORTHWEST REGION

FORESTRY CANADA

5320 - 122 STREET

EDMONTON, ALBERTA

T6H 3S5

MARCH 1993

**NORTHERN FORESTRY CENTRE
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1993-94

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PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Geographic Information Systems, Forest Inventory and Site
2. Responsibility Centre: Northwest Region (8133)
3. Activity: 2214, 2216, 2224
4. Program: Forest Resources
5. Status: Continuing
6. Last Evaluation: February 5, 1992
7. Next Evaluation:

B. KEYWORDS:

020 Ecology/ecosystems
 021 Sustainable development
 025 Forest productivity
 068 Network of Ecological Reserves
 100 Green Plan
 201 Soils
 210 Site Classification
 325 Remote sensing
 330 Models
 424 Insect pests

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	3.75	3.75	4.90	0.00	0.00
Salaries	\$185.6	\$185.6	\$250.0	\$0.0	\$0.0
O & M	\$79.0	\$21.2	\$25.0	\$0.0	\$0.0
Capital	\$23.6	\$0.0	\$0.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$288.2	\$206.8	\$275.0	\$0.0	\$0.0

D. PROJECT DESCRIPTION:

The recent developments in GIS, remote sensing, and computing have presented opportunities to use new and powerful tools to extend the applications of many of our forest research findings for integrated forest resource management and sustainable development and to compare results from diverse disciplines within a common geographic framework. The increasing realization that many forest management opportunities and constraints are related to site type presents the possibility of their prediction and analysis using a site classification within a GIS, and in conjunction with remote sensing methods.

The application of these and other information technologies to forest management is being tested through the integration of various land related information (e.g. site classification, forest inventory, growth and yield, soils, topography, insect and disease outbreaks etc.) in studies with forest industry and other cooperators.

A major new NoFC initiative in Decision Support Systems for Mixedwood Management will use NOR 02 project expertise to put the spatial dimension to stand and forest level modelling activities in this client - oriented research program.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for formal screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary (\$):

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u>	<u>Upcoming</u>	<u>Planning 1</u>
	<u>\$000s</u>				
Primary	12.80				
Secondary					
Total					
Green Plan	59.02	64.00			

3. Collaborators:**Secondary**

B. Liblong, Jan Mulder - Alberta Research Council
 K. O'Connor - Hughes Aircraft Canada
 K. Jones - Environmental Systems Research Institute (ESRI)
 R. Sims - FCOR
 D. McKenney - FCOR
 T. Moore - PNFI
 D. Morgan - Alberta Forest Service

G. Bauer - Canfor Ltd., Grande Prairie
 B. Maier - Weldwood of Canada Ltd., Hinton
 D. MacLean - FCMR
 W. Meades - FCNLR

4. Green Plan:

Initiatives are on-going or planned in four forestry programs - Forestry Practices, Land Classification, Decision Support Systems (DSS) and Ecological Reserves. Dr. Corns has input to technical committees in all these programs and is coordinator for the Dynamic, Spatially-Oriented Ecological Inventory sub-program of the DSS program. A brief description of each follows:

Forestry Practices

Major participant in NoFC Sustainable Development of Boreal Mixedwood Ecosystems Study. A 1991-92 contact involved a comprehensive literature review and evaluation of some old CFS research plots. Further evaluation of the old A15 plots will occur in 1993-94.

Land Classification

Several cooperative efforts are under way including an "Indicator Plants of Canada" book. In NWR, funding has been awarded in support of a study to relate several mixedwood succession to soil and site properties.

Decision Support Systems

Conducted a contracted planning workshop in 1991; Coordination of Dynamic Spatially Oriented Ecological Inventory Component, with studies at PNFI, GLFC, NoFC. At NoFC, work is focusing on mixedwood successional modelling and on inventory projection.

Ecological Reserves

A Model Ecological Reserve will be set up within the Foothills Model Forest in cooperation with Weldwood, Alberta Environment Protection and NoFC.

5. Milestones:

1993-94:

1. Complete "Proof of Concept" for NAIA Predictive site mapping project in cooperation with Hughes Aircraft, Alberta Research Council and ESRI Canada (Jones) (Allan, Kalenith).

2. Work with NOR-10 in conjunction with knowledge engineer to more fully develop the DSS Mixedwood conceptual model, forest level framework and integration of site classification and GIS into the program. (Navratil, (NOR 10) Bella, Yang, Hans, (NOR 4), Kalenith)
3. Continue involvement in Green Plan technical committees and program.
 - a) Forestry Practices - Initiate sample plot set-up to evaluate effects of forestry practices (after Powers, U.S. Forest Service). (Corns, Maynard NOR-07)
 - b) Decision Support Systems - National Coordination of "Dynamic Spatially Oriented Biophysical Inventory". (Corns)
 - c) Land Classification - Conduct mainly via contract, work related to technology transfer in site classification. (Corns)
 - d) Ecological Reserves - Facilitate development of provincial initiatives that would support a national registry of ecological reserves. (Corns)
4. Initiate mixedwood succession study in cooperation with Navratil (NOR 10) and Bella (NOR 4). (Corns)
5. Initiate work on Ecosystem Classification of northern Alberta in cooperation with the Alberta Forest Service. (Corns)
6. Chair CIF/RMS Executive Council. (Corns)
7. Participate on Alberta Forest Service Regeneration Standards task force. (Corns)
8. Complete sampling and descriptions for ecosystem Associations of the Montane Ecoregion of west central Alberta as a supplement to Field Guide to Forest Ecosystems of West-central Alberta. (Corns, Allan)
9. Initiate work on Ecosystem Classification of northern Alberta in cooperation with Alberta Forest Service. (Corns)
10. Initiate contract on Field Guide to Forest Ecosystems of Manitoba. (Corns, Saskatchewan District Office) (NOR 46)
11. Initiate contracts to apply NAIA predictive site mapping methods to the Manitoba site classification pilot areas. (Corns)
12. Provide input into monitoring study of logged white spruce floodplain forests in Wood Buffalo National Park. (Corns)
13. Conduct spatial analysis of site related influences on forest cover in Torch River forest Saskatchewan and provide consultation to Ron Hall NOR 02-04 as required regarding site influences related to his Ph.D. research. (Green Plan) (Corns, Kalenith)

14. In cooperation with Drs. La Roi, Pluth, and Strong prepare a manuscript for submission to Can. J. For. Res. on the nutrient relationships of lodgepole pine and white spruce ecosystems in west-central Alberta. The work study is part of a PRUF contract of several years ago. (Corns)
 15. Provide advisory services in remote sensing, forest inventory, and GIS to NoFC clients and colleagues as required and particularly:
 - a) assist C. Ogilvie (NOR 05-02) as needed in the use of the camera pod and cooperate with both Yukon NAP and Ogilvie in procurement of a STA approval.
 - b) continue as member of SPANS Government User's Group.
 - c) continue as member of ForCan Remote Sensing Working Group.
 - d) continue as Alberta Forest Service contact person to Remote Sensing Subcommittee of the Canadian Forest Inventory Committee.
 - e) continue to review manuscripts as requested by Scientific and Technical journals.
 16. Completion of the Ph.D. degree under LTT with particular emphasis on Phase 2 (digital remote sensing) and Phase 3 (GIS and spatial analysis). (Hall)
 17. Provide statistical analysis assistance and scientific support to L. Fent of AFLW, on "An analysis of film sensitometric characteristics and interpretation accuracies for forest inventories at 1:20 000," to determine if a specific combination of film and film quality yields more accurate forest cover interpretation. (Hall)
 18. Assume co-chair of Alberta PAIF a committee with C. Henderson, Alberta Forest Service. (Corns)
6. Accomplishments:
1. Site data and digitized maps were provided to Hughes and ARC by NoFC and I. Corns spent several days at ARC in Calgary "knowledge engineering" the NAIA prototype. The predictive algorithms have been run, refined and re-run several times and results are encouraging. Discussions are on-going with Weldwood - Hinton to do further work/refinements on the Weldwood FMA. I. Corns has co-authored a paper for presentation at GIS '93.
 2. Knowledge engineer hiring was on hold for several months. I. Corns and R. Kalenith worked with R. Yang (NOR 04-09) to facilitate the development of Yang DSS framework under Green Plan DSS (A8021). R. Kalenith provided digital site data and GIS input. Work was demonstrated at the Green Plan DSS - Model Forest workshop in Hinton in November 1992.
 3. a) Two areas were chosen for the Forestry Practices site on the Weldwood FMA northwest of Edson. Thirty-one 15 x 100 m plots were established in the Marlboro VIII working circle. A residual width of 45 meters was left between plots to allow

for logging in a herringbone fashion. Each plot had a 5 meter transect that ran down the middle from top to bottom in which all trees breast height and greater were tallied as to species, dbh, and height. Trees were recorded by 10 meter segments and one measured as a reference tree in each segment. Other trees were estimated to the nearest 0.5 m in height. Field sampling was coordinated by D. Allan assisted by C. Olive.

- b) I. Corns participated in several meetings (Fredericton, Hinton) with DSS Steering and Technical Committee and with proponents in the Dynamic Inventory program to help refine program goals. A 1992-93 work plan for the Dynamic Inventory program was prepared. The 1992 Dynamic Inventory budget was dispersed to study leaders. Results of the various DSS studies were presented at a joint Green Plan DSS - Model Forest meeting in Hinton, November 1992.
 - c) Work under contract supervised by Sims, Meades, Corns on an "Indicator Plants of Canada" manual is progressing well (Northland Associates of St. John's Nfld.). A planning meeting for 1993-94 is to be held in Ottawa February 8-9, 1993.
 - d) I. Corns commented on strategic plan drafts by D. Pollard (PFC) and D. Johnson; attended with P. Lee (Alberta representative), an organization meeting in Toronto, March 1992. Discussions have occurred with Alberta and Saskatchewan but the small budget precludes any progress toward the goal of a national network of ecological reserves.
4. A mixedwood succession study was initiated and 63 plots were sampled in the Rocky Mountain House area. Alberta Forest Service suggested the study area, provided forest cover, digital topography and physical land classification (PLC) information. R. Kalenith digitized the forest cover and PLC map themes, and set up data base. Proposals for support for a graduate student have been sent to the three Model Forests in our region.
 5. I. Corns accompanied H. Archibald (Alberta Forest Service) on a four day field trip to the northern portion of the Sivak study area to identify site types that required further sampling. A contract supervised by Alberta Forest Service was awarded to sample additional plots for site units that were not well-represented originally. A second contract was awarded by Alberta Forest Service to D.A. Westworth and associates to re-compile the Sivak data and correlate the site classification with previous efforts. I. Corns accompanied contractor and H. Archibald of Alberta Forest Service on a one week field trip to southwestern Alberta to help identify potential problems and solutions in implementing the Sivak classification. I. Corns will review upon completion.
 6. I. Corns chaired monthly (approx) Council (CIF-RMS) meetings, sat on ARPFA panel Slave Lake (June 12, 1992), chaired three business meetings and technical session (October 15, 1992), attended to business/correspondence arising from meetings.
 7. I. Corns participated in a November 25 meeting which discussed principal site factors to evaluate regeneration performance as a basis for refining the Alberta "Free to Grow" standards.

8. Additional plots were sampled (total now 42) in the Montane ecoregion of west-central Alberta. Work on data synthesis and site unit descriptions has not yet begun, but data have been entered in computer.
9. I. Corns and H. Archibald (Alberta Forest Service) have planned strategy for sampling in northern Alberta. Existing data was being compiled in same format during 1992. Field work will take place in 1993 and 1994.
10. A proposal was tendered and contract awarded under Manitoba PAIF to Geomatics International of Burlington, Ontario. Work is progressing on schedule. A meeting with Manitoba Forestry Branch and forest industry personnel was held in Winnipeg August 19, 1992 and a field workshop with the contractor on the Abitibi-Price FMA on October 6, 1992.
11. A contract was awarded to Hughes Aircraft - Alberta Research Council to apply the NAIA technology to the site classification pilot areas mapped under the previous Manitoba PAIF. A meeting with Manitoba Forestry Branch and Manitoba industry was held in Winnipeg, December 17, 1992.
12. I. Corns was invited by Steve Cornielson of Wood Buffalo National Park to set up a monitoring study in the park. I. Corns declined due to previous commitments and recommended consultants.
13. The Torch River site data were digitized by R. Kalenith and integration into SPANS GIS database is in progress.
14. Two meetings were held with co-authors to divide work load, contributions etc. for a manuscript on the nutrient relationships of lodgepole pine and white spruce ecosystems in west-central Alberta. Much of the data have been coded into a data base by G. La Roi.
15. Phase 1 was completed and a journal paper was written, reviewed and accepted for publication in the Canadian Journal of Forest Research. Phase 2 (digital remote sensing) and 3 (GIS spatial analysis) data processing have been ongoing and Phase 2 plus an entomology review background chapter should be finished by March '93. Phase 2 preprocessing have entailed atmospheric and geometric corrections of the multitude (3) Landsat TM scenes into image subsets that can be readily transferred to the SPANS GIS. Phase 3 preprocessing over the past year have entailed the digitization and integration of site and photo interpreted top-kill into the SPANS GIS database. A poster paper describing the work was presented at the annual University of Alberta Forestry Symposium. The preparation of 3 research proposals for '93-'94 funding and completion of other goals have delayed completion of the thesis. (Hall)
16. a) assisted C. Ogilvie (NOR 05-02) by liaising with Yukon Forest Resources, NWI, and Canadian Helicopters as needed in the procurement of a STA approval. STA approval may be achieved by March 1993.

b) continued as member of SPANS User's Group, attended 3 meetings and working with Alberta Forest Service to coordinate a 1-day Technical User's Exchange Forum with Intera Tydac to be held Feb. 23/93.

- c) Provided annual report update as member of ForCan Remote Sensing Working Group. A proposal was made to host the User's Group Meeting during the Fall of 1993.
 - d) Canadian Forest Inventory Committee: Invited to join the Terminology Subcommittee of the "Forest Inventory Terms of Canada", and assisted in creating the Terms of Reference. No action was requested by the chair of the Remote Sensing Subcommittee.
 - e) Completed 4 manuscript reviews: Canadian Journal for Forest Research, Canadian Journal for Remote Sensing, International Journal of Remote Sensing, and a Fire Management Note. (Hall)
17. Completed statistical analysis and assisted in drafting journal paper by Fent, Hall and Nesby that has now been submitted to Photogrammetric Engineering and Remote Sensing for review. A graphic slide presentation was also prepared for presentation at the annual CFIC meeting. A follow-up to this study was the basis for an Alberta PAIF proposal which was approved for 1993-94. (Hall)
18. Meetings to screen proposals etc. were held April 21, May 13, November 3.

7. Link to Strategic Plan:

National:

The NOR 02 Project has links to the Forestry Canada Strategic Plan in the areas of Forest Sector Development (research and technology transfer in site classification and remote sensing), Forest Environmental Quality (participation in the Green Plan Ecological Reserves Program) and Science and Technology (forest ecosystem dynamics, decision support systems, remote sensing applications, technology transfer).

Regional/Institute:

NOR 02 project activities relate primarily to new program thrusts (1) Development of operational decision support systems (DSS) for integrated management of boreal mixedwood and aspen forests.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 11, 1993

1. **STUDY TITLE:** Forest ecology and site productivity
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** GIS, Forest Inventory and Site
5. **Office Location(s):** Edmonton
6. **Work Location:** Alberta, Saskatchewan, Manitoba
7. **Study Staff:**

	Name
Study Leader	I. Corns
Team Members	Doug Allan
	Rex Kalenith

8. **Study Key Words:** GIS, Forest ecology, site productivity, forest soils, site modification, succession, site classification, sustainable development, forest sector leadership, ecological reserves, working groups, inventory, remote sensing, silviculture, models, stand development, management systems, vegetation management, model forests, forestry practices, land classification, decision support systems, mixedwood management
9. **Study Activity:** 2214, 2216, 2224

10. Study Resources:Personnel Information

Employee Name	Category	1993/94	Fiscal Year 1993-94			1994/95
		Previous	Budget	Revised	Forecast	Upcoming
I. Corns	SE-RES-3 (P)	1.00	1.00	1.00		
D. Allan	EG-5 (T)	1.00	1.00	1.00		
R. Kalenith	EG-4 (T)	0.90	0.90	0.90		
FTEs		3.65	3.65	3.90		

Financial Resources (\$000s)

	1992/93	Fiscal Year 1993-94			1994/95
		Budget	Revised	Final	
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	11.65	15.0			
Capital	6.92	0.00			
G & C					
TOTAL:	18.57	15.0			

	ID #	1992/93	Fiscal Year 1993-94			1994/95
		Previous	Budget	Revised	Final	Upcoming
<u>Agreements</u>						
Salaries						
O&M:						
Man.	M8045		79.25			
Sask.	S8072		125.0			
Capital						
G & C:						
Alta.	A4002		30.0			
TOTAL:			234.25			

	ID #	1992/93	Fiscal Year 1993-94			1994/95
		Previous	Budget	Revised	Final	Upcoming
<u>Green Plan</u>						
Salaries						
O&M	02-82 02-83 02-85	54.06	64.0			
Capital	02-82	4.96				
G & C						
TOTAL:		59.02	64.0			

STUDY TOTAL		313.25				
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11. Study Background and Problem Analysis

The Boreal Mixedwood forest region is the most extensive forest area in Canada. The expansion of forestry activity in the Boreal Mixedwood Region has led to government, industry and public concerns about the potential negative impacts of forestry practices on the environment. As indicated in Canada's Green Plan, "Canadians have a strong sense of commitment toward the preservation and protection of the great variety of complex biological systems residing in our forests." In order to achieve this goal for the responsible management of the forest requires a "shift from sustainable yield to sustainable development." Sustainable development, as defined in Canada's Green Plan refers to "our ability to manage our forest resource without prejudice to its future productivity, ecological diversity and capacity for regeneration."

These national commitments can only be fulfilled if we address the issues and potential negative impacts of forestry practices on the forest. These include:

1. decreases in ecosystem productivity through soil compaction and loss of soil organic matter and nutrients;
2. the destruction of ecosystem integrity through ecological dysfunction and fragmentation, loss of biodiversity and wildlife habitat, and
3. a loss of landscape diversity through the harvesting of old growth forests.

We still have limited knowledge on the impacts of forestry practices and other disturbances upon the structure and processes of the major Boreal Mixedwood ecosystems in the Northwest Region. The Forestry Practices program of Green Plan offers an opportunity to address these problems.

Forest succession is of great importance to industrial forestry, wildlife, and recreational interests. The rate of succession dictates timber harvest schedules and patterns, determines

habitat for wildlife, influences recreational values, and controls the ecological diversity of the forest. A lack of knowledge of succession processes and rates has prevented optimum management of forestland. There is a lack of appreciation by forestland managers of the rate of plant community and stand development in boreal mixedwood ecosystems. It is assumed that the new forest crop will generally be harvested in 60 to 100 years in mixedwood forest (60 years for *Populus tremuloides* and 100 years for *Picea* spp.) under uneven-age management. Inherent land productivity for *Picea* spp. and *Populus tremuloides* has not been part of the rationale for land allocation of these species. Variability in rates of plant succession and stand development in different forest ecosystems has generally not been considered a factor in stand rotations. The study is relevant to Green Plan initiatives in the areas of Model Forests, the Dynamic Inventory Projection sub-program of the Decision Support System program, and as part of NoFC Forestry Practices study. The study relates to the ForCan strategic initiative in support of forest ecosystem dynamics and forest management systems and to the NoFC DSS Mixedwood initiative.

Recent developments in GIS, remote sensing and other information technologies have presented an opportunity to use new and powerful tools to extend the applications of many of our forest research findings and to compare results from diverse disciplines within a common geographic framework. The increasing realization that many forest management opportunities and constraints are related to site type presents the possibility of their prediction and analysis using a site classification within a GIS, and in conjunction with remote sensing methods. Several aspects will be addressed by this study. The Naia predictive site classification study addresses national and regional and provincial strategic initiatives in the areas of decision support and forest management systems and in ecological site classification. The Forest Resources Research program at NoFC has undertaken a major initiative in the development of Decision Support Systems (DSS) for Mixedwood Management. Much of the leadership of this initiative will be through NOR-02, upon staffing of a "Knowledge Engineer".

Forest Ecosystem classification has been increasingly recognized as being fundamental to practising sustainable forest land management, and has been given high priority by the three provinces in the Northwest Region. Opportunities exist under the PAIF programs to complete site classification field guides for the remainder of Alberta and much of Saskatchewan and Manitoba.

Large scale pulpwood clearcutting operations in Alberta foothills have resulted in large areas of young (≤ 25 yr.) forest. The rate and extent to which the productivity, structure and species composition of these forests is proceeding toward that of mature forest on similar situations is not well documented. An opportunity is thus available to increase our understanding of forest dynamics in the foothills. Such information can be used to interpret recently developed forest site classifications emphasizing mature forest vegetation. The study is relevant national strategic initiatives in forest ecosystem dynamics and regional initiatives in ecological site classification.

Grass competition with white spruce seedlings in our region is recognized to be a major silvicultural problem. Mechanical site preparation is expensive and often not effective. Chemical methods have encountered resistance from environmental lobby groups. Reduction of grass competition by an alternative method may be attractive. (Carried over from NOR-10-06). The study is relevant to regional and national initiatives in forest management systems.

12. Study Objectives:

i) Objectives

- 1) To conduct and facilitate research and development and technology transfer in ecological site classification in the Northwest Region and to increase the area of the Northwest Region covered by comprehensive ecological site classifications.
- 2) Evaluate the impact of forestry practices on boreal forest, ecological processes and productivity.
- 3) Increase our knowledge of the dynamics of boreal forest ecosystems and the environmental factors controlling their development and productivity.
- 4) To evaluate the utility of current information technologies including GIS, GPS, digital remote sensing, expert systems, relational database systems etc. in enhanced forest land management, especially as applied to decision support systems for mixedwood management.
- 5) To integrate non-timber values especially wildlife in ecologically sound forest land management systems.
- 6) To provide leadership to the NOR-02 project.

ii) Deliverables

Short Term (1-5 years)

Publication primarily through supervised contract, of 4 ecological site classification field manuals for southwestern Alberta (completion of Swak work) northern Alberta, the mixedwood section of Saskatchewan and the productive forest area of Manitoba. This work is facilitated by PAIF funding. Related field training to clients would be provided.

Development of several computerized dynamic inventory projection software tools under the Green Plan DSS program.

Practical implementation with clients of mixedwood DSS modules for stand tending and mixedwood silviculture, and of the NAIA predictive site classification and mapping software in conjunction with ARC and Hughes Aircraft.

Documentation of ecosystem dynamics in the boreal mixedwood as input into forest succession modules in the Forest Resources and Green Plan DSS Forestry Practices and Model Forests Programs.

Preparation of a supplement for "Forest Ecosystems of West-Central Alberta", classifying and describing the ecosystem association of the Montane Ecoregion. Plot sampling is nearly complete.

Publications in the following areas:

- a) Evaluation of synthetic mulches to control grass competition with planted white spruce;
- b) Information report on 25 year results of succession after clearcutting lodgepole pine;
- c) Information report on highly productive sites in the Northwest Region;
- d) Symposium - journal publications on NAIA predictive site mapping project - the first to appear in proceedings of GIS 93.
- e) Conceptual models of boreal mixedwood succession
- f) Forestry practices effects on mixedwood forest composition, processes and productivity;
- g) Evaluation of MEIS imagery to discriminate site classes.

Long Term (5 years and beyond)

Facilitate the maturation and eventual commercialization of the Naia predictive mapping software.

Facilitate the implementation of the mixedwood management DSS in the Northwest Region and deliver modules to clients.

Implementation of the Dynamic Spatially Oriented Biophysical Inventory Program software in Canada and especially on Model Forest sites.

Elucidation of forest ecosystem - environment relationships and dynamics in the Northwest Region with effects of impacts of various management strategies upon productivity.

iii) Significant Linkages:

Alberta Research Council - B. Liblong, J. Mulder
 Hughes Aircraft Canada - K. O'Connor, D. Leishman
 ESRI Canada - K. Jones
 University of Calgary - P. Gong
 Maritimes Forestry Centre - D. McLean
 Great Lakes Forestry Centre - P. Addison, R. Sims, D. McKenney, B. Mackey
 Petawawa National Forestry Institute - M. Strome, T. Moore
 Pacific Forestry Centre - D. Pollard
 Forestry Canada, Winnipeg - J. Ball (NOR 42)
 Forestry Canada, Prince Albert - P. Loeth (NOR 46)
 NoFC - D. Maynard (07-07); R. Yang, (04-09); S. Navratil (10-12); I. Edwards (10-13)
 ForCan - Newfoundland and Labrador region - W. Meades
 Canadian Forest Products, Grande Prairie - D. Weeks, J. Bauer
 Manitoba Forestry Branch - R. Lamont, G. Becker

Saskatchewan Forestry Branch - D. Lindenias, J. Benson
 Alberta Forest Service - H. Archibald, D. Morgan, C. Henderson, J. Kitz, K. Branter,
 T. Lakusta
 Forestry Canada Headquarters - D. Brand
 Weldwood, Hinton - R. Udell, S. Curry, W. Rugg
 Weyerhaeuser, Prince Albert - R. Orynik
 University of Alberta - D. Pluth, J. Robertson (Soil Science)

13. Progress and Achievements Up to and including 1991-92

Progress to date has included the compilation of data from nearly 900 sample plots and their analysis to complete the "Field Guide to Forest Ecosystems of West-central Alberta" (Corns and Annas, 1986) which is widely used throughout the northwest region. Other research activities have focused on the evaluation of soil compaction effects on seedling growth for several soil types in west-central Alberta; documentation of the most productive sites in the northwest region; dynamics of lodgepole pine communities developing after clearcutting; evaluation of MEIS and SAR digital remote sensing data for site type discrimination and an evaluation of synthetic mulches to control grass competition in north-central Alberta. The study leader has been very active in field training and technology transfer in site classification.

The study leader has been active in several advisory committees and task forces (e.g., Alberta Ecological Classification task force and Alberta Regeneration Standards task force) as well as in the Canadian Institute of Forestry both nationally as vice-chair and chair of the Ecology Working Group (1989-91) and in the Rocky Mountain Section as councillor (1989-92) and chair (1992-93).

As acting Program Director Forest Resources, the study leader organized national and regional workshops on Decision Support Systems and was invited to be national coordinator of the Dynamic Spatially-Oriented Biophysical Inventory sub-program of the Green Plan DSS initiative. He also sits on Green Plan technical committees for Forestry Practices, Ecological Reserves and Land Classification.

14. Goals and Accomplishments (1992-93)

- 1) *Complete "Proof of Concept" for NAIA Predictive site mapping project in cooperation with Hughes Aircraft, Alberta Research Council and ESRI Canada (Jones) (Allan, Kalenith)*

Site data and digitized maps were provided to Hughes and ARC by NoFC and I. Corns spent several days at ARC in Calgary "knowledge engineering" the NAIA prototype. The predictive algorithms have been run, refined and re-run several times and results are encouraging. Discussions are on-going with Weldwood - Hinton to do further work/refinements on the Weldwood FMA. I. Corns has co-authored a paper for presentation at GIS '93.

- 2) *Work with NOR-10 and NOR-4 in conjunction with knowledge engineer, to more fully develop the DSS Mixedwood conceptual model, forest level framework and integration of site*

classification and GIS into the program. (Navratil (NOR 10-12), Bella (NOR 04-01), Yang (NOR 04-05), Hans (NOR 04-09), Kalenith).

Knowledge engineer hiring is currently on hold. I. Corns and R. Kalenith worked with R. Yang to facilitate the development of Yang DSS framework under Green Plan DSS. R. Kalenith provided digital site data and GIS input. Work was demonstrated at the Green Plan DSS - Model Forest workshop in Hinton in November 1992.

3) *Continue involvement in Green Plan technical committees and program.*

a) *Forestry Practices - Initiate sample plot set-up to evaluate effects of forestry practices (after Powers, U.S., Forest Service) with NOR-07-01. (Corns, Maynard; NOR 7-01)*

Two areas were chosen for the Forestry Practices site on the Weldwood FMA northwest of Edson. Thirty-one 15 × 100 m plots were established in the Marlboro VIII working circle. A residual width of 45 meters was left between plots to allow for logging in a herringbone fashion. Each plot had a 5 meter transect that ran down the middle from top to bottom in which all trees breast height and greater were tallied as to species, dbh, and height. Trees were recorded by 10 meter segments and one measured as a reference tree in each segment. Other trees were estimated to the nearest 0.5 m in height. Field sampling was coordinated by DA assisted by C. Olive.

b) *Decision Support Systems - National Coordination of "Dynamic Spatially Oriented Biophysical Inventory"*

Study leader participated in several meetings (Fredericton, Hinton) with DSS Steering and Technical Committee and with proponents in the Dynamic Inventory program to help refine program goals. A 1992-93 work plan for the Dynamic Inventory program was prepared. The 1992 Dynamic Inventory budget was dispersed to study leaders. Results of the various DSS studies were presented at a joint Green Plan DSS - Model Forest meeting in Hinton, November 1992.

c) *Land Classification - Initiatives to be discussed further at March 9 meeting*

Work under contract supervised by Sims, Meades, Corns on an "Indicator Plants of Canada" manual is progressing well (Northland Associates of St. John's Nfld.). A planning meeting for 1993-94 is to be held in Ottawa February 8-9, 1993.

d) *Ecological Reserves - Facilitate development of provincial initiatives that would support a national registry of ecological reserves.*

I. Corns commented on strategic plan drafts by D. Pollard PFC and D. Johnson attended with P. Lee (AB representative), an organization meeting in Toronto, March 1992. Discussions have occurred with Alberta and Saskatchewan but small budget precludes any progress toward the goal of a national network of ecological reserves.

- 4) *Provide leadership to NOR-2 including staffing of knowledge engineer and wildlife ecologist and initiate work with GIS technician.*

Applicants for the knowledge engineer and wildlife ecologist positions have been screened. Interviews are pending lifting of spending freeze. The GIS technician has assumed a variety of duties within NOR 02 and has assisted S. Navratil, R. Yang, and others at NoFC.

- 5) *Prepare Forest Management Note on highly productive sites in the region.*

No progress

- 6) *Continue evaluation of remote sensing methods in site classification.*

- a) *Assist in interpretation of CCRS multitemporal SAR imagery for Whitecourt study area.*

Multitemporal imagery has not yet been provided by CCRS for interpretation.

- b) *Draft Forest Management Note on evaluation of MEIS imagery to discriminate site classes.*

No progress.

- 7) *Submit manuscript to Forestry Chronicle on the evaluation of synthetic mulches to control grass competition with planted white spruce.*

Time permitted field measurements for another growing season but no progress on manuscript.

- 8) *Initiate mixedwood succession study in cooperation with Navratil and Bella Funding from Green Plan, PAIF.*

A mixedwood succession study was initiated and 63 plots were sampled in the Rocky Mountain House area. AFS suggested the study area, provided forest cover, digital topography and physical land classification (PLC) information. R. Kalenith digitized the forest cover and PLC map themes, and set up data base. Proposals for support for a graduate student have been sent to the three Model Forests (NOR 26-01) in our region.

- 9) *Prepare the clearcutting succession paper as an information report.*

No progress.

- 10) *Facilitate publication of Forest Ecosystems of South Western Alberta in cooperation with the Alberta Forest Service.*

I. Corns accompanied H. Archibald AFS on a four day field trip to the northern portion of the Sivak study area to identify site types that required further sampling. A contract supervised by AFS was awarded to sample additional plots for site units

that were not well-represented originally. A second contract was awarded by AFS to D.A. Westworth and associates to re-compile the Sivak data and correlate the site classification with previous efforts. I. Corns accompanied contractor and H. Archibald of AFS on a one week field trip to southwestern Alberta to help identify potential problems and solutions in implementing the Sivak classification. I. Corns will review upon completion.

11) *Continue committee involvement:*

a) *Trees in Canada book*

Final drafts of several sections were reviewed. Publication scheduled for spring 1993.

b) *NAIT Biological Sciences, Renewable Resources Option, Curriculum advisory committee.*

I. Corns participated in annual review of the program, January 1992.

c) *Alberta ecological classification task force*

Task force did not meet in 1992 but I. Corns met several times with H. Archibald, AFS to plan delivery of Alberta PAIF site classification program.

d) *West-central Alberta caribou technical working group*

Working group met in Hinton November 26, but I. Corns was unable to participate.

e) *chairman CIF/RMS Executive Council*

I. Corns chaired monthly (approx) Council meetings, sat on ARPFA panel Slave Lake (June 12, 1992), chaired Peace River business meeting and technical session (October 15, 1992), attended to business/correspondence arising from meetings. Next meeting in Slave Lake January 22 joint with ARPFA.

f) *AFS Regeneration standards task force*

I. Corns participated in a November 25 meeting which discussed principal site factors to evaluate regeneration performance against. Soil drainage and elevation are to be evaluated first.

12) *Complete sampling and descriptions for ecosystem Associations of the Montane Ecoregion of west-central Alberta as a supplement to Field Guide to Forest Ecosystems of West-central Alberta.*

Additional plots were sampled (total now 42) in the Montane ecoregion of west-central Alberta. Work on data synthesis and site unit descriptions has not yet begun, but data have been entered in computer.

- 13) *Initiate work on Ecosystem Classification of northern Alberta in cooperation with AFS.*

I. Corns and H. Archibald (AFS) have planned strategy for sampling in northern Alberta. Existing data was being compiled in same format during 1992. Field work will take place in 1993 and 1994.

- 14) *Initiate contract on Field Guide to Forest Ecosystems of Manitoba.*

A proposal was tendered and contract awarded under Manitoba PAIF to Geomatics International of Burlington, Ontario. Work is progressing on schedule a meeting with Manitoba Forestry Branch and forest industry personnel was held in Winnipeg August 19, 1992 and a field workshop with the contractor on the Abitibi-Price FMA on October 6, 1992. (C/M PAIF: 8045)

- 15) *Initiate contracts to apply NAIA predictive site mapping methods to the Manitoba site classification pilot areas.*

A contract was awarded to Hughes Aircraft - Alberta Research Council to apply the Naia technology to the site classification pilot areas mapped under the previous Manitoba PAIF. A meeting with Manitoba Forestry Branch and Manitoba industry was held in Winnipeg, December 17, 1992.

- 16) *Provide input into monitoring study of logged white spruce floodplain forests in Wood Buffalo National Park.*

I. Corns was invited by Steve Cornielson of WBNP to set up a monitoring study in the park. I. Corns declined due to previous commitments and recommended consultants.

- 17) *Conduct spatial analysis of site related influences on forest cover in Torch River forest SK and provide consultation to Ron Hall NOR 02-04 as required regarding site influences related to his Ph.D. research. (Green Plan)*

The Torch River site data were digitized by R. Kalenith and integration into SPANS GIS database is in progress.

- 18) *In cooperation with Drs. La Roi, Pluth, and Strong prepare a manuscript for submission to Can. J. For. Res. on the nutrient relationships of lodgepole pine and white spruce ecosystems in west-central Alberta. The work study is part of a PRUIF contract of several years ago.*

Two meetings were held with no-authors to divide work load, contributions etc. Much of the data have been coded into a data base by G. La Roi.

Added Goal

- 19) *Assume co-chair of Alberta PAIF. A committee with C. Henderson, AFS.*

Meetings to screen proposals etc. were held April 21, May 13, November 3.

15. Information Activities

i) Journal Publications

Corns, I.G.W. 1992. Forest Site Classification in Alberta: its evolution and present status. For. Chron. 68:85-93.

ii) Information Reports

Nil

iii) Other reports

Mulder, J.A. and I.G.W. Corns. A decision support system for predicting and consolidating ecosystems from existing map data and classification systems. Submitted to GIS 93.

iv) Lectures, courses, seminars and scientific addresses

- I. Corns addressed AFRAC on March 26, 1992 with a presentation on the NoFC Mixedwood Management DSS initiative and on the Naia predictive site mapping project.
- I. Corns was a co-leader of the "Forest Soils of West-central Alberta" tour August 8-9, 1992 conducted in conjunction with the Canadian Society of Soil Science conference held in Edmonton.
- I. Corns presented a demonstration of Naia and NOR-2 project capability to Mr. Oberle, April 23, 1992.
- I. Corns with assistance from D. Allan lead three site classification field courses for first year NAIT Forest Technology students at Elk Island National Park, April 29, 30, and May 1, 1992.
- I. Corns consulted with Saskatchewan provincial government staff from several departments on the compilation of an ecoregions of Saskatchewan map; in Saskatoon May 29, 1992.
- I. Corns made a presentation on the Green Plan DSS - Inventory Projection Model proposal of T. Moore of PNFI to the annual Canadian Forest Inventory Committee meeting at Hinton, June 11, 1992.
- I. Corns invited to present a paper on "The Silvicultural Implications of In-woods chipping" at the FERIC - sponsored workshop on In-woods chipping held at Hinton October 20, 1992.
- I. Corns made a presentation on progress in the Dynamic Inventory initiative to the Green Plan DSS Technical and Steering Committees at the joint Green Plan DSS and model forest meetings in Hinton November 17-19, 1992.

- I. Corns made a presentation on "The history and Development of Site Classification in Canada" to a CIF sponsored (joint with Saskatchewan PAIF) workshop on site classification in Prince Albert, December 10, 1992.

v) Technology transfer:

- I. Corns and R. Kalenith presented a demonstration of GIS related work to a Chinese delegation to NoFC lead by Dr. J. Beck of Dept. Forest Science, U. of A., August 3, 1992.

16. Goals 1993-94

- 1) Work with NOR-10 and NOR-4 in conjunction with knowledge engineer to more fully develop the Green Plan DSS Mixedwood conceptual model, forest level framework and integration of site classification and GIS into the program (Navratil (NOR 10-12), Bella (NOR 4-01), Yang (NOR 4-09), Hans, Kalenith).
- 2) Continue involvement in Green Plan technical committees and program.
 - a) Forestry practices - install organic matter manipulation and compaction treatments, vegetation analysis, soil sampling on plots on Weldwood FMA. Also re-evaluation of several A-15 plots for mixedwood succession data base - possibly with graduate student.
 - b) Decision Support Systems - National Coordination of Dynamic Spatially - Oriented Biophysical Inventory:
 - Supervision of contract on Inventory Projection System (T. Moore, PNFI to help with drafting specifications).
 - Work with R. Yang (NOR 4-05) on enhanced DSS framework and initiation of mixedwood silviculture module with knowledge engineer on Model Forest site(s).
 - Supervision of bio-environmental indices work of McKenney and Mackey, GLFC.
 - Provide input to mixedwood succession models of Sims (GLFC).
 - Continue to gather data for mixedwood succession models in Northwest Region (possibly with U of A grad student).
 - Supervision of contract on enhancement of Functional Design of the Dynamic Inventory program (Hughes/ARC).
 - Possible additional study supervision - finalized in March 93.

c) Land Classification.

- See indicator plants of Canada manual through to completion.
- Other initiatives to be discussed at February 5-9, 1993 meeting.

d) Ecological Reserves

Work with Model Forests in Northwest Region to set up an Ecological Reserve.

- 3) Provide leadership to NOR 02 including staffing of knowledge engineer and wildlife ecologist.
- 4) Submit manuscript to Forestry Chronicle on the evaluation of synthetic mulches to control grass competition with planted white spruce.
- 5) Initiate U of A Dept. Soil Science graduate student (A. Hammermeister) study of Mixedwood succession in relation to soil drainage and topography with Model Forest and Green Plan Forestry Practices/DSS funding.
- 6) Publication of Field Guide to Forest Ecosystems of Southwestern Alberta in Cooperation with AFS.
 - a) Trees in Canada book. Review remaining final drafts.
 - b) NAIT Biological Sciences, Renewable Resources Option, Curriculum advisory committee.
 - c) Alberta ecological classification task force.
 - d) West-central Alberta caribou technical working group.
 - e) Director, CIF/RMS Executive Council
 - f) AFS Regeneration standards task force
 - g) Co-chairman Alberta PAIF A committee
 - h) Member Sask. PAIF site classification and biometrics working group.
- 7) Complete draft of forest ecosystems of Montane ecoregion of west-central Alberta as a supplement to the "Green book".
- 8) Initiate work on forest ecosystem of northern Alberta in cooperation with AFS.
- 9) Continue to supervise (joint with R. Sims GLFC) contract on Field Guide to Forest Ecosystems of Manitoba. (C/M PAIF: 8045)
- 10) Continue to supervise contract and finalize results of NAIA predictive site mapping methods applied to the Manitoba site classification pilot areas.
- 11) Conduct spatial analysis of site related influences on forest cover in Torch River forest Saskatchewan.
- 12) In cooperation with Drs. La Roi, Pluth and Strong prepare a manuscript for submission to Can. J. For. Res. on the nutrient relationships of lodgepole pine and

white spruce ecosystems in west-central Alberta. Data were collected during a PRUF contract that I. Corns supervised several years ago.

17. Major Co-operators:

i) Internal - FC

- Maynard, Sidhu (NOR-07); Navratil, Edwards (NOR-10); Yang, Hans (NOR-04)

Great Lakes Forestry Centre

- in Green Plan DSOBIP studies of Sims and McKenney
- Co-supervision of contracts with R. Sims on "Indicator Plants" and site classification field guide for Manitoba

Petawawa National Forest Institute

- in Green Plan DSOBIP initiative re. Inventory Projection System work by T. Moore. Also M. Stranet team leader of Green Plan DSS.

Maritimes Forestry Centre

- cooperation with Dr. D. McLean on development of inventory projection system under Green Plan DSS.

Pacific Forestry Centre

- Cooperation with Dr. D. Pollard in implementing a Green Plan Ecological Reserve on a Model Forest

Forestry Canada Winnipeg

- cooperation with J. Ball as district contract for site classification contract and for DSS related work in Manitoba District Office

Forestry Canada Prince Albert

- cooperation with P. Loseth in drafting and implementing site classification contract for Saskatchewan.

ii) External -

Hughes Aircraft Canada

- Contract supervision in functional design specifications for DSOBIP program of Green Plan (K. O'Connor, M. MacDonald).

Alberta Research Council

- Contract supervision related to DSOBIP above plus refinement of Naia on Weldwood FMA (J. Mulder).

ESRI Canada

- cooperation with Naia on Weldwood and possible collaboration in implementation of ARC Forest at NoFC.

Manitoba Forestry Branch

- cooperation with R. Lamont and G. Becker as Manitoba contacts for two site classification contracts.

Saskatchewan Forestry Branch

- cooperation with D. Linden and J. Benson as SK contacts for site classification contract.

Alberta Forest Service

- H. Archibald for site classification work; T. Lakusta and D. Morgan for mixedwood succession work; J. Kitz and K. Branter for regeneration

standards task force; C. Henderson D. Dermott, D. Fregren for Alberta PAIF
A committee.

Weldwood Hinton

- S. Curry and B. Mair for site classification and Naia; W. Rugg and D. Renaud for Forestry Practices study

Weyerhaeuser, Prince Albert

- R. Orynik for Model Forest related activities

University of Alberta

- D. Pluth and J. Robertson (Soil Science) for Forest Soils 314 course.

Canadian Forest Products, Grande Prairie

- D. Week, J. Bauer for NAIA work.
- Feric (West) - Cooperation with chipped residue application in Forestry Practices study.

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the study activities of previous years and concluded that these activities were not potentially detrimental to the environment. However, a re-evaluation may be appropriate in light of activities planned under the Green Plan Forestry Practices program.

ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 11, 1993

1. **STUDY TITLE:** Remote sensing and GIS technologies for inventory and mixedwood management
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** GIS, Forest Inventory & Site
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Alberta, Saskatchewan
7. **Study Staff:**

	Name
Study Leader	R. Hall
Team Members	D. Patterson
	R. Kalenith

8. **Study Key Words:** inventory, Geographic Information Systems (GIS), remote sensing, mixedwood management, biometrics, digital image analysis, satellite imagery, aerial photography, large-scale photography (LSP), technology transfer
9. **Study Activity:** 2224

10. Study Resources:Personnel Information

		1923/93	Fiscal Year 1993-94			1994/95
Employee Name	Category	Previous	Budget	Revised	Forecast	Upcoming
Ron Hall	FO-2 (P)	0.00	0.00	1.00		
R/S Tech (Term)	EG-5 (T)					
Rex Kalenith	EG-4 (T)	0.10	0.10	0.00		
FTEs		0.10	0.10	1.00		

Financial Resources (\$000s)

	1992/93	Fiscal Year 1993-94			1994/95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M + software maintenance PCI, SPANS	7.15	10.0			\$6600 + \$4420 for PCI, SPANS
Capital	5.16				
G & C					
TOTAL:	12.31	10.0			

		1992/93	Fiscal Year 1993-94			1994/95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries						
O&M: Alta.	A8055		20.0			
Capital						
G & C						
TOTAL:			20.0			

STUDY TOTAL		30.0				
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11. Study Background and Problem Analysis

Forestry is a spatially distributed resource and increasing needs for inventory information relevant to mixedwood management, present both an opportunity and requirement to evaluate new digital/analogous remote sensing and Geographic Information System technologies, to augment or replace conventional survey methods. Parallel to these information needs however, are both new sensors and improvements in existing, airborne (e.g., MEIS, imaging spectrometer, FMC aerial cameras, laser, GPS) and satellite (e.g., RADARSAT, SPOT, ERS-1, LANDSAT) sensors that offer a much wider diversity in information acquisition of forest resources than ever before. Research is needed for both digital processing of remote sensing data and integration with spatially referenced geographic information, to produce the products relevant to mixedwood management. Such technologies are also emerging as new tools for determining spatially-based, biological relationships of forest stand susceptibilities to forest pests. Quantifying such relationships potentially results in significant improvements to forest management and harvest scheduling decisions.

A newly defined regional strategic priority in developing Mixedwood Management Decision Support Systems (DSS) will entail development of suitable remote sensing inputs and integration within a GIS and DSS framework. Such systems generally require large amounts of data that are both diverse and up-to-date. The greatest contributions of remote sensing to these systems are its currency and ability to detect changes in the forest landscape with multivariate observations.

Three new studies to be funded by the Alberta PAIF will be initiated in 1993/94 to address regional mixedwood forest inventory problems. The first study addresses hardwood species discrimination by implementing a more basic, biological approach of "inside tree-out" and "ground-up" by recording/analyzing spectral reflectance characteristics of individual leaves, trees and forest stands. This approach will comprise the foundation towards developing a photographic or digital solution. The second study is to determine the spatial distribution and presence of conifer understory under a hardwood canopy to assist management of the land base. Landsat TM and SPOT multivariate image data will be evaluated to produce image maps that could be exported as a data layer in a GIS. For the third study, it is generally known that the accuracy and reliability of inventory information depicted on forest cover maps is influenced by the quality of aerial photographs interpreted. The objective of the third study is to determine the characteristics of aerial film products that produce the highest interpreted accuracies of cover type attributes depicted on forest cover maps.

12. Study Objectives:

i) Objectives:

1. To assess, develop and apply new remote sensing & interpretation (digital image analysis) techniques in the inventory and monitoring of forest resources relevant to mixedwood management with consideration for GIS integration. For example, to undertake projects of regional importance such as hardwood species discrimination and conifer understory as support, time and financial resources allow.

2. To provide advisory and technology transfer services in the acquisition, uses, analyses of remote sensing imagery, mapping, survey design, GIS, microcomputers, and in the operation of interpretation equipment.
3. To cooperate in developing a Mixedwood Management Decision Support System under the Green Plan and C/A PAIF as one of the regional strategic priorities.
4. To enhance and maintain a comprehensive image acquisition, image analysis, and GIS laboratory for cooperative studies.

ii) Deliverables

Short Term (1-5 years):

Completion of PHD thesis on determining spatial relationships of jack pine budworm top-kill defoliation patterns. Completion of Alberta PAIF projects addressing mixedwood inventory problems and development of technology transfer plan for operational implementation where appropriate. Creation of remote sensing and GIS information and image databases (e.g., RESORS, Procite, etc) for R&D and technology transfer purposes. Creation and delivery of aerial photo acquisition technology seminars to the region. Geometric correction and enhancement of thermal infrared line scanner imagery and production of map products is possible.

Long Term (5 years and beyond):

The requirement for up-to-date data in GIS applications and the increasing diversity of airborne and satellite remote sensing data sources will increase integration opportunities. Evaluation of new remote sensing data at resolutions appropriate to assist mixedwood management decisions must be undertaken and packaged for delivery. One example is the development of methodology for incorporating remote sensing data into the Mixedwood Management Decision Support System.

iii) Significant Linkages:

Alberta Forest Service (Forest Measurements), Resource Information Branch
 W.R. Dempster & Associates
 Daishowa Canada
 Slave Lake Pulp
 University of Calgary, Department of Geography
 NOR-05-02 fire detection technologies with C. Ogilvie
 University of Alberta - Spatial Information Systems Working Group
 Petawawa National Forestry Institute
 Canada Centre for Remote Sensing
 PCI Incorporated
 Intera Tydac (SPANS)

13. Progress and Achievements Up to and including 1991-92

Previous activity included development of a computer-based, large-scale aerial camera system which included a second system for Yukon Forest Resources. There has been several LSP applications with particular emphasis on regeneration assessment. Subsequent studies have been directed at defining the aerial film specifications that are optimal for forest inventory and two studies have been completed in this area. A third study to relate film characteristics to specific forest cover attributes will commence in 1993. Analogue and digital remote sensing techniques were applied to forest tent caterpillar defoliation mapping, cutover mapping, and broad forest covertype mapping. Special image enhancements were developed for high resolution MEIS data of the mixedwood Boreal forest in cooperation with PNFI. There has been 25 reports published, 4 file reports written, and 47 manuscripts have been technically reviewed.

Significant progress has been made on the PHD under Longer Term Training with completion planned during the 1993-94 fiscal year. The LSP camera pod has now been used for 4 years on fire hotspot detection and mop-up work with a thermal infrared line scanner. Some technology transfer activities (e.g., advice and review of aerial photos for spruce budworm defoliation, remote sensing/GIS methodologies for climate change, inventory, vegetation mapping) have been undertaken but technical assistance has been deferred as much as possible.

14. Goals and Accomplishments (1992-93)

1. *Completion of the PHD degree under LTT with particular emphasis on Phase 2 (digital remote sensing) and Phase 3 (GIS and spatial analysis).*

Phase 1 was completed and a journal paper was written, reviewed and accepted for publication in the Canadian Journal of Forest Research. Phase 2 (digital remote sensing) and 3 (GIS spatial analysis) data preprocessing have been ongoing and Phase 2 plus an entomology review background chapter should be finished by March '93. Phase 2 preprocessing have entailed atmospheric and geometric corrections of the multirate (3) Landsat TM scenes into image subsets that can be readily transferred to the SPANS GIS. Phase 3 preprocessing over the past year have entailed the digitization and integration of site and photo interpreted top-kill into the SPANS GIS database. A poster paper describing the work was presented at the annual University of Alberta Forestry Symposium. The preparation of 3 research proposals for '93-'94 funding and completion of other goals have delayed completion of the thesis.

2. *Provide advisory services in remote sensing, forest inventory, and GIS to NoFC clients and colleagues as required and particularly:*

- a) *assist NOR 05-02 (Ogilvie) as needed in the use of the camera pod and cooperate with both Yukon NAP and Ogilvie in procurement of a STA approval.*

assisted NOR 05-02 (Ogilvie) by liaising with Yukon Forest Resources, NWI, and Canadian Helicopters as needed in the procurement of a STA approval being funded by PAIF's in Alberta and Manitoba. STA approval may be achieved by March 1993.

b) continue as member of SPANS Government User's Group.

Continued as member of SPANS User's Group, attended 3 meetings and working with AFS to coordinate a 1-day Technical User's Exchange Forum with Intera Tydac to be held Feb. 23/93.

c) continue as member of ForCan Remote Sensing Working Group.

Provided annual report update as member of ForCan Remote Sensing Working Group. A proposal was made to host the User's Group Meeting during the Fall of 1993.

d) continue as AFS contact person to Remote Sensing Subcommittee of the Canadian Forest Inventory Committee.

Invited to join the Terminology Subcommittee of the CFIC (Canadian Forest Inventory Committee) to assist in revising the current 3rd edition of the "Forest Inventory Terms in Canada," and assisted in creating the Terms of Reference. No action was requested by the chair of the Remote Sensing Subcommittee.

e) added: review manuscripts as requested by Scientific and Technical journals

Completed 4 manuscript reviews: Canadian Journal for Forest Research, Canadian Journal for Remote Sensing, International Journal of Remote Sensing, and a Fire Management Note.

3. *Provide statistical analysis assistance and scientific support to L. Fent of AFLW, on "An analysis of film sensitometric characteristics and interpretation accuracies for forest inventories at 1:20 000," to determine if a specific combination of film and film quality yields more accurate forest cover interpretation.*

Completed statistical analysis and assisted in drafting journal paper by Fent, Hall and Nesby which has been submitted to Photogrammetric Engineering and Remote Sensing for review. A graphic slide presentation was also prepared for presentation at the annual CFIC meeting. A follow-up to this study was the basis for an Alberta PAIF proposal which was approved for 1993-94.

15. Information Activities

i) Journal Publications:

Hall, R.J. and A.H. Aldred. 1992. Forest regeneration appraisal with large-scale aerial photographs. *The Forestry Chronicle* 68(1): 142-150.

Hall, R.J., S.J. Titus and W.J.A. Volney. 1993. Estimating top-kill volumes with large-scale photos on trees defoliated by the jack pine budworm. *Can. J. For. Res.* in press.

ii) Information Reports:

iii) Other reports:

Fent, L., R.J. Hall, and R.K. Nesby. Aerial films for forest inventory: optimizing film parameters. Photogramm. Eng. Remote Sensing. Submitted to review.

iv) Lectures, courses, seminars and scientific addresses:

Hall, R.J., S.J. Titus, W.J.A. Volney, P.H. Crown, J.D. Heidt. 1992. Jack pine budworm defoliation: quantifying top-kill and characterizing stand vulnerability. Poster paper presented at the University Forestry Research Symposium held at University of Alberta.

Hall, R.J. and D.G. Leckie. 1992. MEIS forestry enhancements: Alberta mixedwood Boreal Forest experience. Poster paper presented at the International Forum on Airborne Multispectral Scanning for Forestry and Mapping held in Val Morin, Quebec, April 13-16.

Hall, R.J. 1992. Remote sensing and GIS project overview. Presentation to the Minister of Forestry, April 23rd.

Hall, R.J. 1992. Remote sensing in forestry: To see where your eyes cannot. Presentation at annual NoFC R&D Forum, May 8th.

Fent, L. and R.J. Hall. 1992. Aerial films for forest inventory: choosing the best product. Presentation at the Annual Canadian Forest Inventory Committee Meeting, Hinton, Alberta. June 8th.

v) Technology transfer:

Provided aerial photo contract specifications and assisted evaluation of photo products acquired for spruce budworm defoliation for David Ip, Manitoba District Office.

Provided advice and consultation to 3 graduate students (7 hours total) on GIS, remote sensing and statistical analysis methodologies.

Represented the Dept. of Forest Science Graduate Students on the University of Alberta Virus Committee. Assisted the Dept. of Forest Science in implementing computer virus protection and instructed graduate students on computer virus scanning and PC system management.

Reviewed and recommended Landsat TM band combinations and image enhancement type for a 1:100 000 reconnaissance inventory of the White Area proposed by the Alberta Forest Service requested by Dave Morgan. This request includes loan of the NoFC Procomm.

Reviewed remote sensing alternatives for Joe Niederleitner to assess leaf area index and standing biomass for climate change applications.

16. Goals 1993-94

1. Completion of the PHD degree and prepare draft papers from Phase 2 (digital remote sensing) and 3 (GIS and spatial analysis) for submission to an appropriate journal. If appropriate, draft paper on spatial analysis methodology for presentation at GIS '94 in Vancouver.
2. Manuscript review from:

Fent, L., R.J. Hall, and R.K. Nesby. Aerial films for forest inventory: optimizing film parameters submitted to Photogramm. Eng. Remote Sensing.
3. Undertake Alberta PAIF study with Alberta Forestry on the influence of air photo quality on photo interpretation accuracies of forest inventory cover type attributes. (C/A PAIF: 8055)
4. Complete phase 1 of Alberta PAIF study by obtaining spectral reflectance measurements of aspen, balsam poplar and white birch. Select study areas and sample sites in cooperation with Slave Lake Pulp and Alberta Forestry. Compare and draft a report on variations in spectral reflectance curves.
5. Initiate Alberta PAIF study to evaluate Landsat and SPOT imagery for detecting softwood understorey under a hardwood canopy. Select study area and sample sites in cooperation with W.R. Dempster & Associates and Diashowa Canada. Prepare contract specifications and manage project.
6. Provide advisory services in remote sensing, forest inventory, and GIS to NoFC clients and colleagues as required and particularly:
 - a) cooperate with NOR-0502 (Ogilvie) in providing maintenance support to the LSP camera pod and radar altimeter for the Ontario and BC prescribed fire behavior and smoke management studies. Also, to provide advice as required on possible remote sensing methods to analyze the data acquired from the FLIR and AIRDMAS (Airborne InfraRed Data Management and Analysis System), and to explore avenues for GIS integration in developing fire applications.
 - b) continue as member of the SPANS User's Group.
 - c) continue as member of the ForCan Remote Sensing Working Group.
 - d) continue as member of the Terminology Subcommittee of the CFIC and work to gather terms for the 4th edition.
 - e) review manuscripts as requested by scientific/technical journals and NoFC manuscript review process.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
NoFC		Project Leader	Ian Corns
		GIS Technician	Rex Kalenith
		Fire Study Leader	Chuck Ogilvie
		Remote Sensing Tech	
PNFI			Don Leckie

ii) External -

Establishment	ID#	Title	Contact name
Alta Forestry, AFS			Dave Morgan Livio Fent Tom Lakusta Richard Nesby
W.R. Dempster & Associates			Neil Stevens Dean Patterson
Slave Lake Pulp			Colin Beauchamp
Daishowa Canada			Steve Luchkow
Canada Centre for Remote Sensing			Frank Ahern

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Forest Policy, Planning and Resource Data
2. Responsibility Centre: Northwest Region (8151)
3. Activity: 1334
4. Program: Regional Development
5. Status: Terminating
6. Last Evaluation: February 8, 1993
7. Next Evaluation:

B. KEYWORDS:

004 Policy issues
 005 Development agreements
 007 Economics
 021 Sustainable development
 041 Evaluation
 056 Industry and Trade Advice; Forest Management
 100 Green Plan
 016 Research review and assessment
 240 Multiple use
 780 Statistics

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	3.00	3.00	0.00	0.00	0.00
Salaries	\$166.6	\$166.6	\$0.0	\$0.0	\$0.0
O & M	\$14.6	\$13.0	\$0.0	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$181.2	\$179.6	\$0.0	\$0.0	\$0.0

D. PROJECT DESCRIPTION

This project provides socio-economic, forestry, integrated forest resource data, analyses and documentation for policy, planning and program development in the area of regional and national forestry research, development, and technology transfer for sustainable development of the forest resource. It also provides planning and evaluation frameworks and various evaluation methodologies for integrated resource planning and management projects. It assesses the socio-economic benefits and impact of forest sector activities in the region related to partnership/cooperation agreements in forestry, job creation and the Green Plan.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary (\$s & PYs): \$000s

N/A

3. Collaborators:

N/A

4. Green Plan:

Objectives of the project are directly linked to the enhanced Science and Technology section of the Green Plan Forest Practices Initiative. The development of regional integrated multiple resource data bases as well as integrated forest resource management planning projects will eventually be linked to the Model Forest initiative.

Major participant in NoFC Sustainable Development of Boreal Mixedwood Ecosystems Study which involved a comprehensive literature review and evaluation of old CFS research plots. Scientific authority for a contract on Multiple Forest Resource Inventories to support Integrated Forest Management Strategic Options.

5. Milestones:

1. This project was terminated in November, 1992. See NOR 57: Policy, Planning and Evaluation and NOR 06: Forest Economics Research for new and continuing milestones.

Accomplishments:

1. Development of applied research studies in various aspects of integrated resource management was continued until 1 July, when these projects plus membership on the

Saskatchewan Forest Habitat Project were transferred to NOR 46: Canada-Saskatchewan Partnership Agreement in Forestry and District Office Acted as project authority and editor for the conference proceedings "Birds in the Boreal Forest". Developed a number of proposals for PAIF projects such as: Saskatchewan forestry-wildlife information management; Bow-Crow Forest IRM data requirements; models of the effects of forest management practices on wildlife indicator species habitat and populations with the Manitoba Forestry/Wildlife Management Committee.

Served as a member of the Northwest Region Task Force on Integrated Resource Management.

2. Acted as Forestry Canada project authority and Steering Committee Member for the Manitoba and Saskatchewan Long Term Integrated Forest Resource Management plans. This involved:
 - attendance at Saskatchewan Long Term Plan Steering Committee meetings;
 - attendance and speaker at 4 Public Information meetings;
 - preparation of detailed comments on 5 drafts of the State of Resource report;
 - preparation of comments on 2 drafts of the Planning Model and several proposals for changes in the planning framework/contract.

For the Manitoba Long Term Plan, rewrote the Request for Proposals, outlining a totally different approach which was then submitted to various members of Manitoba Natural Resources.

Served as Chair, Regional Integrated Forest Resource Management Technical Committee. Organized and conducted two meetings of the Regional Committee. A presentation was made to MANFRAC.

3. Developed and implemented research projects for primary and secondary wood-using directories for Saskatchewan. Contract for secondary wood-using directory was developed and let.

The primary and secondary wood-using directories for Manitoba were published and distributed. Prepared and published publication (similar to the previous Forestry Reports) on Manitoba Forestry. Prepared tables for the Manitoba Forest Industry Report. Developed concept for publication with D. Pronger, Communications (NOR 42-02).

Develop and manage forest product and marketing opportunities contracts under the Saskatchewan and Manitoba PAIFs.

Served as a member of the C/A PAIF Sub-committee B.2 Wood/Fibre Utilization-Related Research and Development.

4. Three evaluation frameworks were prepared for the Manitoba, Saskatchewan and Alberta PAIFs, without the assistance of provincial representatives. Presentations on options for an evaluation plan were prepared for discussion at the Saskatchewan and the Manitoba PAIF Management Committee meetings.

Attended CES workshop on Evaluation and Total Quality Management.

Served on the Evaluation and Evaluation Management Committees of the Canada-Government Northwest Territories Economic Development Framework Agreement as well as the Sub-Committee on the Evaluation Framework. Assisted in developing the Request for Proposals, evaluation criteria grid and selection of consultant, monitoring of Framework development, critiquing of two framework proposals. Assisted in preparation of subsequent draft plan.

5. Continued to act in an advisory role to the National Forestry Database Project. Specific items included the review of an extensive consultant's report detailing a proposed database management system to be implemented in the provinces to provide a national accounting of the status and success of silviculture, and the transfer of all national databases in the Northwest Region to Ottawa.

Preparation and analysis of various forest resource inventory and private land data attributes for input into a LOGIT travel cost model was done.

6. The development of a regional resource data strategic plan consistent with the regional strategic plan to meet the data requirements of regional Forestry Canada researchers and staff and Forestry Canada's clients was undertaken. The plan highlighted ecological reserves, Model Forests information and database integration as the most suitable areas where the project could provide a meaningful role, in addition to the continuing PSP catalogue function.
7. An advisory and trouble-shooting role in the 1991 national forest inventory was maintained. Specific events included: assisting with the signing of letters of agreement between provinces in the region and the Petawawa National Forestry Institute concerning the division of labour and the transfer of funds from PNFI, and modifying a 1986 inventory conversion program to operate on a PNFI computer for use in the 1991 exercise.
8. Continued to provide socio-economic and statistical data analysis and documentation for both Regional Development and Northwest Region programs, PAIFs, Green Plan initiative and other policies and programs, as required. Also, provided reviews/comments of reports, journal articles, research proposals and briefings.
9. Designed a new format for Northwest Region study work plan that incorporated data and timing requirements of Forestry Canada-PIMS as well as traditional content.

Input for annual plans for 1991-92 and 1992-93 was coordinated and verified for the required PIMS deadlines. Written text of Study Work Plans as well as of PIMS and its computerized data base were coordinated, verified, cross-checked and produced.

The regional working group, specific to PIMS had several meetings and sent recommendations to Headquarters.

The 1993-94 planning process was introduced at the Northwest Region Retreat, Management and Project Leader meetings in October and November.

Attended two courses designed to assist in development of a Strategic Implementation/Action Plan and tracking/monitoring of its development.

Draft documentation for the methodology as well as an assessment of our current Regional Strategic Plan is being prepared and expected to be complete by fiscal year-end.

10. A Green Plan contract to establish a header catalogue of land holdings of government, non-government and private progressed to the database design state only, due to lack of funding.

7. Link to Strategic Plan:

National:

This project links to several elements of the National Strategic Plan which include the national Database, industry and trade; forest management and new forestry agreements.

Regional/Institute:

This project links to the Regional Strategic Plan issues to stimulate economic use of the forest resource and regional development through the forest sector as well as to multiple use forest management. It is also involved in the new program thrust to develop research programs for integrating and applying forest management activities in support of the sustainable developments of nontimber forest resource and values.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: February 6, 1993

1. **STUDY TITLE:** Policy, planning and statistics
2. **Responsibility Centre:** Northwest Region (8151)
3. **Program:** Regional Development
4. **Project Title:** Forest Policy, Planning and Resource Data
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	D. Boylen
Team Members	R. Bohning
	D. Benke
	B. Chow
	J. Simunkovic
	Northwest Management Committee

8. **Study Key Words:** Forest resource policy, planning, integrated resource management, marketing systems, forest industry, employment/economic impacts, forest statistics
9. **Study Activity:** 1334

10. Study Resources:

Personnel Information

Employee Name	Category	1992/93	Fiscal Year 1993/94			1994/95
		Previous	Budget	Revised	Final	Upcoming
D. Boylen	ES-06 (P)	0.83	0.83	0.00	0.00	0
R. Bohning	CO-01 (P)	1.00	1.00	0.00	0.00	0
Total PY/\$		1.83	1.83	0.00	0.00	0

Financial Resources (\$000s)

	1992/93	Fiscal Year 1993-94			1994/95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries					
O&M	9.91	0.0	0.0	0.0	0
Capital					
G & C					
TOTAL:	9.91				

	ID #	1992/93	Fiscal Year 1993-94			1994/95
		Previous	Budget	Revised	Final	Upcoming
<u>Agreements</u>						
Salaries						
O&M:						
Alta.	A8024	75.0				
	A8025	35.0				
	A8026	1.5				
Sask.	S6044	19.8				
	S6052	30.0				
Man.	M8010	19.0				
Capital						
G & C:						
Sask.	S7010	133.3				
TOTAL:		423.6				

STUDY TOTAL	433.51				
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11. Study Background and Problem Analysis

Not applicable

12. Study Objectives:

i) Objectives

1. To provide socio-economic and statistical data, analyses and documentation for policy and program development of regional and national forestry research, development and technology transfer programs.
2. To coordinate and monitor strategic and operational planning processes, including documentation, for regional programs in forestry research, development, technology transfer and administration.
3. To provide evaluation of the costs of integrated forest management practices, the socio-economic benefits and impact of forest sector activities in the region, to be used for forestry research development and programs such as job creation and federal-provincial Agreements.

ii) Deliverables

Short Term (1-5 years)

Not applicable

Long Term (5 years and beyond)

Not applicable

iii) Significant Linkages:

NOR-51 - Management Services

NOR-53 Informatics

NOR-42 Canada-Manitoba Partnership Agreement in Forestry/District Office

NOR-44 Canada-Alberta Partnership Agreement in Forestry

NOR-46 Canada-Saskatchewan Partnership Agreement in Forestry/District Office

NOR-48 Canada-Northwest Territories Co-operation Agreement in Forestry

DIAND Evaluation Directorate

FORCAN - HQ - Policy, Planning and Evaluation Directorate

University of Saskatchewan - Extension Division

Weyerhaeuser Canada - Saskatchewan Division

13. Progress and Achievements

As this project and study were terminated in November, 1992, a review of the project/study's achievements is summarized from 1983 onward, when the current Project Leader filled the position. More detail is available in the annual project, study and operational plans of those years.

Beginning in 1983-84, the Resource Economics and Statistics project helped prepare the regional development situation assessments, the legal documents for three provincial Forest Resource Development Agreements, their accompanying Schedules, the Treasury Board submissions, Memorandums to Cabinet and other miscellaneous documents. For the recent Partnership/Cooperation Agreements in Forestry, project/study members prepared Schedule "A"s and miscellaneous material.

The Project/study leader has prepared evaluation frameworks for 7 agreements, two with the aid of consultants, as well as evaluation plans and Requests for Proposals. She was also involved in aspects of their Audit both within/out the Department.

The majority of the work in the project/study involved the development and management both directly and in a supervisory role of 46 projects in socio-economic and forest resource management, as well as forest industry profiles, directories and analyses, totalling \$905,000, mostly funded by Agreements. Two additional projects involving long term integrated forest resource management plans in Saskatchewan and Manitoba are being funded at some \$890,000. An additional 9 projects in integrated resource management applied research were developed and initiated with partners last year.

A decision support system, called FDAS - Fire Damage Appraisal System was developed and awaits further development and integration into fire management decision support systems.

The Project Leader was involved on two national Task Forces/groups to explore and develop strategies for national programs in forest economics. The last identified Northwest Region as a catalyst for applied research in integrated resource management in addition to forest resource economics. Various other regional task forces, such as the one on Integrated Resource Management were participated in.

Some 37 publications were written by the project/study team. These include: 5 journal/conference papers, 10 FRDA reports, 12 file/unpublished reports, 5 Information Reports, and 5 poster papers/brochures/transfer notes.

The project/study was able to participate in 3 ENFOR and 5 PRUF projects. The latter were especially helpful in supporting some 13 graduate students (resulting in 8 theses), whom we advised. An additional 3 graduate students on exchange from the University of Helsinki, Finland were supervised during three summer programs.

The project leader designed, co-ordinated the development with staff, and wrote the Northwest Region Strategic Plan 1990-95.

The growing importance of strategic planning and evaluation in the operation of the Forestry Canada program in this region, plus the personal interests of the Project Leader have resulted in the termination of NOR-3 and the development of a new project NOR-57 -Policy, Planning and Evaluation.

14. Goals and Accomplishments (1992-93)

1. *Co-ordinate the regional planning process. (Boylen)*

Designed a new format for Northwest Region study work plan that incorporated data and timing requirements of Forestry Canada-PIMS as well as traditional content.

Input for annual plans for 1991-92 and 1992-93 was coordinated and verified for the required PIMS deadlines. A new semi-annual updating (October 31) was requested in December. Financial and PY information have been imputed, with semi-annual activity data to be added by year end. Regional data dictionaries will be updated as other information systems improve.

The regional working group, specific to PIMS had 3 formal meetings, as well as numerous informal meetings. Suggestions for modifications to PIMS and the planning systems were formally made on 3 occasions, as well as other discussions regionally and nationally.

Written text of Study Work Plans as well as of PIMS and its computerized data base were coordinated, verified, cross-checked and produced.

The 1992-93 planning process was introduced at the Northwest Region Retreat, Management and Project Leader meetings in October and November. Few inquiries were made of the new format. Scheduling changes were reduced to half of the previous year (8).

2. *Design a methodology to document the progress of the Northwest Region Regional Strategic Plan towards its goals and implementation of new thrusts, as well as linkages to the Green Plan PAIFs, National Strategic Plan and other activities. (Boylen)*

Attended two courses designed to assist in development of a Strategic Implementation/Action Plan and tracking/monitoring of its development.

University of British Columbia - Implementing the Strategic Plan, Edmonton - September

AMA-CMC - Strategy Implementation, Toronto - November

Draft documentation for the methodology as well as an assessment of our current Regional Strategic Plan is being prepared and expected to be complete by fiscal year-end.

3. *Continue to provide policy and planning analysis and documentation for Northwest Region PAIFs, Green Plan initiatives, other new initiatives as requested. (Boylen)*

Documentation was provided, especially for PIMS queries.

Evaluation:

4. *Develop evaluation frameworks for the Manitoba, Saskatchewan PAIFs with the assistance of the provincial PAIF Evaluation Committees. Make presentations on options to the PAIF management committees. (Boylen)*

Three evaluation frameworks were prepared for the Manitoba, Saskatchewan and Alberta PAIFs, without the assistance of provincial representatives. Presentations on

options for an evaluation plan were prepared for discussion at the Saskatchewan (cancelled) and the Manitoba PAIF Management Committee meetings.

Attended CES workshop on Evaluation and Total Quality Management.

5. *Serve on the Evaluation and Evaluation Management Committees of the Canada-Government Northwest Territories Economic Development Framework Agreement. (Boylen)*

Served on these Committees, as well as the Sub-Committee on the Evaluation Framework. Assisted in developing the Request for Proposals, evaluation criteria grid and selection of consultant, monitoring of Framework development, critiquing of two framework proposals. Assisted in preparation of subsequent draft plan.

Integrated Resource Management:

6. *Act as ForCan project authority and Steering Committee Member for the Manitoba and Saskatchewan Long Term Integrated Forest Resource Management plans. (Boylen)*

For the Saskatchewan Long Term Plan, participated in very numerous - almost weekly, lengthy Steering Committee meetings.

Attended and spoke at four (4) Public Information meetings.

Prepared detailed comments on five (5) drafts of the State of Resource report.

Provided comments on two (2) drafts of the Planning Model and several proposals for changes in the planning framework/contract.

For the Manitoba Long Term Plan, rewrote the Request for Proposals, outlining a totally different approach which was then submitted to various members of Manitoba Natural Resources. Slight alterations were requested and it is anticipated that the RFP will soon be mailed out to consultants.

7. *Serve as Chair, Regional Integrated Forest Resource Management Technical Committee. Organize and implement two meetings of the Regional Committee. (Boylen)*

Two meetings of the Committee were organized and held. The Spring technology transfer and field trip meetings was held at Seebe, Alberta. Presentation by seven (7) guest speakers were given on the first day and a field trip designed to show various aspects of integrated resource management was given by the Alberta Forest Service on the second day. The Fall business meeting was held in Edmonton. Three information presentations, and discussion on resolutions for the provincial forest research advisory committees comprised the agenda.

A presentation was made to MANFRAC about the activities and resolutions of the Committee.

Regional Development Programs - Contract Authority:

8. *Development and implement research projects for primary and secondary wood-using directories for Saskatchewan. (Bohning)*

Contract for secondary wood-using directory was developed and let. The primary and secondary wood-using directories for Manitoba were published and distributed.

9. *Prepare and publish publication (similar to the previous Forestry Reports) on Manitoba Forestry. (Bohning)*

Prepared tables for the Manitoba Forest Industry Report. Developed concept for publication with D. Pronger, Communications (NOR 42-04)

10. *Develop and manage forest product and marketing opportunities contracts under the Saskatchewan and Manitoba PAIFs. (Bohning)*

Bohning accepted an Acting assignment as Forest Products Officer with the Canada-Alberta PAIF on 1 July 1993. Some 24 projects under that Agreement are being developed or supervised.

Details are reported in NOR-44-03.

Policy and Program Development

11. *Continue to provide socio-economic and statistical data analysis and documentation for both Regional Development and Northwest Region programs, PAIFs, Green Plan initiatives and other policies and programs, as required. (Boylen, Bohning)*

Analyses and documentation were provided as required.

Attended RISI - Forest Products Industry in a Challenging Environment - Boston (Boylen)

Assisted in the organization of conference - Healthy Ecosystems, with University of Saskatchewan - Saskatoon. (Boylen)

12. *Continue to provide reviews/comments of reports, journal articles, research proposals as well as briefings. (Boylen, Bohning)*

Reviews/comments and briefing notes were provided as required.

Project Co-ordination, Committees

13. *Continue to act as Project Leader for NOR-03. (Boylen)*

Continued as Project Leader

14. *Continue to serve as Chair, Regional Integrated Forest Resource Management Technical Committee. (Boylen)*

Continued as Chair

15. *Continue as a Forestry Canada member on the Saskatchewan Forest Habitat Project. (Boylen)*

Attended June annual meeting. As of 1 July, membership was transferred to J. Doornbos (NOR 46-04).

16. *Continue to serve as a member of the Steering Committees for the LT Integrated Forest Resource Management Plans in Manitoba and Saskatchewan. (Boylen)*

Continued as member.

17. *Continue to serve as a member of the Evaluation Committees of the Canada-Manitoba and Canada-Saskatchewan PAIFs and the Canada-GNWT EDA and CAIF (Boylen).*

Continued as member.

18. *Continue to serve on NoFC Science Committee. (Boylen)*

Continued as member.

19. *Serve on various departmental Committees and Task Forces, as required. (Boylen)*

Served as a member of the Northwest Region Task Force on Integrated Resource Management. (Boylen)

Served as a member Canada/Alberta PAIF Sub-Committee B.2 Wood/Fibre Utilization-Related Research and Development (Bohning).

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports

Bohning R.A.; Rounds, R.C. 1992. Directory of Secondary Wood-Using Industries in Manitoba 1991. Forestry Canada, Winnipeg, Manitoba and Canada - Manitoba Partnership Agreement in Forestry.

Giles, D.R. and R.A. Bohning. 1992. Directory of primary wood-using industries in Manitoba - 1991. Forestry Canada, Winnipeg, Manitoba and Canada - Manitoba Partnership Agreement in Forestry.. vi, 145 p.

- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer:

16. Goals 1993-94

- 1. Project and study were terminated in November, 1992. Aspects of this study are not continuing in NOR-57.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
ForCan - HQ		Planning	T. Bezanson T. Ellis

ii) External -

Establishment	ID#	Title	Contact name
Weyerhaeuser			J. Spencer D. Pawson
MNR - Forestry			R. Lamont
SERM - Forestry			A. Atkinson

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement: Not applicable
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: Feb. 8, 1993

1. **STUDY TITLE:** Forestry and socio-economic statistics and analysis
2. **Responsibility Centre:** Northwest Region (8151)
3. **Program:** Regional Development
4. **Project Title:** Forest Policy and Analysis, Planning and Resource Data
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	D. Kuhnke
Team Members	D. Boylen
	S. Lux
	B. Lashley

8. **Study Key Words:** Provincial, regional and national forest resource data, integrated forest resource management, socio-economic statistics, database management, evaluation frameworks, DEVMIS
9. **Study Activity:** 1334
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
D. Kuhnke	FO-2 (P)	1.0	1.0	0.0	0.0	0.0
FTEs		1.0	1.0	0.0	0.0	0.0

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	2.27	0.00			
Capital	0.64				
G & C					
TOTAL:	2.91	0.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries						
O&M: Sask.	S8060	5.00				
Capital						
G & C						
TOTAL:		5.00				

		1992/93	Fiscal Year 1993-94			1994/95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries						
O&M	1-0898	10.0				
Capital						
G & C						
TOTAL:		10.0				

STUDY TOTAL	17.91				
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11. Study Background and Problem Analysis

The 1989 Act of Parliament that created Forestry Canada establishes the foundation upon which the department can achieve its mission which is to promote the sustainable development and competitiveness of Canada's forest sector for the well-being of present and future generations of Canadians. Sustainable development encompasses many scientific and technical fields that seek to develop quantitative relationships that characterize forest and forest inhabitant responses to management strategies. Quantitative relationships can only be proven when reliable data are available to validate them, however. The Resource Data Project collaborates with resource management personnel within Forestry Canada and outside of it to interpret and integrate data to support the research and information needs of the department's clients.

The project has dealt with tasks on national, regional, and provincial scales that interpreted and presented forestry data to clients through various media including printed reports and distributed databases.

12. Study Objectives:

i) Objectives

To develop and interpret forestry, integrated forest resource and socio-economic data at the stand, provincial, regional and national levels to further and to improve forest management decision-making by resource managers and researchers.

To assist in the development and implementation of project proposals, management information systems and evaluation frameworks related to partnership agreements in forestry and the federal Green Plan.

ii) Deliverables

Short Term (1-5 years)

Not applicable

Long Term (5 years and beyond)

Not applicable

iii) Significant Linkages:

Region:

NOR 4, Stand Productivity
 NOR 44, Alberta Partnership Agreement in Forestry
 Canadian Wildlife Service
 Alberta Forest Service

University of Alberta
 Manitoba Dept. of Natural Resources

NOR 42, Manitoba District Office
NOR 46 Saskatchewan District Office
Saskatchewan Environment and Resource Management
Great Lakes Forestry Centre
Provincial Forest Management Agencies across Canada

National

Petawawa National Forestry Institute
Advisory service to the National Forestry Database Project,
Forestry Canada, Ottawa

iv) Methodologies

13. Progress and Achievements

Because the study was terminated in the fall of 1992, a complete review of the study's achievements is presented. Achievements are presented in three-year periods beginning in 1984 when the incumbent filled the position.

A) 1984-1986

The study was heavily involved with the planning and operation of the first round of federal-provincial agreements. Activities included preparation of agreement cash flow schedules, written materials concerning various "schedules" of the agreements, and development and management of a database of applicants for job openings funded under the agreements.

During this period, work began on investigating the status of various databases of growth measurements stemming from permanent sample plots maintained by the department (as the Canadian Forestry Service) with the aim of providing consistency and ease of access to this valuable data. Significant achievements in this area were the transfer of data from the former Kananaskis Forest Experiment Station to the Alberta Forest Service and the development of a multi-year contract under the Canada-Alberta agreement to develop a database catalogue of information about CFS permanent sample plots.

As the regional representative for the FORSTATS (FOREst STATistics) program, the major accomplishment was the expansion of the national silviculture statistics database (including the incorporation of regeneration success rates) leading to the publication of an Information Report titled "Silviculture Statistics for Canada, 1975-76 to 1982-83". Regional data was also collected and screened for several other FORSTATS reports including a forest management expenditures report and a forest nursery report.

Work began on the 1986 national forest inventory during this period. This involved numerous meetings and consultations with provincial forestry staff from Alberta, Saskatchewan, and Manitoba to develop conversion specifications. Conversion software was also begun.

B) 1987-1989

The bulk of the activity during this period centred on the delivery of regional input to the 1986 national forest inventory. Software development for conversion of several provincial forest inventories and extensive verification and correction of provincial forest inventory data were the chief functions. The total commitment to this exercise totalled 22.5 person-months and \$111 000 in agreement and A-base funding.

Work by contractors continued on the PSP Catalogue resulted in the development of a widely distributed microcomputer database. Conversion of PSPs from interested clients, including private industry, was performed in-house during this period.

A landmark 10-year summary report on national silviculture statistics was published during this period. This report saw a number of significant improvements over previous reports including refinement of regeneration success rates and the reporting of silviculture activities funded under the agreements. Input into other FORSTATS reports (and acting as a reviewer) continued as well.

Other notable achievements during this period were the preparation and staging of a national conference on Geographic Information Systems and the publication of a leaflet titled "Silviculture in Canada" that was widely distributed to Canadians.

c) 1990-1992

Work continued on the silviculture statistics database during this period, with a change to an annual reporting format combining national silviculture and forest management expenditure statistics being a chief development. A 12-page booklet titled "Forest management statistics for Canada, 1977-88" targeted at a more general audience than previous Information Reports was a highlight of this period.

Preparation of a second annual report was begun, however controversial information contained in a draft report resulted in its suspension by the National Forestry Database Program Steering Committee, a national body patterned after the successful National Forestry Inventory Committee following the dissolution of the FORSTATS program. The Northwest Region withdrew from all national level statistics reporting activities soon thereafter, retaining only an advisory capacity.

Development of proposals under the Green Plan with a general theme of sustainable development in keeping with the department's (now Forestry Canada) strategic plan constituted one of the main activities during this period (the project title was changed to Forest Policy, Planning and Resource Data in keeping with the new thrust in the integrated resource management area).

Other achievements in this area included the preparation of two papers. A paper titled "Sustainable development and biodiversity in Canada's boreal forest" was presented at an IUFRO conference, and a paper titled "Expanding Forestry Canada's permanent sample plot catalogue to meet the needs of integrated resource management" was presented at a workshop on the relationship between boreal forest bird populations and forest management. Acting as editor to prepare a 250 plus page proceedings report of this workshop was another highlight of this period.

Finally, work began with the Manitoba Forestry/Wildlife Management Committee that seeks to develop spatially based models to predict the likely effect of forest management practices on wildlife indicator species.

14. Goals and Accomplishments (1992-93)

1. *Develop a regional resource data strategic plan consistent with the regional strategic plan to meet the data requirements of regional Forestry Canada researchers and staff and Forestry Canada's clients. Extensive cooperation and liaison with other programs in Forestry Canada and outside clients are anticipated. An evaluation and determination of the future status and direction of the Forest Industry Data Management System falls under this goal.*

The development of a regional resource data strategic plan consistent with the regional strategic plan to meet the data requirements of regional Forestry Canada researchers and staff and Forestry Canada's clients was undertaken. The plan highlighted ecological reserves, Model Forests information and database integration were the most suitable areas the project could provide a meaningful role, in addition to the continuing PSP catalogue function.

2. *Manage a contract under the Green Plan to establish a header catalogue of land holdings of government (federal and provincial), non-government (non-profit) and private organizations. The purpose of the catalogue is to promote integrated resource management through the cross-over of information between organizations managing different natural resources.*

A Green Plan contract to establish a header catalogue of land holdings of government, non-government and private progressed to the database design stage. No further progress was made as Green Plan funding was allocated to other areas.

3. *Act as Forestry Canada's contact for a forestry-wildlife information management project under the Canada-Saskatchewan PAIF (NOR-36-03: 7004). This project seeks to integrate a multitude of different forest wildlife observation data with GIS forest databases to assist forest managers to analyze the capability of different forest habitats and forest harvest patterns to manage or optimize wildlife populations.*

A role as Forestry Canada's contact for a forestry-wildlife information management project under the Canada-Saskatchewan PAIF was foreseen but never realized because of staffing problems encountered by Saskatchewan wildlife personnel. Efforts were transferred to the Manitoba Forestry/Wildlife Management Committee, a body charged by government and industry to develop spatially-based models to predict the effects of forest management practices on wildlife indicator species habitat and populations.

4. *Act as Project Authority for projects under the Partnership Agreements in Forestry, e.g., editing of Proceedings on "Birds in Boreal Forest" (NOR 46-03:8060).*

Acting as Project Authority for PAIF projects was another goal. Specific projects were the Birds in the Boreal Forest Proceedings (C/S) and the Bow/Crow Forest IRM data requirements study (C/A).

5. *Continue to perform liaison activities for the 1991 national forest inventory as required.*

An advisory and trouble-shooting role in the 1991 national forest inventory was maintained. Specific events included: assisting with the signing of letters of agreements between provinces in the region and the Petawawa national Forestry Institute concerning the division of labour and the transfer of funds from PNFI, and modifying a 1986 inventory conversion program to operate on a PNFI computer for use in the 1991 exercise.

6. *Continue to perform an advisory role to the National Forestry Database Program.*

Continued to act in an advisory role to the National Forestry Database Project. Specific items included the review of an extensive consultant's report detailing a proposed database management system to be implemented in the province to provide a national accounting of the status and success of silviculture, and the transfer of all national databases in the Northwest Region to Ottawa.

7. *Prepare and publish the proceedings of the workshop on the ecology and management of forest birds.*

Publication of the proceedings for the workshop on boreal forest birds was the final stated goal. This involved extensive effort as editor to bring the proceedings to a standard established by previous proceedings produced in the Northwest Region.

8. An added goal was the preparation and analysis of various forest resource inventory and private agricultural land data attributes for input into a LOGIT travel cost model that assesses the probability of social behavioral characteristics by outdoor recreation enthusiasts based on a number of socio-economic and physical resource variable inputs.

15. Information Activities

i) Journal Publications

ii) Information Reports

iii) Other reports

Kuhnke, D.H., editor. 1993. Birds in the boreal forest. Proceedings of a workshop held March 10-12, 1992. Prince Albert, Saskatchewan. For. Can. Northwest Reg., North. For. Cent., Edmonton, Alberta.

iv) Lectures, courses, seminars and scientific addresses

v) Technology transfer:

16. Goals 1993-94

Not applicable; the project (NOR 3) was terminated in November 1992 and aspects of this study transferred to NOR 6-02.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
NWR-NoFC			Peter Boxall

ii) External -

Establishment	ID#	Title	Contact name
Canadian Wildlife Service			Dr. T. Diamond

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

Not applicable

ii) FC-NWR EARP Committee Approval Date:

Not applicable

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Stand Productivity
2. Responsibility Centre: Northwest Region (8133)
3. Activity: 2223, 2224
4. Program: Forest Resources
5. Status: Continuing
6. Last Evaluation: December 21, 1992
7. Next Evaluation:

B. KEYWORDS:

025 Forest productivity
 026 Stand management
 070 National S&T Agenda
 100 Green Plan
 120 Working groups
 321 Growth and Yield
 323 Mensuration
 330 Models
 331 Productivity
 339 Thinning/spacing
 340 Stand development
 341 Management systems
 436 Impact of forests, DSS, Mixedwood DSS

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	7.00	7.00	6.60	0.00	0.00
Salaries	\$374.7	\$374.7	\$355.4	\$0.0	\$0.0
O & M	\$37.0	\$29.0	\$29.0	\$0.0	\$0.0
Capital	\$24.0	\$1.0	\$3.2	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$435.7	\$404.7	\$387.6	\$0.0	\$0.0

D. PROJECT DESCRIPTION:

The expansion of the forest based industry and increasing non-timber uses of the forest in the region result in an accelerating demand for quantitative information on tree and stand growth and development, and for improved knowledge and understanding of how growth and development is affected by stand (age, density, species, structure), environmental (site, climate), and biological (insect, disease, mammal) factors; and of what influence man can exert through exploitation and management practices. The Stand Productivity Project gathers, analyses and transfers such information and knowledge to users. In the Project, studies range from regeneration stocking standards, regeneration and plantation development, spacing, thinning, fertilization, and harvesting systems to quantitative modelling and forecasting of tree and stand growth and yield, under a variety of conditions to evaluate outcomes – both in biological and in financial terms – of different management scenarios, and to update forest inventories, thus providing the basis for timber supply forecasts (AAC calculations).

Efficient and effective forest management requires a wide knowledge base combined with substantial experience. Current advances in computer technology and in artificial intelligence offer opportunities to develop user friendly, computerized, knowledge-based advisory systems that may greatly facilitate management decision making. A new thrust in this Project is directed toward developing such decision support systems (DSS), both for stand and for forest level management decisions for the major cover types in the region, within an ecological site classification framework and considering all major potential uses of the forest land base.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan. Only the lodgepole pine fertilization study may have any potential impact on the environment. However, the small area (only 1.5 ha) treated, the flat terrain with no water courses, and the manual application of fertilizers mean minimal impact and no need for further action.

2. Collaborators/Green Plan Resource Summary \$s

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u>	<u>Upcoming</u>	<u>Planning 1</u>
	\$000s				
Primary					
Secondary					
Total					
Green Plan	24.80	0			

3. Collaborators:Secondary

Regional Growth and Yield Cooperative (WESBOGY)
 Provincial forest management services in Alberta, Saskatchewan, and Manitoba
 Weldwood Forest Products Ltd.
 University of Alberta - Forest Science Department
 Sherritt Gordon Mines - provision of fertilizers
 Other ForCan establishments

4. Green Plan:Forestry Practices

Within the Foothills Model Forest (see NOR 26-01), evaluate stand growth and yield impact of small mammal chewing damage on young lodgepole pine, and develop stand management prescriptions to alleviate this problem.

Decision Support Systems

The Forcan Northwest Region strategic plan identifies the development of Decision Support Systems for forest management as one of five major new initiatives. This project has played an important role in the DSS initiative from the start: in problem definition, in defining objectives and in developing plans for prototype models.

A proposal to develop mixedwood management DSS from work is being funded (jointly with NOR 02-01).

5. Milestones:1993-94:

1. Calibrate the generic growth and yield forecasting system with suitable data to all the native commercial forest cover types, initially for pure stands of different density levels. Also, implement the lodgepole pine density -height growth model into the general stand growth and yield model for that species.
2. Identify scenarios and analyze benefits/costs of different mixedwood (white spruce-trembling aspen) management options. Participate in developing financial and economic analyses modules for the regional forest management DSS .
3. Enhance the forest management DSS prototype by developing and implementing silvicultural and harvesting modules in the System. Conduct demonstrations-consultations with clients while continuing System upgrading and publish results as warranted.

4. Prepare final report on new taper functions and error assessment for the Saskatchewan government and transfer technology to user. Prepare journal paper on the results if warranted. For the Canada-Alberta PAIF project aimed at evaluating mixedwood stand development in Alberta following partial cutting that removed the largest white spruce some 40 plus years ago, conduct PSP reassessment and initial analysis of growth data to describe development of these stands.
5. For the Foothills Model Forest, design a study and initiate field work, in cooperation with Weldwood, to evaluate mammal chewing impact on lodgepole pine stand productivity.

6. Accomplishments:

1. A preliminary generic growth and yield forecasting system has been developed; Technology transfer activities were done through journal paper, posters, oral presentations and direct contact with clients.
2. A new density height growth-SI model has been developed and manuscripts both for scientific and (journal papers) and technical audience (FMN) have been prepared. This will be an important component of the lodgepole pine growth and yield forecasting model, while having direct use in density management decisions.
3. TIMRET, a PC financial analysis software, was developed in LOTUS. A FMN and a companion user's manual was prepared. Trends in poplar utilization in the early 1990s was analyzed and a paper submitted for journal publishing; also, yields and revenues in relation to harvest timing in western Canada's aspen stands were assessed and a symposium paper prepared and presented.
4. In the DSS initiative, developed: 1) "winds ws" - based aspen forest management information system; 2) a DSS prototype that integrates GIS, knowledge systems, database management systems and a suitable growth and yield model.
5. Developed new, improved stem taper functions and error estimating systems for the Saskatchewan Provincial Forest Inventory.

7. Link to Strategic Plan:

National:

This project supports the National S&T agenda in growth and yield, mensuration, modelling, productivity, thinning/spacing, and in the development at DSS for forest management.

Regional/Institute:

This project supports the Regional Strategic Plan in Research/Development/Innovation and through the development of Mixedwood Decision Support System.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 21, 1992

1. **STUDY TITLE:** Analysis of growth and yield of major timber species in the prairie provinces
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Stand Productivity
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Alberta, Saskatchewan, Manitoba
7. **Study Staff:**

	Name
Study Leader	I. Bella
Team Members	Z. Somogyi
	S. Lux

8. **Study Key Words:**
Research coordinator, project leader, working groups, growth and yield, models
9. **Study Activity:** 2223
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992/93	Fiscal Year 1993/94			1994/95
		Previous	Budget	Revised	Forecast	Upcoming
I. Bella	SE-RES-3 (P)	0.60	0.60	1.00		
Z. Somogyi	(P)					
FTEs		0.60	0.60	1.00		

Financial Resources (\$000s)

	1992/93	Fiscal Year 1993-94			1994/95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	10.52	9.00			
Capital	0.95	3.20			
G & C					
TOTAL:	11.47	12.20			

		1992/93	Fiscal Year 1993-94			1994/95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries:						
Alta.	A8043		6.5			
Sask.	S8029		7.0			
O&M:						
Alta.	A8043		18.5			
Sask.	S8029		29.7			
Capital						
G & C:						
Alta.	A8043		10.0			
TOTAL:			71.7			

STUDY TOTAL		83.9			
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11. Study Background and Problem Analysis

As forestry activity and demand for wood fibre increases in the region, so does demand for information on growth and yield of the major commercial tree species, whether they are growing in old growth, fire origin stands or in second growth stands following harvesting. The most important problems include: predicting growth and yield in natural, unmanaged stands; predicting growth and yield of managed, planted, seeded stands that were spaced, thinned and possibly fertilized; the effects of insects, diseases and other agents on growth and yield; species selection for optimum growth and development on a given site; and synthesizing tree and stand growth information into suitable predicting models to be used for estimating Annual Allowable Cut (AAC). This information and models are essential to the development of Decision Support Systems (DSS) in forest management.

12. Study Objectives:

i) Objectives

1. Provide project leadership, advice and technical transfer to project and regional forest development agreement staff, clients and the Growth and Yield Cooperative in growth and yield R & D activities.
2. Develop and evaluate growth and yield models for natural and managed stands of the major timber species in the region and facilitate the implementation of those models in the regional DSS. Obtain managed stand growth and yield information from related spacing, thinning and fertilization experiments.
3. Develop stand tending treatment prescriptions for different species for use by forest managers.
4. Conduct intensive short-term studies on timely problems as required by clients, including those related to federal-provincial partnership agreements in forestry and Green Plan - Model Forest initiatives.
5. Cooperate in the development of forest management DSS in the region as design team member and domain expert on natural and managed stand yield and modelling.

ii) Deliverables

Short Term (1-5 years)

- a) Cooperate in the development, completion, tech transfer and implementation of a system of growth and yield predicting models for the major forest cover types and sites in the region (linkages to Alberta and Saskatchewan PAIF).
- b) Cooperate in the development, completion and implementation of new height growth - SI curves for the major species in Saskatchewan (linkages to Sask. PAIF).
- c) Develop models to predict growth and yield of mixed white spruce-trembling aspen stands after partial cutting of the white spruce component (linkages to Alta. PAIF).
- d) Incorporate all this information and models in the regional forest management DSS.

Long Term (5 years and beyond)

Continue enlarging the regional growth and yield knowledge base and models, and keep improving the regional forest management DSS.

iii) Significant Linkages:

- provincial forest services in the region
- major forest industries
- regional growth and yield cooperative

- Green Plan, Foothills Model Forest
- University of Alberta
- activities in IUFRO
- FORCAN modelling working group
- cooperative work with PFC
- NSERC visiting scientist program

13. Progress and Achievements Up to and including 1991-92

A series of PSPs established in the past are still being monitored to track growth and development of old growth stands of lodgepole pine, jack pine, white spruce, and trembling aspen. Some of these plots date back to 30 years or more. Data were analyzed as they became available, and preliminary yield tables published for jack pine, lodgepole pine, white spruce and trembling aspen. Many of these plots—most of them lodgepole pine—are still intact, are being remeasured periodically and will provide increasingly useful information in the future.

Thinning and spacing experiments, and some growth monitoring plots in operational thinning trials, have been established in jack pine, lodgepole pine, red pine, trembling aspen, and white spruce. Results are published as they become available, and the studies provide increasingly important information on managed stand yield. Thinning equipment performance trials were also conducted, analyzed and published.

At the request of the Alberta Government, intensive short term studies were conducted on regeneration standards, and tree growth response along seismic lines. Results were analyzed and published.

Studies have been initiated to determine the impact of insects, diseases and other agents on growth and yield, particularly in stands following harvest. Preliminary results and recommendations have been presented at symposiums and/or published.

Over 30 reports and journal articles have been published on growth and yield, on thinning and spacing response and on related problems referred to above for jack pine, lodgepole pine, red pine, scots pine, and white spruce by Bella, I.E. and DeFranceschi, J.P.; Cayford, J.H. Jameson, J.S., Johnstone, W.D., Steneker, G.A., Wilson, G.M and Yang, R.C. between 1950 and present.

Leadership function and technical transfer are important and continuing activities under this study, with an added new trust through the Regional Growth and Yield Cooperative.

Most work in growth and yield model evaluation and development is currently centred on our effort to complete the development of managed stand yield tables (models) for lodgepole pine and white spruce, initially funded under Canada-Alberta FRDA agreements, and to develop a comprehensive system of models for updating forest inventories and calculating AAC's across the region (Alta., Sask., Man.).

Treatment prescriptions, particularly for spacing and thinning, are developed as data becomes available and are passed to the user through workshops, field tours and printed form.

All treatment response and prescription information together with Growth and Yield forecasting models will be integral part of stand and forest level DSS being developed by a multi-disciplinary team, with important input from this study and project (NOR-4).

14. Goals and Accomplishments (1992-93)

1. *Provide project leadership functions to NOR-04 staff and functional guidance to Regional Development staff in Manitoba and Saskatchewan District Offices and to the Alberta and Saskatchewan Agreements' mensurationists; provide advice to colleagues and clients on mensurational problems and carry out technology transfer in thinning, growth and yield, stand modelling, and yield forecasting; act as a scientific authority on related contracts as required.*

In addition to ongoing activities, which were accomplished as the need arose, a significant effort was expanded on a Can.-Sask. PAIF project to develop new, improved taper functions and to devise error estimating systems for the Saskatchewan Provincial Inventory. Details of this work are summarized under Goal VI. (see NOR 46)

Also acted as a reviewer of manuscripts for journals and colleagues.

2. *Provide technical input in the regional Growth and Yield Coop.*

Participated in the annual meeting and work planning exercise, by giving progress reports on NOR-04 activities:

- a) height growth SI modelling of regional timber species;
- b) density related height growth reduction in lodgepole pine;
- c) managed stand models for lodgepole pine;
- d) development of the regional forest management DSS;
- e) the Saskatchewan PAIF project on taper functions and error assessment.

As a member of the regional Growth and Yield Coop Team, reviewed progress in the study of white spruce-trembling aspen development under intensive culture and prepared work plans for 1992.

3. *Cooperate with C. Cieszewski on goals listed in NOR 04-10, viz., goals 2, 3, and 4.*

Cooperated as planned, accomplishments are detailed under Study NOR 04-10.

4. *Cooperate with V. Zakrzewski in preparing a final manuscript on a G & Y predicting system for updating inventory.*

No progress on this goal because of V. Zakrzewski's other priorities in his current position with the Ontario government.

5. *Contribute as required in the Mixedwood MD initiative, particularly in the development of a regional DSS for forest management, and provide leadership/organizational functions to the development and testing of a knowledge base system for aspen management. (Green Plan).*

This initiative showed a steady progress during the year under R. Yang's (NOR 04-05) leadership. Contributions from this study were mainly in planning and design. Related to this initiative was cooperative work with R. Yang on a comparison of potential growth and yield after different harvest scenarios in mixed white spruce - trembling aspen stands. A draft manuscript is now under review for publication as a FMN.

6. *Cooperate with Z. Somogyi in completing a final report on taper functions for volume estimation for Saskatchewan. Initiate a review and analysis of the volume estimation system in Saskatchewan inventory, that will also provide ways for error assessments for volume estimates.*

A final report on new taper functions has been prepared and submitted to Saskatchewan Environment and Resource Management. A draft report on error assessment has also been prepared, submitted, and is in review. A journal article on error assessment has also been prepared and is in review.

7. *Jointly with Stan Navratil (NOR 10-12), develop a Can.-Alta. PAIF project to evaluate mixedwood stand development in Alberta following partial cutting in the early 1950s that removed spruce saw-timber to certain diameter limit. This will involve relocating and directing the remeasurement of PSPs - established some 40 years ago and remeasured in 1962 -analysis of data and preparation of a report. The study should provide the basis for related silvicultural prescriptions, stand growth and development forecasts, and also for needed forest management decision support system development.*

With support from S. Lux and C. Rentz, study records relating to this work (filed under the old Alberta mixedwood partial cutting project A-15) were reviewed, plots still intact were relocated, their potential value for model development assessed, and plot boundaries marked.

15. Information Activities

i) Journal Publications

Nil

ii) Information Reports

Nil

iii) Other reports

Bella, I.E., Somogyi, Z. 1992. New taper functions for seven main timber species in Saskatchewan. Internal report submitted to Sask. Dept. Renewable Resources. Available for distribution under Can.-Sask. PAIF cover.

Bella, I.E., Somogyi, Z. 1992. Error assessment in the Saskatchewan Timber Inventory: a case study in the Boreal Mixedwoods. Ms. prepared for journal publication, presently in review.

Somogyi, Z., Bella, I.E. 1992. A review of the Saskatchewan Provincial Timber Inventory and development of appropriate error assessment system. Internal report submitted to Sask. Environment and Resource Management.

Yang, R.C., Bella, I.E. 1992. Comparison of yield for different harvest scenarios in white spruce - trembling aspen stands. Ms. under review for a FMN.

iv) Lectures, courses, seminars and scientific addresses

Bella, I.E.; Ondro, W.J. 1992. Effect of harvest timing on yield and revenues in western Canada's aspen stands. Pages 7-11 in Proc., IUFRO Symp. September 5-9, 1992, Zvolen, CSK.

v) Technology transfer:

Discussions and advice on growth and yield problems with provincial and industry foresters.

16. Goals 1993-94

1. Provide project leadership functions to NOR-04 staff and functional guidance to Regional Development staff in Manitoba and Saskatchewan District Offices and to the Saskatchewan Agreements' mensurationist; provide technical input to the regional Growth and Yield Coop; provide advice to colleagues and clients on mensurational problems and carry out technology transfer in thinning, growth and yield, stand modelling, and yield forecasting; act as a scientific authority on related contracts as required.
2. Cooperate with C. Cieszewski on goals listed in NOR 04-10, viz., goals 2 and 3.
3. Contribute as required in the Mixedwood MD initiative, particularly in the development of a regional DSS for forest management, and testing of a knowledge base system for aspen management (Green Plan Linkages). In cooperation with R. Yang (NOR 04-05), revise and publish FMN on yield comparisons for different harvest scenarios in mixed white spruce-trembling aspen stands.
4. Prepare a final report on error assessment for Sask., and complete the review and revisions of a manuscript for journal publication on the same topic. Depending on Sask. requests and availability of help, e.g., Research Associate, initiate work on updating the Sask. Inventory volume compilation software.

Also cooperate with C. Cieszewski (NOR 04-10) and Research Associate in completing the new set of height growth - SI curves for Sask.

5. For a joint project with S. Navratil (NOR 10-12), supported by Can.-Alta. PAIF which is aimed at evaluating mixedwood stand development in Alberta following a partial cutting that removed spruce sawlogs to certain diameter limit in the early 1950s next year's goal is to conduct plot remeasurement and initial analysis of tree growth data toward the development of a model that can predict growth and yield of these stands

in terms of residual density, species composition, elapsed time since logging and site quality. Ingress and regeneration development will also be examined. (C/A PAIF: 8043)

6. In cooperation with W.Rugg, WELDWOOD Canada in Hinton, develop plans for a study within the Foothills Model Forest, to evaluate growth and yield impact of mammal chewing damage on young lodgepole pine. Upon approval, develop detailed study design, work plan and if time permit, select study areas and initiate field work in concert with WELDWOOD staff.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Pacific		Stand Modelling	M. Bonnor

ii) External -

Establishment	ID#	Title	Contact name
AFS		General Growth and Yield	D. Morgan
Sask. Dept. Renewable Resources		Taper functions Error budgets SI, Stand models	J. Benson & D. Lindenias
U of A		WESBOGY	S. Titus
Weldwood		lodgepole pine growth vs. mammals damage	W. Rugg

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December, 1993

1. **STUDY TITLE:** Data base development for growth and yield of important forest types in the Prairie Provinces.
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Stand Productivity
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Alberta, Saskatchewan, Manitoba
7. **Study Staff:**

	Name
Study Leader	S. Lux
Team Members	C. Rentz

8. **Study Key Words:** Computerized database, thinning, spacing, growth and yield, mensuration and stand management
9. **Study Activity:** 2223
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992/93	Fiscal Year 1993-94			1994/95
		Previous	Budget	Revised	Forecast	Upcoming
S. Lux	EG-5 (T)	0.50	0.50	0.50		
C. Rentz	EG-5 (T)	0.00	0.00	0.10		
FTEs		0.50	0.50	0.60		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994/95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	3.35	5.00			
Capital	6.65				
G & C					
TOTAL:	10.00	5.00			

STUDY TOTAL	10.00	5.00			
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11. Study Background and Problem Analysis

Growth and yield information is required for the efficient management of forest resources in the Prairie Provinces. Such information is needed for both treated and untreated stands. Silvicultural options and treatments can be evaluated by establishing and periodically re-examining permanent sample plots in the important forest types in the region. Growth and yield information thus obtained will form the basis of developing and improving growth and yield forecasting models both for old growth and managed stands. Computerizing such data bases increases their usefulness in-house and to clients.

12. Study Objectives:

i) Objectives

1. Continue to monitor existing permanent sample plots as well as to establish new plots where necessary for studying the effect of stand treatments in the important cover types in the prairie provinces.
2. Develop, maintain and update a computerized database of regional forest productivity data.
3. Analyze and interpret growth and yield data as well as publish appropriate information reports and forest management notes.

ii) Deliverables

Short Term (1-5 years)

To provide data base information to other studies (Nor 04-10) and (Nor 04-09)

Continue to remeasure and upgrade all growth and yield studies as they come due. (see summary table)

Long Term (5 years and beyond)

Continue enlarging and upgrading regional growth and yield data bases.

iii) Significant Linkages:

Provide data for other studies in NOR 04-02

13. Progress and Achievements

1. A series of permanent sample plots were established for monitoring old growth stands in lodgepole pine, jack pine, white spruce, and trembling aspen. Many of these plots, some date back more than 40 years - are still periodically remeasured and provide useful information. Thinning (in jack pine, lodgepole pine, trembling aspen, and white spruce) and spacing (in jack pine, lodgepole pine, red pine, and white spruce) experiments were established and these studies provide useful information on managed stands (see summary table).
2. A regional PSP catalogue containing Forestry Canada as well as provincial and industrial PSP's has been developed and distributed to cliental by D. Kuhnke (NOR 03-02). In addition individual tree and plot information has been computerized to ensure effective utilization by Forestry Canada staff and clients.
3. Appropriate reports - both Information Reports and Forest Management Notes - are published as information related to additional remeasurements becomes available or new analytical techniques come on stream.

14. Goals and Accomplishments (1992-93)

1. *Remeasure and maintain Teepee Pole Creek thinning trial in Alberta. (Lux)*

Remeasurement and maintenance of Teepee Pole Creek thinning trial was completed and added to the data base. Also a new height measurement program developed by C. Cieszewski and A. Wawrykowiez (NOR 04-10) was field tested and used for height measurements.

2. *Revise and re-submit the proposed journal article on aspen thinning (MS155) in conjunction with aspen DSS. (Yang NOR 04-09) (Green Plan)*

A prototype tending model has been developed for Aspen DSS. (Yang)

3. *Remeasure and maintain jack pine thinning (MS154) in Sandilands. (Lux)*

Remeasurement of jack pine thinning (MS154) in Sandilands was completed and results were added to computer data base. (Lux)

4. *Remeasure and maintain jack pine mechanical strip thinning at Central and Tougas roads in the Sandilands. (Lux)*

Remeasurement of jack pine strip thinning at Central and Tougas was completed. (Lux)

5. A listing of all the study plots in Alberta and Manitoba is appended in Appendix I of this book of work plans.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports
- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer:

16. Goals 1993-94

- 1. Remeasure and maintain of aspen thinning (MS155) at Pelly Saskatchewan (spring 1993) (Lux, Rentz)
- 2. Remeasure and maintain plantations of red pine, jack pine, and white spruce in Sandilands Man. and add measurements to database. (fall 1993) (Lux, Rentz)
- 3. Provide data from data bases to aspen and mixedwood DSS (NOR-04-09) as well as to other Forestry Canada data bases (PFC) (Bonner)

17. Major Co-operators:

- i) Internal - FC
Not applicable
- ii) External -
Not applicable

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement

The NOFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

- ii) Forestry Canada - Northwest Region EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: Dec. 21, 1992

1. **STUDY TITLE:** Fertilization and thinning of semi-mature lodgepole pine stands
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Stand Productivity
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Alberta, Saskatchewan, Manitoba
7. **Study Staff:**

	Name
Study Leader	R. C. Yang
Team Members	S. Lux

8. **Study Key Words:** Soils, fertilizers, growth and yield, mensuration, productivity, thinning/spacing
9. **Study Activity:** 2223
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992/93	Fiscal Year 1993-94			1994/95
		Previous	Budget	Revised	Forecast	<u>Upcoming</u>
R. C. Yang	SE-RES-2 (P)	0.10	0.10	0.10		
S. Lux	EG-05 (T)					
FTEs		0.10	0.10	0.10		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	0.76	0.50			
Capital					
G & C					
TOTAL:	0.76	0.50			
STUDY TOTAL	0.76	0.50			

11. Study Background and Problem Analysis

Although fertilizing has been found to improve lodgepole pine productivity, information on nutrient requirements of this species remains sparse. Knowledge on the mechanisms of the species in responding to thinning and fertilization treatments is especially limited. A correct diagnosis of nutrient requirements is often cited as a pre-requisite to effective fertilization along with the density control of the stand. The latter is particularly important in young lodgepole pine, which often grows in over-dense stands. Previous study results (NOR 4-04) showed improved diameter and volume growth of two 30-year-old stands after fertilization; stand growth response, however, was obscured by high and variable mortality associated with excessive stand density. This suggests that fertilizer should be applied in combination with thinning to improve stand productivity.

Results from this study will provide input and models to the regional strategic plan to develop decision support systems for forest management.

The study area is located within Weldwood Canada Forest Management Area, the site of Foothills Model Forests. A proposal is being submitted to establish the study area to demonstrate biological responses of under- and over-storey vegetation to thinning and fertilization on lodgepole pine stands.

12. Study Objectives:

i) Objectives

1. To assess the effect of thinning and N fertilization on growth of semi-mature lodgepole pine.
2. To quantify the effect of thinning, fertilization and their combined effects on nutritional status in trees and soils and to establish relationships between tree growth response and nutrient status.

3. To develop a diagnostic technique for fertilizer prescription of lodgepole pine from the above relationships.
4. To obtain growth response information to fertilization for other regional commercial tree species as warranted by available data sources.

ii) Deliverables

Short Term (1-5 years)

1. Publish effects of fertilization and thinning on foliar and soil nutrient status and on tree growth and stand yield.
2. Provide advise on forest fertilization.

Long Term (5 years and beyond)

1. Publish guidelines on fertilization and thinning for lodgepole pine stands.

iii) Significant Linkages:

- A. Green Plan Model Forests.
- B. Decision support system.

13. Progress and Achievements

This study was initiated in 1984. Seventy-two 0.03-ha circular plots were established and half of the plots were thinned; all plot trees were tagged and tallied at establishment. Nitrogen at four levels (0, 180, 360 and 540 kg/ha) along with 40 kg/ha each of P, and S were applied in the fall, 1985. Foliar, ground vegetation, and soils were sampled in 1985 prior to fertilization and 1986, 1987, 1988, 1989 for nutrient analyses. Laboratory analyses of all soil and foliar samples have been completed.

Dimensional changes in current needles in both thinned and fertilized plots become visually noticeable two years after treatment. The information on needle length and weight in combination with nutrient status in soil and foliage following treatment provide needed data for predicting growth response and diagnosing nutrient requirement of lodgepole pine.

Effects of N in combination of P and K fertilization on 35-year-old aspen growth and yield was published.

14. Goals and Accomplishments (1992-93)

1. *Complete data analysis on 5-year growth response of lodgepole pine following fertilization and thinning and prepare a manuscript.*

Data analysis on 5-year growth response of lodgepole pine following fertilization and thinning is in progress; the results of 5-year response will be included in 10-year results (scheduled to be remeasured in 1994).

2. *Continue data analysis on foliar and soil nutrient status in lodgepole pine stands following fertilization and thinning and prepare a report.*

Foliar and soil nutrient status following thinning and fertilization have been analyzed; results will be used to interpret growth responses from 5- and 10-year measurements.

3. *Provide advice and carry out technology transfer on mensurational problems related to forest fertilization.*

Handled a request on forest fertilization information made to Director General and provided published results on growth response of boreal species following fertilization to the client (Don Hoover).

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports
- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer: provided information on growth and yield of boreal species after fertilization to a consulting firm.

16. Goals 1993-94

- 1) Continue data analysis on 5-year growth response of lodgepole pine following fertilization and thinning.
- 2) In cooperation with the Foothills Model Forests, establish the study area for demonstrating under- and over-story vegetation responses following thinning and fertilizing semimature lodgepole pine.
- 3) Provide advice and carry out technology transfer on mensurational problems related to forest fertilization.

17. Major Co-operators:

- i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name
Weldwood Canada			

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of the following clarifications provided by the study leaders, the committee concludes that no further action is required:

1. The treated area is only 1.5 ha.
2. The terrain is flat and there are no creeks in the area. As a result there is no possibility of the fertilizer moving off-sites into nearby water bodies.
3. The fertilizer is applied by manually-operated cyclone spreaders.

ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 21, 1992

1. **STUDY TITLE:** Financial and economic evaluation of forest management practices
2. Responsibility Centre: Northwest Region (8133)
3. Program: Forest Resources
4. Project Title: Stand Productivity
5. Office Location(s): Edmonton
6. Work Location: Alberta, Saskatchewan, Manitoba
7. Study Staff:

	Name
Study Leader	W. Ondro
Team Members	
Total	

8. Study Key Words: Benefit/cost analysis, financial and economic analysis, profitability analysis, cost effectiveness
9. Study Activity: 2223
10. Study Resources:

Personnel Information

	1992-93	Fiscal Year 1993-94				1994-95
	Category	Previous	Budget	Revised	Forecast	Upcoming
W. Ondro	EG-04 (P)	1.00	1.00	1.00		
FTEs		1.00	1.00	1.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	3.83	3.50			
Capital					
G & C					
TOTAL:	3.83	3.50			

STUDY TOTAL	3.83	3.50			
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11. Study Background and Problem Analysis

Biological responses to forest management practices are fairly well documented and understood for the major coniferous cover types, but we are lagging behind in financial and economic analyses of such treatments. Recently an increased interest have been focused on utilization and management of mixedwood cover types. A number of studies on growth response following treatments in these cover types have been completed and cost/benefit and profitability analyses are needed. On the other hand, the prairie provinces have a large poplar resource, which in the past has been largely ignored, because of a) relative abundance of softwoods, and b) insufficient knowledge of the economic feasibility and profitability of utilization of this cover type for various products. A new thrust, the development of DSS for forest management is continuing in the region. NOR-04 has to have a major role in this initiative. Forest management/silvicultural decisions have to be based on sound financial and economic analysis. Modules to do such analysis need to be imbedded in the DSS.

12. Study Objectives:

i) Objectives

- a) Determine financial and economic returns from increased growth after spacing, release, fertilization and other forest management practices.
- b) Evaluate cost-effectiveness of different intensity, mix and sequence of forest management treatments.
- c) Evaluate the economics, utilization and market potential of poplars.
- d) Develop financial and economic modules for aspen and mixedwood decision support systems (DSS).

ii) Deliverables

Short Term (1-5 years)

- a) Evaluate financial implications of some harvesting options in overmature aspen stands.
- b) Evaluate cost/benefits and profitability of white spruce release from trembling aspen.
- c) Prepare financial analysis of spruce/aspen mixedwood management scenarios.
- d) Develop a concept and design ECONRET, a micro - computer software for evaluation forest management treatments. The software would include benefits from wildlife, recreation and water yield.
- e) Design financial and economic analysis modules for aspen DSS.

Long Term (5 years and beyond)

- a) Continue improving computer software for financial and economic evaluation of forest management practices.
- b) Continue benefit/cost analysis of forest management treatments including non-timber values.
- c) Continue profitability analysis of poplar-using industries.

iii) Significant Linkages:

- a) provincial forest services in the region
- b) major forest industries
- c) Green Plan, Foothills Model Forest
- d) Cooperative work with United States of Agriculture Department NC Region

13. Progress and Achievements

In the last decade, using existing studies on growth response from fertilization in young and mature lodgepole pine stands in Alberta (Yang 1985 and Yang 1986), the financial analyses were conducted. The results of profitability following fertilization of mature lodgepole pine were published. Using studies on growth from thinning lodgepole pine (Johnstone 1981a, 1981b, 1982a, and 1982b) and jack pine (Bella and De Franceschi 1972), and the latest thinning plot remeasurements for lodgepole pine and jack pine, financial analyses were conducted. The financial returns from thinning these lodgepole pine and jack pine stands were reported in papers now under review. Evaluation of returns from

increased growth after spruce release from aspen using several data sources (Yang 1989 and Yang 1991, Steneker 1963, 1967, 1974) was completed, and the report prepared.

In poplar (mainly aspen) utilization and management, several studies were completed. In Alberta studies on poplar utilization, market potential for poplar products, and the economics of industrial utilization of poplars for the mid-1980s were published. The studies on poplar utilization, poplar timber supply and market potential for poplar products in the early 1990s were prepared and are now under review. In the area of overmature aspen management, a study on the effect of harvest timing on revenues at harvest was completed, and the results were published. In the immediate future cost/benefit analysis for several important mixedwood white spruce/aspen scenarios will be conducted.

14. Goals and Accomplishments (1992-93)

1. *Publish a forest management note (FMN) on cost/benefits of thinning naturally regenerated lodgepole pine.*

A FMN on cost/benefits of thinning naturally regenerated lodgepole pine was sent for review to two independent reviewers. The reviewers' comments along with author's suggestions to bring this paper to publication stage were sent to Program Director for approval.

2. *Publish a FMN on costs/benefits of thinning naturally regenerated jack pine.*

A FMN on cost/benefits of thinning naturally regenerated jack pine was sent for review to two independent reviewers. The reviewers' comments along with the author's suggestions to bring this paper to publication stage were sent to Program Director for approval.

3. *Prepare a journal article or a FMN on cost/benefits of white spruce release from aspen.*

A journal article or FMN on cost/benefits of white spruce release from aspen was prepared, and sent to the project leader for preliminary approval.

4. *Reprogram TIMRET, micro-computer software on financial evaluation of forest management treatments from BASIC to LOTUS spreadsheet package and prepare FMN.*

TIMRET was reprogrammed from BASIC to LOTUS and FMN was prepared.

5. *Cooperate in the development of financial and economic analyses modules for NoFC aspen decision support systems (DSS). (NOR 04-09 and NOR 10)*

Development of financial and economic analyses modules for NoFC aspen decision support system (DSS) was reviewed with R.C. Yang and areas for cooperation identified.

6. *Cooperate with I.E. Bella (NOR 04-01) in preparing a manuscript on effect of harvest timing, on yield and revenues in western Canada's aspen stands.*

Jointly with I.E. Bella, prepared a manuscript on effect of harvest timing on yield and revenues in western Canada's aspen stands.

7. *Prepare and publish a manuscript on poplar utilization in Alberta in the early 1990s.*

A manuscript on poplar utilization in Alberta in the early 1990 was prepared.

8. *Prepare a manuscript on status of forestry in Brazil in the early 1990s.*

A manuscript on status of forestry in Brazil was prepared and submitted for publication to the Forestry Chronicle.

15. Information Activities

- i) Journal Publications

Ondro, W.J. 1992. Where is forestry going in Brazil in the early 1990s? Les (Forest) CSK 10:20-22.

- ii) Information Reports

Nil

- iii) Other reports

Bella, I.E.; Ondro, W.J. 1992. Effect of harvest timing on yield and revenues in western Canada's aspen stands. Pages 7-11 in Proc., Intern. Conf. and IUFRO Symp. September 5-9, 1992, Zvolen, CSK.

- iv) Lectures, courses, seminars and scientific addresses

Jointly with Y. Hiratsuka presented a seminar on Forestry in Brazil to the Senior Advisory Committee NoFC., November 1991.

- v) Technology transfer:

- vi) Reviewed manuscripts for journals and colleagues:

Morley, P. 1992. Present utilization of poplar in Canada. The Forestry Chronicle.

Yang, R.C.; Bella, I.E. 1992. Comparison of yield for different harvest scenarios in white spruce - trembling aspen. FMN.

16. Goals 1993-94

1. Publish FMN on application of TIMRET, microcomputer software for financial evaluation of forest management treatments.

2. Publish journal article or FMN on cost/benefit of spruce release from aspen.
3. Identify scenarios, collect data and prepare problem analysis on costs and benefits of mixedwood white spruce/aspen management scenarios.
4. Cooperate in the development of financial and economic analyses modules for NoFC aspen decision support system (DSS).

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name
U.S. Dep. Agric. NCFES		Financial software	M. Vasievich

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leaders, the committee concludes that these activities are not potentially detrimental to the environment.

ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: Dec. 21, 1992

1. **STUDY TITLE:** Development of decision support systems for mixedwood management
2. Responsibility Centre: Northwest Region (8133)
3. Program: Forest Resources
4. Project Title: Stand Productivity
5. Office Location(s): Edmonton, Alberta
6. Work Location: Alberta, Saskatchewan, Manitoba
7. Study Staff:

	Name
Study Leader	R. C. Yang
Team Members	Harinder Hans
	Ambrose Chow

8. Study Key Words: decision support system, mixedwood decision support system, integrated forest resource management, multiple use forest management
9. Study Activity: 2223, 2224
10. Study Resources:

Personnel Information

Employee Name	1992-93	Fiscal Year 1993-94			1994-95	
	Category	Previous	Budget	Revised	Forecast	Upcoming
R. C. Yang	SE-RES-2 (P)	0.90	0.90	0.90		
H. Hans	CS-2 (A)	1.00	1.00	1.00		
FTEs		2.00	2.00	1.90		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	7.08	7.00			
Capital					
G & C					
TOTAL:	7.08	7.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Alta.	A8021	7.80				
Salaries		0.00				
O&M:						
Alta	A8021	2.20				
Man.	M8037	33.00				
Capital						
G & C						
TOTAL:		43.00				

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>	0482					
Salaries		0.00	0.00			
O&M		5.20	7.00			
Capital		19.60				
G & C						
TOTAL:		24.80	7.00			

STUDY TOTAL			57.00			
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11. Study Background and Problem Analysis

Spruce-aspen is one of the most important cover types in the Mixedwood Forest Section (B.18a) of the Boreal Forest Region. Management of two-storey structured forests has been a challenge because of its complexity. The management objective was relatively simple in the past when the general practice favored the production of white spruce timber. A series of experimental cutting to release white spruce from aspen competition have been carried out in this region dating back 50 years ago and information on white spruce growth following release from aspen competition are available. The issue became more complicated due to the rising economic position of aspen in this region and to the public demand of managing the biodiverse mixedwood forests for multi-resources (wildlife, recreation, watershed etc.).

Management of mixedwood forests is a complex process involving knowledge in ecology, biology and economics. A large amount of information is available on mixedwood management, but it is fragmented and hard to use. Recent advances in computer hardware and software technology make it possible to synthesize and structure this wealth of information as well as knowledge and experience of experts in a system which is readily accessible and easily useable by practitioners. Such a system and decision framework can now be represented as a decision support system (DSS) -- a branch of artificial intelligence (AI) techniques.

12. Study Objectives:

i) Objectives

1. To synthesize fragmented and dispersed research results, practical knowledge and heuristic rules into organized, integrated and readily accessible information base.
2. To integrate resource management tools such as geographical information systems (GIS), database management systems (DBMS), knowledge-base systems (KBS), and simulation models in decision support systems (DSS) to facilitate effective and efficient decision-making.

ii) Deliverables

Short Term (1-5 years)

1. Decision support system prototypes for evaluation and validation.
2. Publish articles on GIS, database management, expert system techniques related to forestland management.

Long Term (5 years and beyond)

1. Development of decision support systems for forest management applications.
2. Technology transfer and commercialization of developed DSS.

iii) Significant Linkages:

1. Green Plan decision support system initiatives.
2. Green Plan model forest initiatives.
3. Canada-Alberta and Canada-Manitoba Partnerships Agreement in Forestry.

13. Progress and Achievements

This study is based on data from experiments on releasing white spruce from aspen competition established in early 1950's in Manitoba and Saskatchewan (MS-153) and Alberta (A-13). Plots were remeasured 5 and 10 years following release. Five reports were published.

Another remeasurement of release response has been initiated in 1985, 35 years after establishment. Data analysis on individual tree release in Slave Lake, Alberta (A-13) has been completed. Three reports will provide needed information set forth in the study objectives.

Recent advances in applying artificial intelligence (AI) techniques to natural resource management prompted changes in study objectives towards developing decision support systems (DSS) for boreal mixedwood management. A conceptual DSS prototype for aspen stand management has been developed and a system encompassing harvesting, regeneration, and tending are under developing.

14. Goals and Accomplishments (1992-93)

1. *Continue to develop and refine the windows-based aspen forest management information system, prepare a write-up for users. (Yang)*

Development of aspen forest management information system is now completed; manuscript describing the system is under preparation and will be submitted for review shortly.

2. *Continue to develop the aspen growth and yield model, prepare manuscript to describe the model, develop interfaces to the aspen DSS under development. (NOR-4-01) (Yang, Bella, Term)*

The aspen growth and yield model has been developed and included in the Mixedwood Management DSS prototype. Linkages of this model to the DSS prototype, GIS, database management systems are also developed.

3. *In cooperation with in-house domain experts and the knowledge engineer, design and develop a first-cut aspen DSS prototype for reviewing and refining. (Yang, Corns (NOR 02-01), Bella (NOR-04-01), Narvatil (NOR 10-12, Hans, Term)*

The DSS prototype which integrates GIS (Arc/Info), knowledge systems (Nexpert Object), database management systems (Microsoft Excel) and a model has been developed. The

prototype was demonstrated to experts in house and to DSS developers at the Forestry Canada Decision Support System Workshop held on Nov. 17-19, 1992 at Hinton.

4. *In cooperation with the GIS specialist (NOR 2-04), develop and integrate GIS functionality into the proposed DSS to enhance its decision-making power.*

The DSS prototype integrated many GIS functionalities which are useful in decision-making processes.

5. *Continue to develop Microsoft window and Arc-Info interfaces using the Manitoba dataset and implement structured query language (SQL) functionality to the system (Yang, Hans, Term, GIS Specialist (NOR-2-04))*

Linkages between Arc/Info and the DSS prototype were successfully developed and implemented in the prototype; SQL capability is also developed and implemented.

6. *Acquire skills to program and integrate (embed) Oracle, a prominent commercial relational database management system, into proposed DSS (Yang, Hans, Term.).*

Skills to program and integrate Oracle to our DSS prototype have been acquired; but the technique was not used in the DSS prototype because of incompatibility of Oracle and Arc/Info.

7. *Complete the economic analysis of yield scenarios of releasing white spruce in spruce-aspen forests and revise the manuscript for review (Yang, Bella (NOR 04-01))*

Analysis of yield scenarios of releasing white spruce in spruce-aspen forests was completed; a manuscript for publishing as management note has been prepared and is currently under review.

8. *Acquire proficiency in X-window programming on Sun Sparc workstation to take advantage of the new technology in DSS development. (Yang, Hans, Term)*

Technical skills in programming Unix workstation have been developed; the team is ready to migrate from PC to Unix platform to take advantages of new technology in developing DSS applications.

9. *Cooperate with domain experts on Green Plan related DSS projects. (Green Plan)*

A proposal to develop mixedwood management DSS framework has been accepted and funded by the Green Plan DSS initiatives.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports

File report on the DSS prototype functionality as of November, 1992.

iv) Lectures, courses, seminars and scientific addresses

Presented a report and demonstrated the DSS prototype at Forestry Canada Decision Support Systems Workshop held Nov. 17-19, 1992 at Hinton, Alberta.

v) Technology transfer:

Demonstrated the DSS prototype to i) a Japanese delegate and Dr. Jim Beck, U of A; ii) a Chinese delegation from Heilungjiang Forestry Academy, and iii) Chinese Forestry delegation sponsored by the World Bank.

Served as a reviewer for the Forestry Chronicle.

Served as a scientific tour guide and interpreter for the Chinese Man and Biosphere (MAB) Programme National Committee delegates.

16. Goals 1993-94

1. Complete and publish Aspen Management Information System.
2. In cooperation with knowledge engineer, domain experts in house and outside agencies to develop silvicultural and harvesting knowledge systems to enhance the capability of the Mixedwood management DSS prototype.
3. Demonstrate the DSS prototype to outside agencies for evaluation and validation of decision models; solicit input for improvement and enhancement.
4. Prepare manuscripts on 1) analyzing geo-dataset using spreadsheet and 2) the mixedwood DSS prototype for publication.
5. Port the mixedwood DSS prototype to Unix platform under Arc/Info environment; develop X windows programming skill to link Nexpert Object to Arc/Info.
6. In cooperation with Dr. I. Corns (NOR 02-01), prepare a proposal for funding a silvicultural knowledge engineer position through the Green Plan DSS initiatives.
7. In cooperation with the Foothills Model Forest, develop a GIS-based stand-level system for designing and evaluating silvicultural strategies.
8. Revise and publish the manuscript entitled "Comparison of yield for different harvest scenarios in white spruce - trembling aspen stands".
9. Prepare a paper on linking GIS to decision support models for presentation at GIS 94, Vancouver, B.C.
10. Explore the possibilities of cooperating with U.S. Forest Service scientists in developing silvicultural knowledge systems.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leaders, the committee has concluded that these activities are not potentially detrimental to the environment.

ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 21, 1992

1. **STUDY TITLE:** Managed stand yield tables for lodgepole pine and white spruce.
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Stand Productivity
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Alberta, Saskatchewan
7. **Study Staff:**

	Name
Study Leader	C.J. Cieszewski
Team Members	A. Wawrykowicz

8. **Study Key Words:** Stand management, Growth and Yield, Mensuration, Models, Productivity, Thinning/spacing, Stand development, Population dynamics, Statistics
9. **Study Activity:** 2223
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
C.J. Cieszewski	FO-02 (P)	1.0	1.0	1.0		
A. Wawrykowicz	EG-04 (T)	1.0	1.0	1.0		
FTEs		2.8	2.8	2.0		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	00.00	00.00			
O&M	2.90	4.00			
Capital	2.78				
G & C					
TOTAL:	5.68	4.00			
STUDY TOTAL	5.68	4.00			

11. Study Background and Problem Analysis

With the continued and accelerating forest harvest in Alberta, there are ever increasing areas of second growth coniferous stands that are established through either natural regeneration or by planting. Even casual observations reveal substantial differences between various characteristics of this regeneration—especially in stocking density—compared to regeneration of fire origin. These differences cause related differences in tree growth and stand development, and thus in the length of time required to grow the next merchantable crop, i.e., rotation. Yield tables are available to forecast yields of old growth stands, but no yield tables are available for second growth stands. For these (where quantitative information is rather scarce) and even potential data for Alberta are limited to the first 30 years of growth. Therefore, related mensurational research is urgently needed to remedy this situation by developing suitable yield predicting systems for second growth lodgepole pine and white spruce stands.

12. Study Objectives:

i) Objectives

To develop a growth and yield prediction system for second growth lodgepole pine and white spruce, i.e., new stands that follow harvest and are being established through either natural regeneration or planting, within an appropriate and available site classification framework. Yield estimates thus obtained should be suitable input to timber management system models (e.g., TIMPLAN) for AAC calculations.

ii) Deliverables

Short Term (1-5 years)

Density height growth model and an ageless height growth model for lodgepole pine in Alberta.

Completed and refined lodgepole pine managed stand simulation model.

New height growth models for the major timber species in Saskatchewan.

Completed Ph.D. program.

Long Term (5 years and beyond)

Single tree distance independent stand growth model for lodgepole pine and white spruce in Alberta.

Single tree distance independent stand growth model for mixedwood.

iii) Significant Linkages:

Canada-Alberta Partnership Agreement in Forestry (C/A PAIF)

Canada-Saskatchewan Partnership Agreement in Forestry (C/S PAIF)

NOR 4-02

NOR 4-01

Mixedwood Silviculture (NOR 10).

iv) Methodologies

Linear and Nonlinear Regression Analysis, Simulations.

13. Progress and Achievements

Developed the following:

- a) new variable age site index height growth model and calibrated it for the major commercial timber species in Alberta;
- b) a set of models for Weldwood Canada;
- c) new methodologies of 1) fitting base age invariant self-referencing functions and 2) deriving self-referencing functions for biological growth modeling;
- d) a prototype new stand growth model framework based on the self-thinning rule;
- e) new mortality models for lodgepole pine and aspen; and
- f) a new concept of an ageless polymorphic height growth model.

14. Goals and Accomplishments (1992-93)

1. *Continue the Ph.D. program at U. of A.*

A CJFR manuscript (Goal ii) on density related height growth reduction was prepared, and will be a part of the Ph.D. thesis requirements.

2. *Complete the manuscript and submit for publication a paper on predicting density related reduced height growth of lodgepole pine in Alberta (Cieszewski, Bella (NOR 04-01)).*

Completed and submitted for publication in CJFR the paper on predicting density related reduced height growth of lodgepole pine in Alberta: "Modeling density-related lodgepole pine height growth, using Czarnowski's stand dynamics theory" (Cieszewski, Bella).

Completed a second manuscript of a FMN on "Predicting density related reduced height growth of lodgepole pine in Alberta" — printing pending acceptance of the above CJFR manuscript (Cieszewski, Bella).

In response to client's request, prepared a third manuscript of a FMN (in review): "Adjusting lodgepole pine site index for density related height growth reduction" (Cieszewski, Bella).

3. *Complete the development of the new improved diameter growth function using additional data that includes the 1991 remeasurements on the managed stand PSPs. Complete refitting lodgepole pine stand model parameters with the corrected data, test the complete model and prepare a draft manuscript for review.*

With A. Wawrykowicz designed and developed a new, computer assisted, system of measuring heights and developed necessary computer software.

With S. Lux and C. Rentz (NOR 04-02): a) remeasured the TeePee Pole PSPs; b) tested the new height measuring system for measuring height w/o distance measurements; and c) collected additional increment cores for exact breast height age estimation on these plots.

With I. Bella and Z. Somogyi (NOR 04-01): a) remeasured the control PSPs in Greg Burn; and b) collected additional stem analysis data from surroundings stands.

Processed additional data needed for the lodgepole pine stand model development from: a) new remeasurements of TeePee Pole PSPs; b) last year remeasurement of Greg Burn PSPs; c) additional stem analysis data from Greg Burn; and d) breast height increment cores from TeePee Pole Creek.

Developed a new density height growth model and a preliminary diameter model while further analysis are in the process.

4. *Conduct technology transfer and cooperative work with: a) I.Bella (NOR 4\04-01), S.Navratil (NOR 10-12), D.Perala (United States of America), and S.Titus (University of Alberta) on publications; b) G. Gertner (United States of America) and R. McRoberts (United States of America) on organization of new IUFRO working group and development of new technologies for nonlinear regression analysis and growth modeling; and c) P. Duplate (France), and Chhun-Hour UNG (LFC), on data exchange, and other issues.*

Technology transfer and cooperative work included collaboration with: I.Bella, S.Titus (University of Alberta), on publications; and K. White (University of British Columbia), on development of new technologies for nonlinear regression analysis and growth modeling.

The manuscript: "Generic growth and yield equations for trembling aspen (*Populus tremuloides* Michx.) based on the self-thinning rule" (Perala, Cieszewski) has been submitted to CJFR by the senior author.

Acquired and received stem analysis data from P.Duplicate (France) for investigation of new techniques for base age invariant fitting of height-site index models.

Prepared and submitted a provisional list and description of potential topics for the new IUFRO working group to G.Gertner (United States of America) and R.McRoberts (United States of America).

Served as a reviewer for Forest Science.

5. *Conduct the compilation and preliminary analysis of the stem analysis data for development of the variable age site index height growth models for the major timber species in Saskatchewan.*

Conducted the compilation and preliminary analysis of the stem analysis data for the development of the variable age site index height growth models for the major timber species in Saskatchewan.

15. Information Activities

Not applicable

16. Goals 1993-94

1. Continue the Ph.D. program at University of Alberta.
2. Complete data analysis and develop site index height growth models for the major tree species in Saskatchewan (Canada-Saskatchewan PAIF project).
3. Complete the development refitting lodgepole pine (lodgepole pine) stand model parameters with all newly acquired data and test the complete model.
4. Do cooperative work on joint publications with S. Navratil (NOR-10) and D. Perala (United States of America).

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
NoFC	NOR 10-12	Juvenile growth of Aspen suckers and seedlings.	S.Navratil

ii) External -

Establishment	ID#	Title	Contact name
Saskatchewan Department of Environment and Resource Management		SI-Height growth models.	J.Benson, D.Lindenas.

18. Environmental Implications:

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leaders, the committee has concluded that these activities are not potentially detrimental to the environment.

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

PROJECT SUMMARY
1992-93

A. GENERAL INFORMATION:

1. Title: Fire Management Research
2. Responsibility Centre: Northwest Region (8133)
3. Activity: 2231
4. Program: Forest Resources
5. Status: Continuing
6. Last Evaluation: March 16, 1993
7. Next Evaluation:

B. KEYWORDS:

021 Sustainable Development
 028 Forest fire,
 065 Increased Prediction/preparation
 100 Green Plan
 116 International Science and Technology
 311 Prescribed fire
 407 Fire ecology
 408 Fire prevention
 417 Fire behavior
 418 Fire danger rating / fire weather index
 428 Fire management systems

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	7.49	7.49	9.00	0.00	0.00
Salaries	\$365.1	\$365.1	\$448.0	\$0.0	\$0.0
O & M	\$90.9	\$47.6	\$129.0	\$0.0	\$0.0
Capital	\$73.5	\$16.0	\$15.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$529.5	\$428.7	\$592.0	\$0.0	\$0.0

D. PROJECT DESCRIPTION:

The impact of forest fires on the Canadian economy and the sustainable development of our forest is significant. In the Northwest Region alone, an average fire season would see 2000 fires burn 600 000 hectares of forest and other wildlands. The costs of fire management actions in Northwest Region frequently exceed 60 million dollars. The fire management role of provincial and federal land management agencies in Northwest Region is complicated by the extreme variability of the fire environment, the nature of fire occurrences, and the physical fire behavior of wildland fires. Fire management policies are based on the interrelationships between the occurrence, behavior, and impact of wildland fires on the one hand and the suppression budget and resource capabilities on the other. The objectives of Project NOR-5 are predicated on the assumption that fire management policies can be improved through research thrusts in fire behavior, fire impact assessment, improved suppression methods, fire effects, and development of computer-based fire management information systems and models.

1. Environmental Assessment Review Process

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u>	<u>Upcoming</u>	<u>Planning 1</u>
	000's				
Primary	3.40				
Secondary					
Total					
Green Plan	87.59	75.00			

3. Collaborators

1. Primary
2. Secondary

Petawawa National Forestry Institute
 Pacific Forestry Centre
 Great Lakes Forestry Centre
 Alberta Environmental Protection, Lands, and Forest Services
 Saskatchewan Department Environmental and Resource Management
 Manitoba Department of Natural Resources
 NWT Department of Renewable Resources
 Parks Canada
 University of Alberta
 Alberta Forest Technology School

United States Forest Service
 Fire Danger Working Group
 Prescribed Fire Working Group
 Interior West Fire Council
 Canadian Committee on Forest Fire Management
 National Wildfire Coordinating Group (United States)
 Ontario Ministry of Natural Resources
 British Columbia Ministry of Forests and Lands
 Spain, Junta de Andalucía
 Alaska Fire Service
 Maniwaki Technology Transfer Centre
 Environmental Systems Research Institute, Toronto, Canada
 Environmental Systems Research Institute, Boulder, Colorado
 Canadair
 Conair
 Airspray
 Brandon University, Brandon, Manitoba
 University of Manitoba, Winnipeg
 Wajax Industries, Edmonton
 Chemonics, Canada

4. Green Plan

NOR-5 is being funded for the following Green Plan initiatives:

1. Next generation fire management decision support system for Canada.
2. Strategies and techniques for enhanced wildfire detection and suppression.

5. Milestones

1993-94:

1. Co-chair with a member of the United States Forest Service a workshop on Remote Sensing for Forest Fire Management. The workshop will be sponsored by the NWCG Fire Equipment Working Team and the CCFFM Fire Equipment Working Group and held in Salt Lake City April 6-9, 1993.
2. Initiate the gathering of fire behavior and suppression effectiveness data using the FLIR equipped aircraft. This will involve thorough briefing and debriefing of AAO's on a continuing basis, and close cooperation with other fire researchers.
3. Initiate the next version of NFIS for the Province of Saskatchewan. This next phase will include the most recent work from Manitoba and the Northwest Territories and will accelerate development in UNIX and GIS computing environments.
4. Initiate NFIS at CIFFC in Winnipeg. This will include work on long range fire weather forecasting, fire severity (i.e., MetaFire), the use of AES weather forecasting model data, the broadcasting of national fire weather maps to the public via television, and initiation of fire environment data capture for Forestry Canada's

National Forestry Data Program. The specific goal for FY 93-94 is to install the Windows NFIS at CIFFC that accesses AES weather data and computes FWI System outputs for Canada.

5. Continue development of high level GIS spatial modelling application for use in forest fire management. While the major effort will be in the Northwest Territories, this initiative will also provide tools for use in the Foothills Model Forest, Manitou Abi Model Forest, and the provinces of Saskatchewan and Alberta.
6. Present a paper on the application GIS for human-caused fire risk mapping at the ESRI User Conference.
7. Complete development of a man-caused and a lightning-caused fire-occurrence prediction prototype models for Manitoba. Install these models in Manitoba for testing and evaluation. Begin development of a man-caused and a lightning-caused fire-occurrence prediction prototype models for Saskatchewan.
8. Present a paper entitled "Lightning Detection Network Efficiency" at the 17th Conference on severe Local Storms/Conference on Atmospheric Electricity, October 1993, St. Louis, MO.
9. In cooperation with the Government of Spain, initiate a cooperative research program in spatial modelling of fire weather, fire behavior, and human-caused fire occurrence prediction in the Los Alcornocales Natural Park of southern Spain.
10. In corporation with the University of Alberta, complete research into the application of GIS technology and spatial attribute theory as a tool in person-caused fire occurrence prediction.
11. In cooperation with the University of Alberta and the Canadian Parks Service, initiate a research study on the impact of fire on stand origin in Banff National Park. This Green Plan supported project involves supporting a M.Sc. thesis student, Ms. Marie-Pierre Rougeau over a period of two years. Forestry Canada will provide office space, GIS and statistical analysis tools, and thesis supervision throughout this period.
12. Finish analysis and write-up of Ph.D. thesis dealing with crown fire thresholds in exotic pine plantations for review and comment by supervisory committee members by early February 1994 prior to submission to the Australian National University for external peer review examination, by no later than April 23, 1994.
13. a) In cooperation with fire management agencies, collect and compile initial attack effectiveness and production data for a second field season. Analysis of this data will be completed in 1993 to determine if further data collection is required. A preliminary report will be produced.

b) In cooperation with Dr. Gwynn Richards (and other interested individuals), proceed towards the development of a initial attack containment model. Complete a prototype model and determine its value to fire suppression/behavior training.

- c) Develop new or revised fire suppression effectiveness guidelines. Publish as a Forest Management Note or miscellaneous publication.
14. a) Publish a training guide/workbook on the FBP System as an Northern Forestry Centre miscellaneous report and distribute nationally and internationally.
- b) Complete development and beta testing of an interactive, hyper media training program the FBP System. Make a formal presentation and demonstration on the training system and its development at the Forest and Fire Meteorology Conference (October 93). A paper will be published in the conference proceedings.
 - c) Serve as a Unit Leader and instructor at the Advanced Fire Behavior Course, Forest Technology School, Hinton, Alberta.
15. a) Cooperatively publish a bibliography (3000 citations) on the wildlands/urban interface.
- b) Co-chair the Partners in Protection Planning and Development sub-committee. Initiate plans for the creation of a "model" subdivision within the Foothills model forest.
 - c) Publish a journal article or Forest Management Note on a minimum tree spacing required to reduce crown fire rate of spread.
 - d) Collect and analyze data on the effectiveness of thinning at reducing crown fire rate of spread on the Red Deer River prescribed burn in Banff National Park. A preliminary report will be produced.
16. Complete a M.Sc. thesis on the effects of fire in the bog birch cover type of the east slopes of Alberta.

6. Accomplishments

1. The Protection Branch of the Alberta Forest Service purchased 4 FLIR scanners for the 1992 fire season. An introductory training course for Air Attack Officers (AAOs) was conducted at Hinton in March 1992. Follow-up debriefings with the AAOs were conducted throughout the summer and all infrared video tapes recorded during the fire season were reviewed. Data concerning "challenging" fires were obtained and included into the initial attack containment study. (Hirsch NOR 05-08). A system for measuring distances and areas with the FLIR was developed and introduced to the AAOs to allow fire sizes and spread rates to be obtained in real-time. The FLIR system was enhanced by adding high quality video printers and television monitors. Trials were conducted using charcoal briquette as targets to determine hold-over fire detection capability. A Canada Alberta PAIF contract was awarded to conduct an economic evaluation to quantify the benefits of the air attack FLIRs. A paper titled "An evaluation of forward looking infrared equipped air attack" describing the 1991 and 1992 work has been submitted for publication in Fire Management Notes.

2. The Aerial Data Management and Analysis System (AIDMAS) was used to monitor two prescribed fires during 1991 in Ontario and British Columbia providing continuous and detailed coverage of the ignition process and fire behavior. The AIDMAS is considered to be essential for monitoring the prescribed fires that are part of the Canada/United States study of mass fire behavior and smoke emissions and other projects relating to smoke production and dispersal models, wildfire behavior models, and suppression effectiveness models.
3. The Intelligent Fire Management Information System (IFMIS) was installed at the Government of the Northwest Territories, Territorial Forest Fire Centre. Additional programming was completed to import weather data and plot fire weather and fire behavior maps on a daily basis. In addition, assistance was provided to Saskatchewan where IFMIS was used operationally in all of its regional offices and the Provincial Forest Fire Centre during the 1992 fire season.
4. Phase II of the integration of Northern Forestry Center's IFMIS and PNFI's Fire Management System (FMS) was completed in the Province of Manitoba. The merged system has been designated the National Fire Management Information System (NFIS). The first operational usage of NFIS will be during the 1993 fire season. NFIS integrates the strengths of both IFMIS and FMS and represents the most advanced fire management information system in existence today. Phase III (to be completed in FY93-94) will complete this DOS-based PC system and will integrate advanced risk, preparedness planning, and expert system applications currently under development at PNFI and Northern Forestry Center.
5. Development of an initial attack containment model for use in Canada was continued. Data was collected from 21 "challenging" initial attack fires in western and central Canada. Preliminary analysis of the data has been conducted and summary reports have been provided to cooperating agencies. Software development of a robust initial attack containment model was initiated. Dr. Gwynn Richards of Brandon University is developing a fire growth model which could serve as the foundation for the containment model.
6. Technology transfer efforts in the area of the wildland/urban interface were increased through cooperative programs such as the Partners in Protection consortium. Significant assistance was provided in co-sponsoring a conference on interface problems in September 1993 in Jasper, Alberta and in compiling the proceedings. A theoretical model for determining the optimum spacing levels for reducing crown fire rate of spread was developed and applied to interface areas adjacent to the Banff, Alberta townsite.
7. Experimental burns in the bog birch cover type along the east slopes of Alberta were completed. These burns will constitute the experimental basis for a M.Sc. thesis at the University of Alberta.
8. An interim report on the fire history of the Mackenzie Bison Sanctuary, suitable for fire management planning, was completed and forwarded to the Government of the Northwest Territories.

9. Cooperative research with the University of Alberta continued in the area of spatial attribute theory and human-caused fire occurrence prediction. Spatial attributes contributing to human-caused fires in Whitecourt Forest, Alberta have been identified using GIS and logistic regression. Development of the model to predict daily occurrence is now under development. One paper on the analysis of spatial attributes associated with human-caused wildfires was presented at GIS 93 in Vancouver. Two poster presentations were also made throughout the year.
10. The first phase development of preliminary geographic data base layers and modeling environment suitable for forest fire and resource management planning and operations was completed. This "next generation" fire management information system prototype using UNIX-based hardware and the ARC/INFO geographic information system (GIS) was developed for the Northwest Territories Department of Renewable Resources. The prototype will be tested operationally during the 1993 fire season. A second implementation phase will be completed during FY 93-94.

7. Link to Strategic Plan

1. National:

The Fire Management Research project is linked primarily to the Science and Technology area of the national strategic plan. Research and technology activities are directly aimed at improving sustainable forest development and indirectly at increasing the forest sector's ability to compete internationally.

2. Regional:

The Fire Management Research project is linked to the following 1988-95 Regional Strategic Initiatives:

- a) Reduction of losses - The project is developing cost-effective and environmentally acceptable methods for reducing losses to forest from human-caused and lightning-caused forest fires.
- b) Research, Development and Innovation - The project has developed a variety of innovative research products and is an international leader in development and technology transfer activities.
- c) Improvement and Sustainability of yields - Fire research is indirectly aimed at maintaining an economical wood supply and the project will provide valuable information and expertise use in any forest management decision support system.

The Fire Management Research project is linked to the following 1988-95 New Program Thrusts in a direct and indirect manner:

- a) Integrated Forest Resource Management
- b) Mixedwood Decision Support System
- c) Technology Development Unit

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 13, 1993

1. **STUDY TITLE:** Evaluation and development of fire detection-suppression technology
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Fire Management Research
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Current Study Utilization %
Study Leader	C.J. Ogilvie
Team Members	

8. **Study Key Words:**

Aerial patrols, lookouts, detection, storm tracking, wildfire mapping, remote sensing, retardants, combustion lab, air tankers, suppression, fire control, fire planning, foam, infrared

9. **Study Activity:** 2231

10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
C. Ogilvie	EG-04 (T)	0.80	0.80	1.00		
FTEs		0.90	0.90	1.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	6.90	7.00			
Capital					
G & C					
TOTAL:	6.90	7.00			

			Fiscal Year 1992-93			
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries		0.00				
O&M:						
Alta.	A8010	11.00				
	A8026	21.88				
Capital:						
Alta.	A8026	6.13				
G & C						
TOTAL:		39.01				

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>	OS-82					
Salaries		0.00	0.00			
O&M		9.50	3.00			
Capital						
G & C						
TOTAL:		9.50	3.00			

STUDY TOTAL		49.10				
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11. Study Background and Problem Analysis

Each year fire starts number at least 2000 in the prairie provinces and Northwest Territories. Many of these fires become unmanageable resulting in costly suppression and mop-up activities. The objective of this study is to improve fire detection, surveillance and suppression methods. It is oriented towards the immediate needs and requests of the client agencies and so provides an excellent opportunity to improve operations which will reduce total fire losses and minimize fire suppression costs.

Over the 20 plus year span of the study many of the results achieved in this study have already been implemented, and the prospects of further findings being put to practical use are excellent.

The following general course of action is being followed:

1. Discussion with respective user agencies to define and outline the problems to be solved.
2. On-site evaluations of existing installations and analysis of available data.
3. Formulation of objectives to be met by new systems or equipment.
4. Design of new systems or modification of existing systems in order to achieve optimum returns under given local conditions and accepted restraints.
5. Assistance to user agencies during implementation including solving day-to-day problems that have a bearing on systems design and operation.

12. Study Objectives:

i) Objectives

- a) Develop techniques and equipment for wildfire and prescribed fire surveillance and mapping.
- b) Identify the most advantageous primary detection medium for given conditions.
- c) Develop techniques to evaluate fire retardants and determine the optimum application required to inhibit fire spread in different fuels under varying burning conditions.
- d) Develop fire suppression production information for a variety of methods and conditions.
- e) To analyze and disseminate information to fire management agencies through technical assistance, consultation, and training.

This study is closely associated with the strategic plan issues of reduction of losses and research development and innovation.

ii) Deliverables

Short Term (1-5 years)

- a) Produce a paper on the concept of using forward looking infrared (FLIR) for aerial attack.
- b) Produce under contract an economic study on the use of FLIR.
- c) Adapt FLIR data for use in fire behaviour studies.
- d) Develop training methods and standards for aerial attack using FLIR.
- e) Co-chair with a member of the US Forest Service a joint workshop on Remote Sensing for Forest Fire Management
- f) Encourage the development, evaluate and promote new inexpensive fire mapping systems.
- g) Improve fire intelligence dissemination by evaluating and adapting automatic vehicle location systems, video transmission systems and computer data links.
- h) Provide data for input into the prescribed fire ignition model, smoke production and dispersal models, wildfire behaviour models and suppression effectiveness models by maintaining, using, and providing to other centres the Aerial Infrared Data Management and Analysis System (AIDMAS).

Long Term (5 years and beyond)

A great deal of development work in the fields of communications, GIS, GPS, computer software and hardware and remote sensing, is taking place at no cost to the fire community. This study will be oriented toward evaluating and adapting these advances for use in forest fire related work. To accomplish this an international approach must be taken because many of the developments take place outside of the country.

A strong focus on the end user of new technology will be made in the areas of integrating the technology without upsetting operations, training in efficient use and monitoring for maximum benefit.

iii) Significant Linkages:

- a) Fire Management Agencies within the region.
- b) CCFFM, Fire Equipment Working Group.
- c) Canadian fire management agencies outside of region.
- d) U.S. Forest Service, state fire man. agencies.
- e) NWCG, Fire Equipment Working Team
- f) PNFI, GLFC, PFC - Forestry Canada
- h) U. of Alberta
- i) Various private companies e.g., Airspray, Conair, AWB Software, Geodesy, Chemonics, Rotorways

iv) Methodologies

Problem analysis involving user agencies. Need analysis conducted with appropriate supplier.

Concept initiation using new systems or modifications of existing systems.

Conceptual trials

Technology transfer and integration of concept into operations.

Monitoring of operations to ensure maximum benefit.

13. Progress and Achievements

Up to and including 1991-92

Previous activity included introducing and developing methods for using infrared hand held scanners for fire mop-up. A system was developed for gathering and analyzing infrared imagery of large prescribed burns. Detection appraisal studies have been completed for Manitoba, Riding Mountain National Park; Saskatchewan, Prince Albert National Park; Alberta, Wood Buffalo National Park, Northwest Territories and Yukon. Methods and equipment for holdover fire detection have been investigated. Fire mapping systems have been evaluated and one has been developed. Suppressant evaluations have been conducted. Airtanker guidance using infrared was introduced, tested and was operational in Alberta on 4 air attack aircraft for 1992. There have been numerous reports published, file reports written, posters presented and speaking presentation made.

14. Goals and Accomplishments (1992-93)

1. *In cooperation with the Alberta Forest Service expand and refine the use of the air attack FLIR in the areas of foam evaluation, fire behaviour research, and holdover fire detection and produce a progress report. (AFS, Airspray)*

The Protection Branch of the Alberta Forest Service purchased 4 FLIR scanners for the 1992 season. An introductory training course for Air Attack Officers (AAO's) was conducted at Hinton in March 1992. Follow-up debriefings with the AAO's were conducted throughout the summer and all infrared video tapes recorded were reviewed. Data concerning specific fires was obtained from the video tape for inclusion in an initial attack study being conducted by K.G. Hirsch (NOR 05-08). A system for measuring distances and areas with the FLIR system was developed and introduced to the AAO's to allow fire sizes and spread rates to be obtained in real-time. A high quality video printer and 4 small television monitors were purchased and modifications made to the video systems in the aircraft to facilitate more efficient operations. Trials were conducted using charcoal briquets as targets to determine holdover fire detection capability. A Canada/Alberta PAIF contract has been awarded to conduct an economic evaluation to quantify the benefits of the air attack FLIR's (C/A PAIF: 8010). A paper titled "An Evaluation of Forward Looking Infrared Equipped Air Attack" describing the 1991 and 1992 work has been submitted for publication in Fire Management Notes.

2. *As a cooperative researcher provide input to the Ontario prescribed fire ignition model, the British Columbia smoke production - dispersal models and wildfire behaviour models, and the Alberta suppression effectiveness models. This input will involve obtaining IR imagery of prescribed and*

wildfires using the AIDMAS and processing the imagery with the NoFC digital image analysis system. (NOR 05-08, GLFC, PFC, USFS, NOR 02-04)

The Aerial Data Management System (AIDMAS) was used to monitor 2 prescribed fires during 1991 in Ontario and British Columbia providing continuous and detailed coverage of the ignition process and fire behavior. The AIDMAS is considered to be essential for monitoring the prescribed fires that are part of the Canada/US study of mass fire behavior and smoke emissions and other projects relating to smoke production and dispersal models, wildfire behavior models and suppression effectiveness models. Two components of the AIDMAS, the Barr and Stroud infrared scanner and the AWB software analyzer have been purchased using lease to own arrangements. Funding for the first scanner payment of \$40,000 was provided by the Ontario Ministry of Natural Resources (\$15,000) and the Canada/B.C. PAIF (\$25,000). The second payment of \$30,000 was made in 1992 using Green Plan funds and the final payment of \$25,000 will be made in 1993 also with Green Plan funds. The analyzer has been purchased with Canada/Manitoba funds. Forestry Canada personnel in GLFC and PFC have received training on operating the system and have successfully done so. In addition the other two establishments have both obtained means of analyzing the AIDMAS data. Contracts to obtain supplemental type approval (STA) to mount the system on a larger number of helicopters have been awarded using C/M PAIF funds. (GPxxx, NOR-02-04, C/M PAIF 8016).

3. *Continue forest fire foam delivery efficiency evaluations in cooperation with the AFS, and Chemonics Ltd. and produce a progress report. (NOR 05-08, AFS, Chemonics)*

There were no opportunities to address this goal due to the slow fire season in the region and other commitments. This goal should be suspended as it stands now because the logistics that have limited progress in the past are not likely to improve. The purpose behind the goal is still valid however and other methods to achieve it will be explored.

4. *Field test the radio frequency video transmitter. The first operational use for this system if the field tests are favourable is to supply IR data obtained by air attack to ground forces in near real-time. (B.R. Enterprises)*

This system is functional however it is too slow to be of operational use. A contract funded by the C/A PAIF has been awarded for upgrading the system to be capable of transmitting and receiving a video picture in 30 sec. (C/A PAIF: 8026).

5. *Field test the Geodesy/AWB IR fire mapping system. (NOR-36-01:8021, Man. dept. Nat. Res., Geodesy, AWB)*

The field test was conducted over the Duck Mountains, Manitoba in September 1992. The system uses an infrared scanner (The For. Can. scanner was used for this test) and a GPS, both interfaced with a micro-computer and mounted in a light twin aircraft (Cessna 310). The product is composite hard copy infrared imagery of given area at any scale up to 1:50,000. The imagery is overlaid with a transparent topographic map. The trials were done in two scales, 1:25,000 and 1:50,000 with excellent results. The composite IR imagery aligned with the topographic maps very well, resulting in an easily interpreted fire map. The system is also designed for detecting holdover fires by automatically printing an IR hard copy and GPS location of any area containing a hot spot that exceeds an adjustable

threshold. The vendor has indicated that the cost for the service will be \$1000-\$1200 per hour. Funding for the trials was provided by the C/M PAIF. (C/M PAIF 8016).

6. *Analyze client survey responses, prepare a discussion paper and prepare a draft of a paper "Electronic Gadgets Hence". (NOR 05-08)*

The first draft of the paper has been completed.

7. *Provide technical services an liaison to client agencies.*

- a) Attended International Foam Specifications workshop in Missoula, MT. Feb. 4-7.
- b) Attended two GPS demonstrations (Edmonton - Feb. 26, Wetaskiwin March 25).
- c) Attended Air Attack Officer seminar in Hinton April 6-9.
- d) Co-presented a paper at NoFC technical forum May 5.
- e) Attended Foam Task Force meeting in Victoria, May 11-14.
- f) Coordinated a training flight with the AIDMAS for PFC personnel in Kamloops.
- g) Travelled to Whitehorse to trouble shoot AIDMAS July 7-10.
- h) Attended CCFFM Fire Equipment Working Group meeting in Whitehorse, September 14-18.
- i) Employed the For. Can. scanner to monitor foam effectiveness trails in Vernon, October 8-9.
- j) Attended Interior West Fire Council meeting in Yellowknife October, 26-30.
- k) Coordinated a presentation by a representative of Recon Optical to personnel from NoFC and AFS Forest Protection Branch.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports

Ogilvie, C.J. 1992. Electronic Gadgets Hence. Forestry Canada. NoFC Edmonton. Study NOR-5-02. File Report No. 12.

- iv) Lectures, courses, seminars and scientific addresses

Ogilvie, C.J. and R.J. Lieskovsky. 1992. Air attack using FLIR, at International Foam Specifications Workshop, Missoula, Montana. Feb. 4-6, 1992.

Ogilvie, C.J. and R.W. Young. 1992. Introduction to using FLIR for air attack. Air attack officer seminar Hinton, April 6-9, 1992.

Ogilvie, C.J. and R.W. Young. 1992. Air attack using FLIR, at Technical Forum, NoFC May 5, 1992.

Ogilvie, C.J. 1992. Air attack using FLIR, at International Foam Task Force Meeting, Victoria, May 11-14.

Ogilvie, C.J. 1992. Air attack using FLIR at CCFFM Fire Equipment Working Group Meeting, Whitehorse, Sept. 14-18, 1992.

Lieskovsky, R.J. and C.J. Ogilvie. 1992. The use of FLIR scanners for air attack. In proceedings of Interior West Fire Council annual meeting and workshop. Oct. 27-29, 1992.

v) Technology transfer:

16. Goals 1993-94

1. Co-chair with a member of the US Forest Service a workshop on Remote Sensing for Forest Fire Management. The workshop will be sponsored by the NWCG Fire Equipment Working Team and the CCFFM Fire Equipment Working Group and held in Salt Lake City April 6-9, 1993. The NoFC TDU will be playing a keyrole in this goal.
2. In cooperation with AFS protection branch personnel, develop and present a training course on using FLIR from the air attack aircraft.
3. Initiate the gathering of fire behavior and suppression effectiveness data using the FLIR equipped aircraft. This will involve thorough briefing and debriefing of AAO's on a continuing basis, and close cooperation with other fire researchers.
4. Conduct operational evaluations of the Geodesy/AWB fire mapping system and the Rotoways/Istech IR and microwave down linking system and report on progress.
5. Conduct field trials of the radio frequency video down link being developed under contract and report on progress.
6. Maintain, manage and operate when possible, the AIDMAS to ensure availability and results as needed.
7. Provide technical services and liaison to client agencies.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Forestry Canada	Northwest Region		
	TDU Section		
	PNFI		
	PFC		
	GLFC		

ii) External -

Establishment	ID#	Title	Contact name
US Forest Service, Missoula, Boise, Salt Lake City			
AFS	Protection Branch		
Industry			
AFS	Forestry Training School		
AFS-AAO's			
Fire management agencies within Industry			

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 23, 1992

1. **STUDY TITLE:** Fire Management and Modelling
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Fire Management Research
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	B. Lee
	K. Anderson
Team Members	S. Henderson
	R. Smith
	M. Maffey
Student	

8. **Study Key Words:** Fire, fire management systems, preparedness planning, fire weather, fire occurrence prediction
9. **Study Activity:** 2231

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
Lee	FO-3 (P)	1.00	1.00	1.00		
Anderson	PC-2 (P)	1.00	1.00	1.00		
Henderson	CS-2 (A)	1.00	1.00	1.00		
Smith	SI-2 (T)	1.00	1.00	1.00		
Maffey	EG-5 (T)	0.25	0.25	0.00		
Klakowich	EG-5 (T)					
Student						
FTEs		4.25	4.25	4.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	00.00	00.00			
O&M	17.89	23.00			
Capital	19.35	7.00			
G & C					
TOTAL:	37.24	30.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries		0.00				
O&M:						
Alta.	A8027	7.00				
Man.	M8015	20.00				
	M8016	40.00				
	M8020	5.00				
	M8021	25.00				
NWT.	N8003	40.00				
Sask.	S8062	10.00				
Capital						
G & C						
TOTAL:		147.00				

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	05-84	16.71	24.70			
Capital	05-84	29.84	20.50			
G & C						
TOTAL:		46.55	45.20			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Other</u>						
Salaries	Suspense	3.40	.11			
O&M						
Capital						
G & C						
TOTAL:		3.40	.11			

STUDY TOTAL			222.30			
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11. Study Background and Problem Analysis

Fire management is becoming more complex every day. Increasing costs, changing values, higher risk, as well as hosts of other factors make any fire management decision difficult at best. At the same time, we are entering into the age of "high technologies" which offer new opportunities for fire management decision support. Hence, it is becoming increasingly more important that Forestry Canada investigate the application of these "high technologies" to forest fire management problems. A significant research, development, and technology transfer role exists to develop new processes, conduct applications research, and provide support for the integration of the new technology into day-to-day forest fire management.

The application and integration of management science techniques such as operations research expert systems, and artificial intelligence into forest fire management emphasizes the development and technology transfer components of the innovation (research) process. Fire management needs computerized decision-aids, database management structures and/or systems, and associated technology transfer documents to operate effectively in today's environment. This role is well within the mandate of Forestry Canada and the capability of NoFC.

The maturing computer applications area of expert systems provides a new opportunity area for Forestry Canada. Such systems have the potential to provide enhanced day-to-day decision making for fire and natural resource managers. In future these systems will integrate factual information now being derived from numerical models like the FWI and FBP systems with the knowledge and "expertise" of fire managers. They will add a new layer of information into the computer-assisted decision process and will provide better human-machine interfaces. Future expert systems will also automate the learning process, however such systems are probably 10 years away at this time.

12. Study Objectives:

i) Objectives

1. To identify the key factors relating to the occurrence, behaviour, and effect of wildfires on the cost-effectiveness of fire control decisions.
2. To build, test, and operate relevant decision-aid models designed to assist fire management agencies in optimizing the allocation and use of available resources.
3. To develop and maintain regional data bases on fire weather, fire occurrence, and fire environments for use in fire research and fire management activities.

ii) Deliverables

Short Term (1-5 years)

1. The development of fire occurrence prediction models to predict the potential numbers and locations of fires. The study of mesoscale meteorological models to determine their possible role in fire weather, fire behaviour, and fire occurrence

prediction. The development of preparedness planning strategies using the elements of risk, danger, and value to best deploy fire suppression resources.

2. The development of the next generation fire management information systems in cooperation with PNFI and others. The incorporation of fire occurrence prediction, mesoscale meteorological models, wood supply models, among other models into fire management systems. The integration of such models into both tactical and strategic fire management decision making.
3. The archiving, updating, and publication of the current fire environment data library.

Long Term (5 years and beyond)

1. The study of fire weather forecasting, fuel characterization, spatial modeling of fire phenomenon and their interaction in fire management decision making.
2. The integration of computer technology with fire science, including fire behavior and growth models, fire detection, fire occurrence prediction and the incorporation of advanced meteorological models and data into fire management.
3. The recognition of the Northern Forestry Centre as an archiving centre for fire environment databases, both regionally and nationally.

iii) Significant Linkages:

Fire management systems (IFMIS, GIS) research and development, technology transfer
 Fire Danger Research Working Group
 Prescribed Fire Working Group, Forestry Canada
 Alberta Forest Service
 Saskatchewan Dept. of Environment & Revenue Management
 Manitoba Dept. of Natural Resources, Fire Program
 Northwest Territories, Dept. of Renewable Resources,
 Canadian Interagency Forest Fire Centre
 Alaska Fire Service
 Govt. of New Zealand
 Spain, Junta de Andalucia:

NFIS research and development
 Petawawa National Forestry Institute,
 IDSYS Inc.,
 Manitoba Dept. of Natural Resources, Fire Program:

Initial attack base location optimization research.
 British Columbia Forest Service,
 Alberta Forest Service:

Human-caused fire occurrence prediction.
 University of Alberta
 Alberta Forest Service

Spain, Junta de Andalucia:

Membership and active participation
 Interior West Fire Council,
 Western Region Fire Weather Committee
 Central Region Fire Weather Committee
 Canadian Committee on Forest Fire Management

Cooperative student program
 University of Alberta

iv) Methodologies

1. Both human-caused and lightning-caused fire occurrence prediction systems are being developed using logistic regression, pattern recognition, and neural network techniques. Available mesoscale meteorological models are being evaluated to see their benefits to fire management operations. Preparedness planning strategies are being developed using linear, dynamic, and genetic programming.
2. The Intelligent Fire Management Information System (IFMIS) decision support system has been developed for DOS based personal computers. The next generation of fire management information systems currently under development will make more use of commercial GIS technology and be capable of running on a wide range of hardware platforms (i.e., UNIX, Windows NT, AUX).
3. Fire environment data is continually been updated and archived. Currently it is in an IFMIS format. The goal is to publish this data by decades using CS-ROM technology and to make the data available to users in a flexible format.

13. Progress and Achievements

Fire Management in the Northwest Region is becoming increasingly more sophisticated. All clients in the region have deployed microcomputers at their HQ and forest level operations, with minicomputers being considered. Similarly, with the advent of this computing capability, is a new and budding demand for the so-called "high technologies". These technologies include mathematical programming, artificial intelligence, expert systems, computer graphics and GIS, along with others too numerous to mention. It would appear that the timing is right for this study to capitalize on applications research opportunities in these new technology areas.

Specific contributions by study objectives listed can be summarized as follows:

1. The Intelligent Fire Management Information System (IFMIS) has been very successful in Alberta, Saskatchewan, and Manitoba. Preliminary studies conducted by the Alberta Forest Service have suggested by using IFMIS, the province can save in the order of two to five million dollars a year in pre-suppression costs. As a result, the AFS has adopted the coverage assessment and optimization concepts used in IFMIS as the standard method for pre-suppression planning in the Province of Alberta.

2. Knowledge engineering and systems analysis approaches with client agencies have served to identify key factors related to fire management as well as to develop conceptual models of fire management systems, both existing and in the future.
3. Computer-based decision aid models developed at NoFC such as the Intelligent Fire Management Information System (IFMIS), FWI/PC, FBP/PC, GEO/PC, the Initial Attack Planning Model, FWI/PC, and the Appropriate Suppression Response Expert System are being used by client agencies. Future initiatives in GIS along with new mathematical models for expert systems for deployment planning and fire effects will also contribute to fire management within the region, as well as nationally.
4. A large historical fire weather/fire environment data library has been developed for clients of the Northwest Region and other parts of Canada. This data library has assisted clients in developing the data bases required to evaluate fire management effectiveness and provides the data bases essential for the current development of fire occurrence prediction models.

14. Goals and Accomplishments (1992-93)

1. *Submit a M.Sc. thesis entitled "An evaluation of the application of expert systems for dispatching initial attack resources to wildfires" for committee approval. (Lee)*

Work continued on the thesis. A development leave period of six months is required to complete the research and writing.

2. *Complete the strategic planning initiative begun in FY 91-92 for Fire Management Research for Forestry Canada Northwest Region. The strategic plan will incorporate new initiatives recently identified under the Partnership Agreements and the Green Plan. (Lee)*

A contract was let to analyze the results for the Northwest Region Fire management Client Survey. The resulting contract report will constitute the knowledge framework for the strategic plan. The draft version of the plan will be available by the end of the fiscal year and will be presented to clients at the fall Fire Management Research Technical Advisory Committees.

3. *Continue development and technology transfer of the Intelligent Fire Management Information System*

- a. *Complete development of the DOS version of IFMIS. (Anderson)*

Version 2.1b of IFMIS was completed prior to the 1992 fire season and used operationally throughout the Northwest Region. Aside from minor maintenance and changes requested by clients, IFMIS for DIS is considered completed.

- b. *Produce a complete Windows version of IFMIS. This includes the completion of a Mapper, a Blackboard, and an FBP module. This will also include hypertext manuals for each of these modules. (Henderson)*

Windows versions of the FWI and FBP modules have been completed. The first version of the Mapper will be completed by the end of the fiscal year. These

modules will be tested operationally by a number of client agencies during the 1993 fire season to include Alberta, Saskatchewan, DIFFC, and Spain.

- c. *Assist Saskatchewan in making IFMIS operational in all regions. This would include completing a forest inventory of northern half of the province, installing IFMIS in remaining regions, assisting in optimization/preparedness planning routines, and training fire management personnel. (Anderson, Smith)*

Saskatchewan used IFMIS in all its regions for the 1992 fire season. The forest inventory will be completed using NOAA satellite imagery before the end of the fiscal year. The IFMIS optimizer was set up to run for each region in Saskatchewan and, collectively, for the province. A training session was held in Prince Albert to train staff from each region on running IFMIS.

- d. *Assist the Northwest Territories in using IFMIS at the NWT Fire Centre. This would include installing IFMIS and training fire management personnel. (Henderson, Smith)*

A copy of IFMIS was installed at the Territorial Fire Centre and steps were established to bring in daily weather and plot daily maps. Additionally, training on the use of the IFMIS system was provided.

4. *Begin work on the National Fire Management Information System (NFIS) in cooperation with the fire management system project at PNFI. This will include implementation of the first version of NFIS in the Province of Manitoba. (Lee, Anderson, Henderson)*

Two contracts were tendered to IDSYS Ltd. to complete the first phase of NFIS and to rectify problems and shortcomings resulting initial merging of IFMIS and MTTC/FMS. The completion date for this first phase of the next generation fire management system is March 1993. The first operational usage of NFIS will be during the 1993 fire season in the Province of Manitoba. Derivative products from NFIS are also appearing in Quebec, the Canadian Parks Service, Yukon, and BC through these agencies contracting directly with IDSYS Ltd. NFIS will also be installed at NoFC and will provide real time access to data bases located at the Manitoba Provincial fire Centre in Winnipeg. This will permit NoFC research staff to access the microVAX to obtain weather, lightning, and fire occurrence data currently needed for occurrence prediction and other fire research and for the fire environment data library.

5. *Conduct a statistical study of fire occurrence in Manitoba and Saskatchewan for the development of an operational fire occurrence prediction system. Funding would be provided from the provincial agreements. (Anderson)*

Data collection and preparation has been completed for both Manitoba and Saskatchewan. Statistical analysis and modelling has been initiated. Preliminary models will be run for Manitoba from NoFC using NFIS during the 1993 fire season. (C/M PAIF: 8020, C/S PAIF: 8062)

6. *Complete the development of guidelines for forest fire preparedness planning. This will include a fire suppression containment model and the development of a working computer model. (Anderson, Lee, Hirsch NOR 05-08)*

After several meetings, it was determined that the complexities of the issues precluded the development of preparedness planning guidelines and a containment model at this time. Dr. Gwyn Richards, University of Manitoba, has developed a computerized fire growth simulator and is now looking into the theoretical aspects fire containment model. Enhanced preparedness planning models for Alberta, Manitoba, and Saskatchewan are currently under development. (C/M PAIF: 8021)

7. *Continue cooperative work with IBM on the application of GIS technology to forest fire management and planning. Publish work to date at an appropriate GIS or fire management conference. (Lee, Smith)*

The development of preliminary geographic (spatial) data base layers and modelling environment suitable for forest fire and resource management has been completed. The user interface architecture has been enhanced and dynamic data flows have been developed to permit Forestry Canada research findings to provide a realistic demonstration of GIS technology in an operational forest fire management environment. In addition, the NWT Dept. of Renewable Resources has agreed to adopt the GIS fire model for trial during the 1993 fire season. A contract was tendered to Geomark Analysis Ltd., to for data compilation and technology transfer of the GIS fire model using ARC/INFO. (C/NWT CAIF: 8003)

8. *Complete the fire environment data library for the Northwest Region. This is to include lightning, fuels, and fire weather data. Write a report summarizing data available in the library. (Smith, Anderson, Lee)*

A fire environment data library has been set up as four IFMIS data directories - one for each of the client agencies in the Northwest region. Current data is as follows:

Agency	Lightning	Weather	Fires	Fuels
Alberta	1985-87	1983-92	1983-90	Green zone/quartersection
Manitoba	1976-92	1989-92	1968-92	Province/5 km
Northwest Territories		1990-92		Forest region/ 5 km
Saskatchewan	1983-89	1987-92	1981-92	Primary zone/ 1 km

Additional historical weather data exists but currently lacks FWI values. These calculations will be made and the values entered as time permits.

9. *Provide liaison and technology transfer through attendance at national and regional fire research meetings (ie; CCFFM, RTSC-FMR), Forestry Canada fire research meetings (ie; FDRWG, PFWG), and participation on committees and task forces (ie; AFS Preparedness Planning Committee). (Lee)*

Bryan Lee participated as co-program chair and as a speaker for the Interior West Fire Council Annual Meeting and Workshop held in Yellowknife, NWT, Oct. XX-XX, 1992.

Bryan Lee participated on the steering committee, as a unit leader, and a speaker for the Fire and Resource Management Course held at the Forestry technology School, Hinton, Mar. 8-18, 1992.

Scott Henderson attended the CCFFM meeting in Winnipeg where he gave a presentation on NFIS.

Kerry Anderson and Bryan Lee attended the FDRWG meeting in Quebec City and Bryan Lee attended the meetings in Sault Ste. Marie and Vancouver. The primary topic

Bryan Lee made a presentation to MANFRAC on November 9, 1992 in Winnipeg on the status of the fire management research programs under the Canada/Manitoba Partnership Agreement in Forestry program.

10. *In cooperation with the University of Alberta, conduct research into the application of GIS technology and spatial attribute theory as a tool in person-caused fire occurrence prediction. (Lee)*

Cristina Vega-Garcia continued her thesis on human-caused fire occurrence prediction in Alberta. Spatial attributes contributing to human-caused wildfires in Whitecourt Forest have been identified using GIS and logistic regression. Development of the model to predict daily occurrence is now under development. One paper on the analysis of spatial attributes associated with human-caused wildfires was presented at GIS 93 in Vancouver. Two poster presentations were also made throughout the year.

11. *Organize and chair the Western Region Fire Weather Committee meeting in Edmonton. Organize the scientific and technical seminar for the Central Region Fire Weather Committee meeting. Produce the proceedings for both meetings. (Anderson)*

Both committee meetings were organized and chaired. Scientific and technical seminars were also held with both meetings. Proceedings for these meeting have been compiled and distributed.

12. *Expand the Forest Fire Reprint Collection to include new acquisitions. Initiate cataloguing of maps and slides. (Maffey)*

New acquisitions were entered. The maps and slides will be catalogued by the end of the fiscal year.

13. *Continue to provide advisory services to client agencies, universities, and others as required. (Lee, Anderson, Hirsch (NOR 05-08), Smith)*

Conducted a two-day IFMIS training course in Hinton for the AFS fire protection officers (FPSs). (Anderson)

Assisted Bill DeGroot in preparing papers for the Interior West Fire Council Meeting and the Canadian Committee on Forest Fire Management (CCFFM). (Smith)

Administered and supervised a contract to digitize Phase III forest inventory data for the Bighorn Recreation Area for use in prescribed use of fire and habitat improvement research along the east slopes. (Smith)

Have released copies of GEO/PC to a number of small firms that require coordinate conversions. (Anderson)

Assisted the Alaska Forest Service in getting IFMIS operational for evaluation purposes. (Anderson)

14. *The Project Communications package will be completed during FY 92-93. This will include the hall display, travelling display, and a pamphlet. (Maffey)*

A travelling hall display was completed in cooperation with the communications section. A slide display and brochure will be ready for completion by the end of the fiscal year but will not be produced because of financial restrictions.

15. The Advanced Regional Atmospheric Modelling System (ARAMS) has been purchased for the SUN workstation under the Alberta PAIF. (Anderson)
16. A multimedia presentation on fire management and research was developed and presented to the Friends of Environmental Education Society of Alberta (FEESA) group. (Henderson)
17. Translated, composed and photographed Spanish versions of six slide presentations for use in Spain. (Lee, Henderson, Smith, Contractor)
18. Created and distributed documents to assist fire management personnel in the use of the PC-NFS networking software. (Henderson)

15. Information Activities

i) Journal Publications

Anderson, K.R. 1993. Lightning-caused fire occurrence prediction: an overview. Pages 27-42 in Proc. 6th Western Region Fire Weather Committee Meeting Scientific and Technical Seminar, Mar. 23, 1992, Edmonton, Alberta. For. Can., North. For. Cent., Edmonton, Alberta.

Anderson, K.R. 1993. Forecasting lightning occurrence and frequency. Pages 1-17 in Proc. 8th Central Region Fire Weather Committee Meeting Scientific and Technical Seminar, Apr. 3, 1992, Winnipeg, Manitoba. For. Can., North. For. Cent., Edmonton, Alberta.

Buckley, D.; Lee, B.S. 1992. Forestry Canada applies GIS technology to forest fire management. Pages XX-XX in Proc. 7th Annual Symposium on Geographic Information Systems in forestry, environment, and natural resource management, Feb 15-18, 1993, Vancouver, B.C.

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- Lee, B.S.; Anderson, K.R. 1993. Using linear programming and GIS for pre-suppression planning of forest fire control resources. Pages XX-XX in Proc. 7th Annual Symposium on Geographic Information Systems in forestry, environment, and natural resource management, Feb. 15-18, 1993, Vancouver, B.C.
- Lee, B.C.; Buckley, D. 1992. Forestry Canada applies GIS technology to forest fire management. Pages 44-49 in Earth Observation Magazine, June, 1992.
- Vega-Garcia, C.; Lee, B.S.; Woodard, P. 1993. Geographic analysis of human-caused wildfires. Pages XX-XX in Proc. 7th Annual Symposium on Geographic Information Systems in forestry, environment, and natural resource management, Feb. 15-18, 1993, Vancouver, B.C.

ii) Scientific Addresses

1. Mathematical problems in fire management systems, presented at Workshop on Models, Mathematics, and Numerics of Excitable Media, Oct. 1-4, 1992, Winnipeg, Manitoba. (Anderson)

iii) Oral Presentations

1. Fire management systems research at Northern Forestry Centre. Yukon Fire management Program, Whitehorse, Yukon. Apr. 1992. (Lee).
2. Canadian fire management research programs (two six hour presentations). Junta de Andalicia Forest Engineer Fire Training, Granada and Marbella, Spain. May 15 and May 22, 1992. (Lee)
3. Applying GIS technology to forest fire management. GIS Awareness Session, Forestry Canada, Northwest Region, Edmonton. Sept. 21, 1992. (Lee)
4. Applying GIS technology to forest fire management. Alberta Forest Service Fall Fire Conference, Hinton. Nov. 9, 1992. (Lee)
5. Applying GIS Technology to forest fire management. Fire in Resource Management Course, Forest Technology School, Hinton. Mar. 12, 1993. (Lee)

6. Forestry Canada, Northwest Region's fire management research program. Lac La Biche Forest Spring Ranger Meeting, Athabasca University, Athabasca, Mar. 31, 1993. (Lee, Vega-Garcia)

16. Goals 1993-94

1. Initiate the next version of NFIS for the Province of Saskatchewan. this next phase will include the most recent work from Manitoba, quebec, and the NWT and will accelerate development into the Windows, UNIX, and GIS computing environments. New approaches to preparedness planning and strategic decision making will be explored. (Contractor, Lee, Henderson) (C/S PAIF: 8032, Green Plan).
2. Initiate NFIS at CIFFC in Winnipeg. This will include work on long range fire weather forecasting, fire severity (i.e., MetaFire), the use of AES weather forecasting model data, the broadcasting of national fire weather maps to the public via television, and initiation of fire environment data capture for Forestry Canada's National Forestry Data Program. The specific goal for FY 93-94 is to install the Windows NFIS at CIFFC that accesses AES weather data and computes FWI System outputs for Canada. (Contractor, Henderson, Lee, Smith) (Green Plan)
3. Continue development of high level GIS spatial modelling application for use in forest fire management. While the major effort will be in the NWT, this initiative will also provide tools for use in the Foothills Model Forest, Manitou Abi Model Forest, and the provinces of Saskatchewan and Alberta. (Contractor, Lee, Henderson, Smith) (Green Plan)
4. Present a paper on the application GIS for human-caused fire risk mapping at the ESRI User Conference. (Lee) (Green Plan)
5. Complete development of a man-caused and a lightning-caused fire-occurrence prediction prototype models for Manitoba. Install these models in Manitoba for testing and evaluation. Begin development of a man-caused and a lightning-caused fire-occurrence prediction prototype models for Saskatchewan (Anderson). (C/M PAIF: 8020, C/S PAIF: 8062)
6. Initiate development of ARAMS software for improved fire weather forecasting. This will include establishing a data link to the ANIK satellite system and incorporating FWI System calculations in the ARAMS code. A possible link to fire management system software (IFMIS, NFIS, etc.) will be evaluated. (Anderson)
7. Present a paper entitled "Lightning Detection Network Efficiency" at the 17th Conference on severe Local Storms/Conference on Atmospheric Electricity, October 1993, St. Louis, MO. (Anderson). (C/M PAIF: 8020, C/S PAIF: 8062).
8. Present a paper entitled "A Model to Predict Lighting-Caused Fire Occurrences" at the 12th Conference on Fire and Forest Meteorology, October 1993, Jekyll Island, GA. (Anderson). (C/M PAIF: 8020, C/S PAIF: 8062)
9. Continue maintenance of the IFMIS system for DIS. Assist current user in the operational use of the program. (Anderson)

10. Continue the development and maintenance of the fire environment data library for the Northwest Region. Specific goals for FY 93-94, include:
 - i) routine data capture of and archiving, (Smith)
 - ii) transfer all data in the fire environment library to ARC/INFO, (Smith, Henderson)
 - iii) compilation digitizing of all Class E fires for Canada, (Smith, GLFC)
 - iv) compilation of a national fuel type map using NOAA imagery and CIFFC administrative units. (Contractor, Smith)
 - v) preparation of an ARC/INFO views and data dictionary for the fire environment library. (Smith, Henderson, Lee)
 - vi) completion of the Bighorn Recreation Area ARC/INFO data model to include terrain, forest inventory, and planimetric information. (Smith)
 - vii) providing provincial ARC/INFO data each of the two Forestry Canada district offices for demonstration purposes. (Smith, Henderson, Lee) (Green Plan)
11. In corporation with the University of Alberta, complete research into the application of GIS technology and spatial attribute theory as a tool in person-caused fire occurrence prediction. This will include the completion of Cristina Vega-Garcia M.Sc. thesis and the presentation of a paper on fire risk mapping using GIS at either the ESRI User's Conference or GIS 94. (Vega-Garcia, Woodard, Lee) (Green Plan)
12. In cooperation with the University of Alberta and the Canadian Parks Service, initiate a research study on the impact of fire on stand origin in Banff National Park. This Green Plan supported project involves supporting a M.Sc. thesis student, Ms. Marie-Pierre Rougeau over a period of two years. Forestry Canada will provide office space, GIS and statistical analysis tools, and thesis supervision throughout this period. (Rogeu, Woodard, White, Lee) (Green Plan)
13. In cooperation with the Govt. of Spain, initiate a cooperative research program in spatial modelling of fire weather, fire behavior, and human-caused fire occurrence prediction in the Los Alcornocales Natural Park of Southern Spain. (Lee) (Green Plan and Spain)
14. Continue to expand the Forest Fire Reprint Collection. (Maffey) (Green Plan).
15. Continue to provide advisory services to client agencies, universities, and others as required. (Lee, Anderson, Henderson, Smith)
16. Initiate and supervise a contract to complete the Nahanni Fire History study. (Smith, Lee, Dube)

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: March 16, 1993

1. **STUDY TITLE:** Fire danger and behavior rating in forest and rangeland environments
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Fire Management Research
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

Investigator(s)/Team Member(s)	Name
Study Leader	M.E. Alexander
Study Technician	M. Maffey

8. **Study Key Words:**

Forest fire, fire behavior, fire danger rating/fire weather index, fire management, reduction of forest losses, increased prediction/preparation

9. **Study Activity:** 2231

10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
Alexander	FO-2 (P)	0.17	0.17	1.00		
Maffey	EG-5 (T)	0.08	0.08	1.00		
FTDs		0.25	0.25	2.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	1.08	7.00			
Capital					
G & C					
TOTAL:	1.08	7.00			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries			0.00			
O&M: NWT:	N8006		3.00			
Capital						
G & C						
TOTAL:			3.00			

STUDY TOTAL		10.00			
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11. Study Background and Problem Analysis

Embedded in nearly every fire management decision is the need to accurately evaluate fire danger and/or predict fire behavior for a variety of fuel types/topographic situations over a range of possible fire weather conditions. The goal of fire danger/fire behavior research should be to provide fire managers with simple, timely answers to the following questions given an actual or potential wildfire occurrence:

What will be the head fire rate of spread? What will be the area, perimeter length, and forward spread distance at 1 hour, 2 hours, 3 hours and so on after it starts?

Will it be a high-intensity or low-intensity fire? Will it be a crown fire or a surface fire? How difficult will it be to control? Will mechanical equipment and/or airtankers be required or can it be handled by a suppression crew?

Is there a possibility of it "blowing-up"? If so, will it produce a towering convection column or have a wind-driven smoke plume? What will be the spotting potential? – short- or long-range? Are fire whirls likely to develop? If so, when and where?

Satisfying these information needs and assessing the probable number of man-caused and lightning fire starts provides the scientific basis for informed and effective management or control of free-burning forest fires.

The Canadian Forest Fire Danger Rating System (CFFDRS) is the national system of rating fire danger in Canada. The CFFDRS represents the practical output of the continuing Forestry Canada (ForCan) fire behavior research programme (i.e., experimental burning projects and wildfire investigations).

The CFFDRS includes all guides to the evaluation of fire danger and the prediction of fire behavior such as the Canadian Forest Fire Weather Index (FWI) System and Canadian Forest Fire Behavior Prediction (FBP) System. This study formalizes the need for the continuing development, evaluation, interpretation, and application of the CFFDRS in the region serviced by the Northern Forestry Centre (NoFC) in order to further extend its usefulness in fire management planning and operational decision-making, including computer-based decision support systems such as the Intelligent Fire Management Information System (IFMIS). Secondly, it recognizes the opportunity to formulate improved methods for the assessment and prediction of wildfire behavior in terms which are useful to fire management agencies by regional adaptation of existing and new knowledge, techniques, etc. The principal aim or thrust of Study NOR-5-05 is to develop practical systems or schemes for evaluating fire danger and predicting fire behavior for use in fire management and fire suppression programs in order to ultimately assist fire managers in reducing the adverse impacts of unwanted fires, regardless of whether they are of planned or unplanned origin.

12. Study Objectives:

i) Objectives

1. To develop, evaluate, interpret, and apply the Canadian Forest Fire Danger Rating System.
2. To improve the assessment and prediction of wildfire behavior in terms and by methods which are useful to fire management agencies.

The objectives of Study NOR 5-05 are directly related to "Regional Issue III: Reduction of Losses" as outlined in **Toward the 21st Forest: the Northwest Region's Strategic Plan, 1990-95:** and the key initiative pertaining to the "increased capability to predict and prepare for the consequences of human activities and natural disturbances... on forest ecosystems" as noted in the national strategic plan entitled **Forestry Canada: Preparing For The Future – Our Strategic Plan (April 1990).**

ii) Deliverables

Short Term (1-5 years)

1. Completion of Ph.D. thesis dealing with crown fire thresholds in pine plantations and preparation of articles for publication in peer review journals.
2. Final documentation of the results of the Big Fish Lake experimental burning project in northern Alberta (i.e., Information Report and videotape); this represents one of the "benchmark" fuel type studies used in the development of the Canadian Forest Fire Behavior Prediction (FBP) System.
3. Publication of several previous investigations and activities in the region (e.g., climatology of atmospheric conditions related to extreme fire behaviour, annotated bibliographies on NWR fire research - 1962-92 and the CFFDRS, fire behavior in lodgepole pine slash at Kananaskis, spring Drought Code starting value analyses, and Fire Weather Index System severity rating, grass fire rate of spread analyses, helicopter soundings of atmospheric stability) as Information Reports, Forest Management Notes, journal articles and papers in symposium/conference proceedings.
4. Documentation of experimental fires in specific fuel types (e.g., grasslands) and selected wildfire situations (e.g., observation zones in NWT, Saskatchewan and Manitoba) designed to ground truth certain elements of the FBP System.

Long Term (5 years and beyond)

Development of more refined guidelines and decision aids for predicting fire danger and fire behavior which meet the diversity of clients and their specific needs in the future, including extension of previously unaddressed wildland fire phenomena by ForCan (e.g., spot fire transport, fire whirl development and "blow-up" occurrence). This will be accomplished in part by continued participation as a "core" member of the ForCan Fire Danger Group in activities pertaining to further research into the fundamentals of fire behavior in support of improvements to the CFFDRS, especially with respect to the FBP System. International collaboration with other fire behavior scientists, notably those in Australia and the U.S.A., is seen as necessary if the goal to develop a more universal fire behavior model is to eventually be realized.

iii) Significant Linkages:

Regionally

- ForCan Northwest Region, Northern Forestry Centre (NOR 5-02, NOR 5-04, NOR 5-08, NOR-5-09)
- Central and Western Region Fire Weather Committees
- Interior West Fire Council
- Alberta Forest Technology School (D. Quintilio and T. Van Nest)
- NWT Territorial Forest Fire Centre (R. Lanoville)
- Atmospheric Environment Service, Central and Western Regions
- Canadian Parks Service (C. White)
- Alberta Environmental Protection, Land & Forest Services, Forest Protection Division
- Saskatchewan Department of Natural Resources, Forest Fire Management Branch

- Manitoba Natural Resources, Fire Program
- ForCan Fire Danger Working Group

Nationally

- ForCan National Headquarters, Science Directorate (A.J. Simard)
- ForCan Ontario Region (B.J. Stocks and T.J. Lynham)
- ForCan Pacific Region (B.D. Lawson)
- ForCan Petawawa National Forestry Institute (R.S. McAlpine and M.D. Flannigan)
- Canadian Committee on Forest Fire Management, Task Group on Glossary of Forest Fire Management Terms

Internationally

- USDA Forest Service fire researchers (P.L. Andrews, R.C. Rothermel, K.C. Ryan, and R.M. Nelson @ Missoula, Montana; D.W. Wade @ Dry Branch, Georgia) and fire behavior analysts (D.A. Thomas @ Superior, Montana)
- International Association of Wildland Fire (J.M. Greenlee)
- National Fire Protection Association (W.J. Baden)
- Australian Defence Force Academy, Department of Mathematics (E.A. Catchpole, W.J. Catchpole, R.O. Weber)
- CSIRO Division of Forestry, Bushfire Research Unit [Australia] (N.P. Cheney, I.K. Knight, J.S. Gould)
- Australian National University, Department of Forestry (A.C.F. Trevitt)
- New Zealand Forest Research Institute (H.G. Pearce, L. Fogarty)
- National Rural Fire Authority of New Zealand (M.J. Dudfield)

iv) Experimental Design, Sampling, Methodologies

Not applicable at this particular time.

13. Progress and Achievements

The present study was initiated in early 1981 by M.E. Alexander who was joined in mid 1985 by R.S. McAlpine, on a part-time basis (0.5 PY), as a co-study leader (McAlpine transferred to PNF in April 1989). M.E. Alexander was on longer term training (LTT) in Canberra, Australia (Ph.D. Scholar, Department of Forestry, Australian National University, and Visiting Fire Researcher, Bushfire Research Unit, CSIRO Division of Forestry) from September 1989 until March 1992 and from April 1992 until March 1993 he was involved in a secondment to the New Zealand Forest Research Institute in Rotorua as a Visiting Fire Research Scientist. M.E. Maffey serves as the study technician (part-time basis). The study leader is currently a member of the ForCan Fire Danger Group, having joined in April 1981. This group maintains liaison with regional, national, and international fire organizations, committees and agencies to ensure research, development and applications of the CFFDRS continues in a timely and relevant manner. All members received Forestry Canada certificates of appreciation in 1990 for their various roles in the Fire Danger Group (see Forestry Canada's Through The Branches 3(3):15. 1990). Interestingly enough, fire management agencies in Alaska have recently (1992) adopted the CFFDRS in lieu of the U.S. National Fire Danger Rating System.

The major accomplishments of the Group since 1981 have been:

- Production of an updated edition of the FWI System in 1984 (i.e., ForCan Forestry Technical Reports dealing with Tables and Equation/FORTRAN Program).
- Development of the Canadian Forest Fire Behavior Prediction (FBP) System.
- Development of a CFFDRS Users' Guide (i.e., a three-ring binder designed to house all national publications and associated material documenting the technical aspects of the (CFFDRS).

The study leaders have been involved directly or indirectly in the application of the CFFDRS in the "system" of several user agencies in the region (e.g., AFS, Alberta Parks, GNWT).

A point worth emphasizing is the fact that the data base used in the development of the FBP System does include the various experimental fires documented by NoFC staff between 1965-1978. The principal field research activities since 1981 have been concerned with two experimental burning projects coordinated by NoFC but involving fire staff from the other ForCan research establishments:

- i) 1982: Porter Lake, Caribou Range, N.W.T. - upland black spruce- lichen woodland (FBP System Fuel Type C-1); a cooperative project with Indian and Northern Affairs Canada (INAC).
- ii) 1985-89: Big Fish Lake, Footner Lake Forest, Alta. -black spruce-Labrador tea-Cladonia fuel complex (FBP System Fuel Type C-2); a cooperative project with Alberta Forest Service (AFS).

Since 1981, study personnel have produced 22 scientific and technical journal articles, 7 information reports, 11 forest management and technology transfer notes, 27 conference and symposium papers, 3 special miscellaneous publications, 7 newsletter articles, and 21 major internal reports. Several of these published and unpublished documents were co-authored with other ForCan fire researchers as well as provincial and federal fire managers, and university and technical school educators. Other notable achievements during the period 1981-92 include:

- Assistance with the regional implementation of spring Drought Code (DC) starting value determinations on a regular, yearly basis in 1981-82.
- Development of a 4-day advanced fire behavior course in cooperation with Alberta Forest Technology School and AFS Forest Protection Branch in 1982 (sustained participation has continued up to and including 1989). Fire management personnel from N.W.T., Manitoba and Canadian Parks Service have also attended the course.
- Coordinated the development of a scientific and technical seminar series under the auspices of the Western and Central Region Fire Weather Committees beginning in 1983.

- Initiated and solicited support for a 3-yr. CFS-HQ sponsored PRUF (Program of Research University Forestry) by University of Alberta Meteorology Division entitled "Climatology of Atmospheric Conditions Related to Extreme Forest Fire Behavior in West-Central and Northern Canada" in 1984. This work is related to the prediction of blowup fire occurrences.
- Preparation of several user-oriented aids which have been immediately utilized by AFS and INAC. (e.g., procedures and an adiabatic chart for plotting helicopter soundings of temperature, dew-point (DP) tables for fire weather stations with ventilated thermometers, prototype chart/table for the fire intensity component of the FBP System); an excellent example of this is the AFS "Fire Behavior Officer Reference - 1986". The concepts currently incorporated into the WM-680 Wind Monitor produced by Forest Technology Systems Ltd. represents another practical example of an original study initiative.
- Production of a slide-rule device incorporating the existing information on the FBP System. The "Fire Growth Calculator" or FGC simply represents an alternative methods of calculating area, perimeter length, etc. in lieu of manual, table or computer calculation.
- A variety of fire-related programs (e.g., RH and DP computations from dry-and wet-bulb temperatures, spring DC starting value) written in BASIC have been prepared including present versions of the FWI and FBP Systems. The current application involves the NEC PC-8201A portable computer which is ideally suited to district level use and by a fire behavior officer on campaign fires.
- Increased the interest and set standard for wildfire case histories or studies in the Northwest Region of ForCan and elsewhere.
- Development of a propane ignition torch using "off-the-shelf" components that eliminates the need for complicated pressure torches using liquid fuel.

An audit undertaken by Agriculture Canada in 1988 showed that the fire danger rating/fire behavior R&D being undertaken at NoFC had resulted in major savings to fire management agencies, both regionally and nationally.

14. Goals and Accomplishments (1992-93)

1. *Complete long term training (LTT) assignment towards a Ph.D. degree from the Australian National University (ANU) while occupying a Visiting Fire Researcher position with the CSIRO Bushfire Research Unit, Canberra, ACT, Australia. (Alexander)*

Last day of LTT assignment was April 24, 1992. Remaining field work in Australia (e.g., monthly and diurnal foliar moisture content sampling) and a large amount of data analysis pertaining to Ph.D. thesis was completed between February 6 and April 24, 1992. Unfortunately only a minimal amount of time was available for work on the thesis (e.g., Queensland exotic pine plantation wildfire analysis) in FY 1992-93 due to commitments posed by secondment to the New Zealand Forest Research Institute as discussed below. As a result, permission was requested and granted by the Australian

National University to submit the thesis for external peer review examination on or before April 24, 1994.

2. *Undertake secondment as Visiting Scientist (Fire Research), Forest Technology Division, Forest Research Institute, Ministry of Forestry, Rotorua, New Zealand, through the Interchange Canada program. (Alexander)*

Began one-year secondment in late April 1992 at the New Zealand Forest Research Institute (New Zealand FRI) in Rotorua under the terms of an international assignment agreement between Forestry Canada and New Zealand FRI. Funding was provided by the New Zealand Forest Owners' Association, the Foundation for Science and Technology, the Department of Conservation, the National Rural Fire Authority (NRFA), and the Ministry of Forestry. As a Visiting Fire Research Scientist at NRI, this involved four major "task" areas as follows:

Technology Transfer Activities Pertaining to Fire Danger Rating and Fire Behavior Prediction

- Delivery of three five-day Advanced Fire Behavior Courses, in association with NRFA at Rotorua (Sept. 7-11/92), Christchurch (Sep. 21-25/92), and Bulls (Mar. 22-26/93). This involved some 75 students representing a cross section of forest and rural fire organizations. Course handouts are contained in a two-volume binder set.¹
- Delivery of two 1½-day "refresher" seminars for participants of the first two Advanced Fire Behavior Courses, in association with the National Rural Fire Authority, at Rotorua (Mar. 29-30/93) and Christchurch (Mar. 31-Apr. 1/93). Course handouts available in a single binder.¹
- Delivery of four 1½-day Fire Behavior Awareness Workshops, in association with Carter Holt Harvey Forests Limited, at Tokoroa (Apr. 6-7 and Apr. 7-8/93) and Hammer Springs (Apr. 13-14 and Apr. 15-16/93). This also involved a cross section of forest and rural organizations (109 participants). Course handouts available in a single binder.¹
- ½-day presentation on the FWI System to Fiji Pine Limited staff (12) in Lautoka, Apr. 28/93; met with J. Dunn, Manager - Forest Operations, to discuss fire management related issues and possible future role(s) of NZ FRI fire research.
- Completed adaptation of CFS Forestry Technical Report 25 for production of *Fire Weather Index System Tables for New Zealand* to published by NRFA in 1993.
- Prepared prototype stickers detailing the New Zealand adaptations to CFS Forestry Technical Reports 33 (FWI System equations & computer program) and 35 (FWI System development & structure) which were published by NRFA in 1993.

¹These efforts represent the very first training of its kind in New Zealand. The NRFA is planning to use the material from these sessions as the basis for developing a 4-day intermediate fire behavior course of their own.

- Prepared document entitled "Standard Specifications for Fire Weather Index System Computer Calculations" (Oct. 1992) which has now been adopted by NRFA for implementation by Oct. 1/93.
- Prepared requested report entitled "Guidelines for Investigation and Documentation of Wildfires in Exotic Pine Plantations" for meeting of the Australian Forestry Council Research Working Group (RWG) No. 6-Fire Management, Creswick, Victoria, Dec. 9/92.
- Initiated adaptation of CFS Information Report BC-X-177 for production of *Weather Guide the New Zealand Fire Danger Rating System* which is to be published by NRFA in 1993.
- Made several oral presentations:
 - Wildfires and Fire Danger Rating, seminar to Meteorological Service of New Zealand Head Office staff, Wellington, May 27/92.
 - Fire Behaviour Research for Fire Management Purposes, Department of Conservation Science Research Division 1992 Seminar Series, Wellington, July 16/92.
 - Applying the Fire Weather Index System to the Urban-Rural Interface in New Zealand, NZ Fire Service Commanders' Seminar, Marton, July 28/92.
 - Crown Fire Behaviour in Exotic Pine Plantations of Australasia, University of Canterbury - School of Forestry Lunchtime Seminar Series, Christchurch, Aug. 3/92.
 - The Role of Fire Danger Ratings in Forest Land Management, University of Canterbury - School of Forestry Advanced Silviculture Course lecture, Christchurch, Aug. 3/92.
 - The Science of Wildland Fire Behaviour, Lincoln University - Department of Natural Resources Engineering Seminar Series, Lincoln, Aug. 4/92.
 - Fire Behaviour as a Factor in Forest and Rural Fire Suppression, invited presentation to the Forest and Rural Fires Association of New Zealand 2nd Annual Conference, Christchurch, Aug. 6/92.
 - Progress Report on the Fire Research Programme at FRI, presentation at the Fourteenth Meeting of the FAFPRO Forest Technology Board, Rotorua, Aug. 21/92.
 - Fire Danger Rating and Fire Behaviour Prediction, New Zealand Certificate in Forestry. Stage V Course 5170 (Protection and Environmental Studies) lecture, Rotorua, Sep. 17/92.

- Fire Behaviour as a Factor in Fire Suppression with Particular Reference to Exotic Pine Plantations, presentation to Forestry Corporation of New Zealand field staff, Rotorua, Oct. 30/92.
 - Fire Behaviour in Exotic Plantations with Particular Reference to Crown Fire Development, presentation to the Institute of Foresters of New Zealand — Nelson/Marlborough Branch meeting, Nelson, Nov. 24/92.
 - The Science of Plantation Fire Protection, presentation to the Institute of Foresters of New Zealand — Rotorua Section meeting, Rotorua, Dec. 10/92.
 - The Future of Fire Management on the Conservation Estate: A Canadian Fire Researcher's Perspective, presentation to senior Department of Conservation head office and conservancy managers, Dunedin, Feb. 24-25/93.
- Participated in the NRFA sponsored Overhead Team (No. 1) Workshop held at Rotorua, August 19-20, 1992.
 - Met with representatives of ALCOM Communication Services (Oct. 2/92), National Institute of Water and Atmospheric Research Ltd. (Oct. 7/92), and Meteorological Service of New Zealand Ltd. (Oct. 7/92) to discuss a wide range of issues dealing with fire danger rating and fire weather stations as they pertain to the use of the FWI System in New Zealand.
 - Provided extensive written comments to the NRFA on the document dealing with their proposed computerized decision support fire management system which involves many elements of fire danger rating (e.g., FWI System).

A Revision of the Fire Danger Classification Criteria Currently Used in New Zealand.

The fire danger classification criteria used in New Zealand was developed by the last fire researcher at NZ FRI in 1978 and was obviously antiquated. A literature review and survey of existing practices in the USA, Australia and Canada was firstly undertaken in relation to New Zealand's needs; the fact that New Zealand has no body of fire danger or fire behavior research knowledge upon which draw upon certainly hindered matters. Traditionally, the concept of fire danger index frequency of occurrence has been used to derive fire danger classes. It was decided that this approach was no longer relevant nor appropriate for New Zealand in light of developments in fire behavior/fire suppression modelling in recent years. The proposed revision to the fire danger class criteria was presented at the NRFA Regional Annual Meetings held in Palmerston North (Nov. 3/92), Te Awamuta (Nov. 5/92), Burnham (Nov. 18/92), Balclutha (Nov. 20/92) and Nelson (Nov. 24/92); the proposal was very warmly received and is to be implemented for 1993-94 fire season. Separate classifications for "forests" and "grasslands" have been derived on the basis of relevant Canadian information and experience (e.g., FBP System). A "Very High" class was added. The criteria is based on the idea that Byram's fireline intensity (kW/m) determines the degree or severity of the containment difficulty should on ignition occur; division of the fire intensity continuum into discrete classes was done on the basis of previous R&D undertaken in Study NOR 5-05. The classification scheme is designed primarily for fire prevention purposes (i.e., to inform the public of impending fire danger conditions).

Demonstrations of the Experimental Fire Technique Designed to Furnish Fire Behavior Data in Selected Fuel Types

Three experimental fires (two point source ignitions and one line ignition) were successfully carried out in (< 1 y.o.) radiata pine logging slash in cooperation with the Kinleith Forest Region of Carter Holt Harvey Forests Limited during February-March 1993; the two point source fires were conducted as part of a simulated wildfire training exercise initiated by the study leader. In addition, a few test fires were undertaken during March 1993 in tussock grasslands in cooperation with New Zealand Defence Force staff at the Waiouru Military Camp. A single line source experimental fire was also successfully carried out in the manuka heathland fuel type in cooperation with the Far North District Council in early April 1993 by the NZ FRI resident fire researcher based on preliminary work undertaken by the study leader. These efforts constitute the very first quantified experimental fires ever undertaken in New Zealand. Preparations were also made for experimental burning in wheat stubble and gorse fuel types in cooperation with private landowners and the Department of Conservation, but wet weather conditions negated a successful execution.

In addition to the above activities, "representative" foliar moisture content samples and daily "noon" fire weather observations (in order to calculate the FWI System component values) associated with six major exotic pine plantation wildfires which occurred between 1946-1981 were obtained. This data along with the spread rate information is being used to evaluate the applicability of FBP System Fuel Type C-6 (Conifer Plantation) to the New Zealand scene.

Undertake a Problem Analysis on Future Fire Research Needs

The goal of undertaking a problem analysis was to enable NZ FRI to direct its scarce fire research resources at the most pressing issues in forest and rural fire management. This was accomplished, based in part on the study leader's 20 years experience in fire research and management, through discussions with numerous individuals at training courses, meetings, etc., reviewing the relevant NZ literature and from a knowledge of past and present overseas fire research activities combined with a review of current fire management practices. It was concluded that NZ FRI should concentrate its fire research program on the physical aspects of fire; the development of a New Zealand Fire Danger Rating System would be seen as a long term goal especially a New Zealand equivalent of the Canadian FBP System. The main conclusions of this activity were verbalized in a seminar presentation entitled "Forest and Rural Fire Research Needs in New Zealand: A Canadian Perspective" made at NZ FRI on April 19/93.

Miscellaneous Activities

- Prepared draft terms of reference for the NZ FRI Advisory Committee on Forest and Rural Fire Research and attended several meetings (Rotorua - May 7/92 and Mar. 18/93; Wellington - July 20/92 and Oct. 21/92).
- Participated in the candidate selection process and on the interview panel for a resident fire researcher at NZ FRI, May 8/92.

- Supervised and "mentored" or trained NZ FRI resident fire researcher (H.G. Pearce) from June 1992 to April 1993; prepared proposal outlining a study tour of Canadian fire research and fire management visits during April-July 1993 as part of a continuing on-the-job training process for mr. Pearce.
- Advised several New Zealand fire managers about Canadian study tours: 1992 - M. Dudfield (NRFA), 1993 - P. Smart and M. Strong (Forestry Corporation of N.Z. Ltd.), and 1993 - O. Kemp (Tasman Forestry Ltd.).
- Prepared a proposal (which was in turn accepted and funded by the New Zealand Forest Owners Association) outlining the need for a Technology Transfer Specialist in Fire Protection for forest industry (3 year basis).
- Prepared job description and advertisement for Technology Transfer Specialist in Fire Protection position at NZ FRI; participated in the candidate selection process and on the interview panel, Apr. 20/93.
- Wildfire cause investigation undertaken at the request of Tasman Forestry Limited on the 0.5 MM \$ NZ Mathison Fire of 11.1.93 in the Golden Downs Forest near Nelson; an affidavit was prepared and signed as an "expert witness" for legal proceedings.
- Discussions and document preparation pertaining to a meeting on the funding of forest and rural fire research with the New Zealand Local Government Association and Federated Farmers of New Zealand Inc. in Wellington, Aug. 12/92.
- Attended and provided input to the NRFA sponsored Overhead Team Workshop held at Rotorua, Aug. 19-20/92.
- Served as an *ad hoc* member of the Rotorua Rural Fire Co-ordinating Committee and attended numerous meetings in Rotorua (July 3/92, Aug. 2/92, Sep. 29/92, Feb. 11/93, Apr. 22/93); at the request of the committee chairman and members, provided extensive written comments on the proposed NRFA national individual fire report form.

For his work while in New Zealand, the Forest and Rural Fire Association of New Zealand have conferred honorary membership upon Mr. Alexander.

3. *Continue to participate in cooperative activities of the Forestry Canada Fire Danger Group as necessary. (Alexander)*

The English and French versions of the Information Report on the FBP System were published in August 1992; the study leader co-authored these publications along with past (C.E. Van Wagner) and present (B.J. Stocks, B.D. Lawson, R.S. McAlpine and T.J. Lynham) ForCan Fire Danger Group members. This represents one of the major milestones in Canadian forest fire research which began at a ForCan Fire Danger Group meeting back in April 1981, although some of the data utilized in the development of the various components of the system predate this time. In addition, to the many provincial and federal fire management agencies in Canada which are using the FBP System, a multitude of other users are capitalizing on the availability of the system (e.g., NOR 5-04 for IFMIS, NOR 5-08 for initial attack effectiveness and productivity study and FBP System Training Guide/workbook, REMSOFT Inc. for commercial software

sales, Brandon University for fire growth modelling, University of Manitoba for interactive-hyper media training).

Contributed significant written input to group meetings held in November 1992 and January 1993.

4. *Continue to provide logistical and technical support to M.E. Alexander during the rest of his LTT assignment in Australia and his international assignment in New Zealand as requested. (Maffey)*

Mr. Maffey provided support to M.E. Alexander on a variety of items, as requested. This was all undertaken in a full satisfactory manner.

At the request of the study leader, a 10-yr post-fire tree regeneration survey of the plots experimentally burned as part of the 1982 Porter Lake Project, NWT, was undertaken in July 1992 with the financial support from the Canada-Northwest Territories Cooperation Agreement in Forestry. A brief report was prepared for the funding source. (Maffey)

15. Information Activities

i) Journal Publications

Catchpole, E.A.; Alexander, M.E.; Gill, A.M. 1992. Elliptical-fire perimeter- and area-intensity distributions. *Can. J. For. Res.* 22(7):968-972.

ii) Information Reports

Forestry Canada Fire Danger Group. 1992. Development and structure of the Canadian Forest Fire Behavior Prediction System. *For. Can., Sci. Sustainable Develop. Directorate, Ottawa, Ontario. Inf. Rep. ST-X-3.* 63 p.

Forêts Canada Groupe de travail sur les dangers d'incendie. 1992. Élaboration et structure de la Méthode canadienne de prévision du comportement des incendies de forêt. Forêts Canada, Direction générale des sciences et du développement durable, Ottawa, Ontario. *Rapport d'information ST-X-3F.* 68 p.

Quintilio, D.; Alexander, M.E.; Ponto, R.L. 1991. Spring fires in a semimature trembling aspen stand in central Alberta. *For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-323.* 30 p.

iii) Other Reports

Alexander, M.E. 1990. Computer calculation of the Keetch-Byram Drought Index — programmers beware! *Fire Manage. Notes* 51(4):23-25.

Alexander, M.E. 1992. The 1990 Stephan Bridge Road Fire: a Canadian perspective on the fire danger conditions. *Wildfire News & Notes* 6(1):6.

Alexander, M.E. 1992. Fire behaviour in exotic pine plantations of Australasia. *Aust. For. Grower* 15(1):20.

Alexander, M.E. 1992. Fire behaviour as a factor in forest and rural fire suppression. Pages 64-103 in *Proceedings of Forest and Rural Fires Association of New Zealand 2nd Annual Conference* (Aug. 5-7, 1992, Christchurch, New Zealand). *For. Rural Fires Assoc. N.Z., Rotorua, New Zealand.*

Alexander, M.E. 1992-93. Forest and rural fire research in New Zealand resumed. *Fire Manage. Notes* 53-54(1):19. [see also: *Interl. For. Fire News* No. 7:3-4, 1992.]

Alexander, M.E.; Pearce, H.G. 1992. Follow-up to the Spokane area firestorm '91 report: What were the Canadian fire danger indices? *Wildfire News & Notes* 6(4):6-7.

Alexander, M.E.; Maffey, M.E. 1992-93. Predicting fire behavior in Canada's aspen forests. *Fire Manage. Notes* 53-54(1):10-13.

iv) Lectures, courses, seminars and scientific addresses

Refer to Accomplishments under Goal #2 for 1992-93.

v) Technology transfer

Reviewed draft manuscript of book by E.A. Johnson (1992. *Fire and vegetation dynamics: studies from the North American boreal forest*. Cambridge University Press.).

Reviewed two manuscripts dealing with fire danger rating for the *International Journal of Wildland Fire* as an Associate Editor and external reviewer.

16. Goals 1993-94

1. Priority is to finish analysis and write-up of Ph.D. thesis dealing with crown fire thresholds in exotic pine plantations for review and comment by supervisory committee members by early February 1994 prior to submission to the Australian National University for external peer review examination, by no later than April 23, 1994. (Alexander)
2. In cooperation with the Alberta Environmental Protection staff at the Footner Lake Forest HQ, complete the burning of the four remaining experimental fire plots in the Big Fish Lake Project study area during the 1993 fire season. (Alexander, Maffey)
3. Participate in cooperative activities of the national Forestry Canada Fire Danger Group, as necessary, and continue to provide advisory services in respect to fire danger rating and fire behavior expertise, as required. (Alexander; ForCan Fire Danger Group members; Maffey)

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Northwest	NOR 5-02	Fire suppression technology	C.J. Ogilvie
Northwest	NOR 5-08	Fire suppression systems	K.G. Hirsch
Pacific & Yukon	PC-63-01	CFFDRS	B.D. Lawson
Ontario	GLC-03-062	Fire behavior	B.J. Stocks
Petawawa NFI	PI-4-020	Fire behavior	R.S. McAlpine
National Capital		Natl. fire res. coord.	A.J. Simard

ii) External -

Establishment	ID#	Title	Contact name
Alberta Environmental Protection		Provincial Forest Fire Centre	L.R. Foley
Alberta Environmental Protection		Footner Lake Forest Headquarters	D.F. Huberdeau

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

ii) FC-NWR EARP Committee Approval Date: May 20, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: February, 1993

1. **STUDY TITLE:** Fire Suppression Systems and Strategies
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Fire Management Research
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Canada
7. **Study Staff:**

	Name
Study Leader	K. Hirsch
Team Members	

8. **Study Key Words:** Fire Suppression Systems, suppression effectiveness, suppression efficiency, fuels management, wildland/urban interface, fire behavior, technology transfer
9. **Study Activity:** 2231
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
K. Hirsch	FO-02 (P)	0.90	0.90	1.00		
FTEs		1.00	1.00	1.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	5.87	8.00			
Capital	3.76	2.00			
G & C					
TOTAL:	9.63	10.00			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries: Alta.	A8036		3.30			
O&M: Alta.	A8009		15.00			
	A8036		6.70			
Man.	M5019		13.00			
NWT.	N8005		4.00			
Sask.	S8003		3.00			
	S8063		15.00			
Capital						
G & C						
TOTAL:			60.00			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	05-88	8.60	15.00			
Capital		9.80				
G & C						
TOTAL:		18.40	15.00			

STUDY TOTAL			85.00			
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11. Study Background and Problem Analysis

The suppression of wildfires has been and will continue to be one of the primary objectives of the fire management agencies in Canada. This is especially true in areas where wildfires may have a negative impact on the social or economic value of a given resource. During the 1980s, approximately 9700 fires per year resulted in an annual area burned off over 2.4 million hectares. Fire management expenditures during this period exceeded \$2.7 million per year with the majority of the funds allocated to wildfire suppression. The general goal of research in the field of fire suppression systems is therefore, to develop new strategies and approaches to fire suppression that will reduce resource losses resulting from unwanted wildfires and increase the cost-effectiveness of fire suppression activities.

The fire suppression systems study was initiated at NoFC in 1991 to investigate the *process* of suppressing wildfires. This includes the methods, tactics and strategies used in preparing for and conducting fire suppression activities as well as the impact and benefits obtained from fire suppression. This study is very operationally-oriented, focusing primarily on applied research and technology transfer. The study area is also closely linked to research in fire suppression technology, fire behavior/danger and fire management decision-support systems that is being conducted at NoFC and by other groups or individuals in North America. As well, this study is tied to the science and technology strategic direction as identified in the Forestry Canada National Strategic plan. With respect to the Northwest Region's Strategic plan, fire suppression systems research is directly linked to the reduction of losses, and research, development and innovation strategic issues. It is also indirectly related to the improvement and sustainability of wood supply and multiple use forest management strategic issues.

The need for research, development and technology transfer in the Fire Suppression Systems subject area has increased in recent years for two primary reasons. First, public demand on both industry and government for sustainable forest development has been growing. An important aspect of this demand is the desire for a continuous resource supply to be available from a given area. This has caused a greater reliance on fire suppression to eliminate major resource losses. Second, as overall funding for government programs becomes more difficult to obtain it is important that new, more cost-effective and environmentally acceptable approaches to fire management are developed.

12. Study Objectives:

i) Objectives

1. To identify and develop forest fire suppression knowledge and strategies that will enhance forest resource management and improve the efficiency and cost-effectiveness of fire management programs in Canada. This will assist in the reduction of losses which is a primary objective of the NW Region strategic plan.
2. To develop systematic, quantitatively-based fire suppression practices, guidelines and models that are linked to fire behavior parameters and fire management decision-support systems. The development of such systems is considered a major objective in the Forestry Canada Green Plan.

3. To conduct technology transfer activities in the area of forest fire management in order to facilitate the development and application of forest fire research results and products. Technology transfer is identified as an important activity under both the Green Plan and the regional strategic plan.

ii) Deliverables

Short Term (1-5 years)

- a) Compile and disseminate (through a bibliographic publication) information available on fire management in the wildland/urban interface.
- b) Develop and test a quantitatively-based model for fuels management in the wildland/urban interface.
- c) Cooperatively produce guidelines for sub-division and structure development in the wildland/urban interface and create a model subdivision demonstration area in Alberta.
- d) Develop guidelines and/or models for the effectiveness of initial attack resources and techniques commonly used in the boreal and sub-boreal forests of Canada. This information would serve as a component or module of a Canadian initial attack containment model or could be used in preparedness planning systems, fire management decision-support systems or even a fire economics simulator.
- e) Enhance the understanding and use of fire behavior information in fire suppression activities by:
 - 1) developing a technology transfer package (software and workload) for the Canadian Forest Fire Behavior Prediction (FBP) System that could be used in Canada and internationally; and
 - 2) participating as an instructor at training programs at the Forest Technology School, the University of Alberta and at other institutions in Canada.

Long Term (5 years and beyond)

- a) Development of models and guidelines to assist fire managers in determining optimum fire management strategies in relation to both forest management and natural resource management. Research products will utilize advancing technology (artificial intelligence, GIS, decision support systems, etc.) and require national and international cooperation.
- b) Strategies, techniques, guidelines and models will be developed to improve the efficiency and cost-effectiveness of large (or campaign) fire suppression activities. Ultimately a decision support system for campaign fire management will be developed and implemented.

iii) Significant Linkages:

Provincial and Territorial

- Fire Management Agencies in Canada
- NoFC
 - Fire Suppression Technology
 - Fire Behavior/Danger
 - Fire Management Systems
- Forestry Canada
 - Pacific Forestry Centre
 - Great Lakes Forestry Centre
 - Petawawa National Forest Institute
 - Science and Technology Directorate (Headquarters)
- Canadian Parks Service
- Atmospheric Environment Service
- USDA - Forest Service
- National Fire Protection Association
- Partners in Protection (Alberta)
- University of Alberta
- University of Manitoba
- Brandon University
- Forest Technology School (Hinton)
- Apple Canada
- Association of Wildland Fire

iv) Methodologies

The general methodologies used for this study are as follows. A problem definition is developed for each goal in cooperation with appropriate fire management agencies or research cooperators. A review of pertinent literature is conducted; a hypothesis for the study and a methodology for data collection and analysis is established. This methodology is reviewed by the cooperating agencies and other fire researchers and revised if necessary. Data collection is initiated; occasionally a pilot study is conducted prior to the major study to ensure the data collection technique is feasible. The data collected is generally empirical in nature often involving case studies, validation of theoretical models, direct sampling techniques, and expert knowledge acquisition. Data analysis may include general descriptive statistics and/or the use of linear regression models. Interim reports or presentations are provided when necessary, followed by final publications. Technology transfer through presentations, workshops, training courses, multi-media programs and personal contact is conducted on an extensive basis to ensure direct and widespread dissemination of the research results.

13. Progress and Achievements

The Fire Suppression Systems and Strategies study is relatively new having been initiated in 1991. The first year of the study involved a survey of clients in the Northwest Region to determine the fire suppression systems research priorities. Communications were established with other fire researchers in North America for cooperative research. Work in three major subject areas was then initiated; initial attack productivity and effectiveness research, development of guidelines and models for fire management in the wildland/urban interface, and technology transfer related to the use of fire behavior information and models in fire

suppression activities. Deliverables from these studies will be forth coming between 1992 and 1996.

14. Goals and Accomplishments (1992-93)

1. *Complete (co-author) an internal discussion paper on the direction of fire suppression research at NoFC (Hirsch, Ogilvie).*

An internal discussion paper on the direction of fire research at NoFC was completed (Study NOR 05-08 Field Rep. No. 3).

2. a) *Complete a training guide/workbook on the Canadian Forest Fire Behavior Prediction (FBP) System. This will be published as a NoFC miscellaneous report and distributed nationally and internationally (Hirsch)*

Approximately 75% of the training guide/workbook for the FBP System has been completed. Target date for publication is now September 1993.

- b) *Continue to work with Drs. Bill and Ian Hoskins of the University of Manitoba on the development of an interactive computer-assisted instructional package for the FBP System (Hirsch, FDG, Univ. of Manitoba). A prototype format for a portion of the FBP system will be completed for evaluation by June 1992. (C/A PAIF: 50-07)*

A prototype hyper-media training program for a portion of the FBP System was developed and evaluated. The prototype was very well received and work has started to complete the program for the entire FBP System. The Forest Technology School and Apple Canada have joined the project as cooperators. A presentation and demonstration of the program was conducted at the Interior West Fire Council meeting in Yellowknife. A national media release was also made by Forestry Canada Headquarters on this project.

3. Continue research on initial attack productivity and effectiveness. This will include:
 - a) *in cooperation with a contractor, complete an analysis of historic fire report data for Alberta in an attempt to identify suppression effectiveness levels for various suppression resources, (Hirsch, Contractor)*

A contractors analysis of historic fire report data showed that this data was not suitable for detailed analysis of initial attack activities. The information does however appear suitable for general fire statistics and data on some operational fire suppression activities.

- b) *cooperating with fire management agencies to collect, compile and analyze documented case studies of fireline productivity and effectiveness, (Hirsch, Contractor, Fire Management Agencies) (C/M PAIF: 8016; C/A PAIF: 8033)*

Data was collected on 21 "challenging" initial attach fires in western and central Canada. Preliminary analysis of the data has been conducted and summary reports have been provided to cooperating agencies.

- c) *cooperate with fire managers and other researchers on the development of a new conceptual model for initial attack containment, (Hirsch, fire management agencies, Brandon Univ., U of T) (C/M PAIF: 8016).*

The development of a robust initial attack containment model has been initiated. Dr. Gwynn Richards of Brandon University is developing a fire growth model which will serve as a foundation for a fire containment model that is still being conceptually explored.

- d) *cooperate with other NoFC and Forestry Canada staff to integrate the above information into preparedness planning systems and larger fire management systems (Hirsch, NOFC, PFC, GLFC, PNFI)*

After several meetings it was determined that the complexities of this issue precluded the development of a new preparedness planning system at this time.

4. Increase the research and technology transfer effort related to fire management in the wildland/urban interface. Activities will include:

- a) *Serving as an active member of the multi-agency Partners in Protection (PIP) Steering Committee, (Hirsch, PIP)*

Served as Forestry Canada representative on the Partners in Protection Steering Committee.

- b) *servicing as member of the program planning committee for a major symposium entitled "Minimizing the Risk of Wildfire" to be held September 27-30, 1992 in Jasper, (Hirsch, PIP, C/A PAIF: 8009).*

Served on the Partners in Protection Symposium planning committee; acted as committee chair for 12 weeks, and organized the symposiums poster session.

- c) *Compiling and publishing the proceedings of the wildland/urban interface symposium, (Hirsch)*

Compiled and published symposium proceedings.

- d) *Collection of data on the effectiveness of thinning at reducing crown fire rate of spread on the Red Deer River prescribed burn in Banff National Park, (Hirsch, Maffey, CPS).*

Data was not collected because the prescribed burn was not conducted. Research plots were revisited and a fourth plot was established.

- e) *Completing a journal article or Forest Management Note on a theoretical model for determining optimum spacing levels for reducing crown fire rate of spread. (Hirsch).*

A draft FMN has been completed.

- f) *Assist the Saskatchewan Forest Fire Management Branch in developing an action plan related to wildland/urban interface problems in Saskatchewan (Hirsch) (C/S PAIF: 8063).*

Three fire managers from Saskatchewan attended the Partners in Protection Symposium. This served as a catalyst for further actions including the production of a Saskatchewan interface video.

An international collection of one 500 wildland/urban interface resource materials have been compiled at NoFC. Information on these materials have been entered into a bibliographic data base. A poster presentation on the collection was given at the Partners in Protection Symposium, a draft manuscript has been produced and was distributed to delegates at the Partners Symposium as well as all agencies or individuals who supplied resource materials.

5. *Provide technical services to clients and maintenance liaison with fire management agencies and fire researchers in North America (Hirsch)*

Provided advice, information and technical services on fire suppression and management to individuals with fire management agencies in western Canada, Department of National Defense, University of Brandon, Abitibi-Price Inc. (Manitoba), and numerous other contractors and individuals.

Maintained liaison with fire researchers in North America by attending formal meetings with:

- Fire Suppression Equipment Development Project (Study Leader: Chuck George) in Missoula, MT;
- Fire Behavior Project (Study leader: Pat Andrews) in Missoula, MT;
- Association of Wildland Fire (Executive Director: Jason Greenlee) in Fairfield, Washington;
- University of Toronto (Dr. Dave Martell); and
- Forestry Canada Fire Danger Working Group.

Review manuscripts of three colleagues. Two journal articles (by C.E. Van Wagner and C.J. Ogilvie, respectively) and a conference paper by W.J. De Groot.

15. Information Activities

i) Journal Publications

Hirsch, K.G. 1993. A brief overview of the Canadian Forest Fire Behavior Prediction System. Fire Management Notes 53(x):xx-xx. [submitted for publication].

ii) Information Reports

Nil

iii) Other reports

Hirsch, K.G. compiler. 1992. Minimizing the risk of wildfire: a symposium to address wildfire problems in the wildland/urban interface. Proceedings of a symposium

held September 27-30, 1992, Jasper, Alberta. Partners in Protection, Edmonton, Alberta.

Hirsch, K.G. 1992. A brief overview of the Canadian Forest Fire Behavior Prediction System. Pages XX-XX in Proceedings of Fourth Western Region Fire Weather Committee Scientific and Technical Seminar. For. can., North. For. Cent., Edmonton, Alberta. [in press].

Hirsch, K.G.; Hoskins, J.A.; Hoskins, W.D. 1992. An interaction system for fire behavior training: a conceptual example. Pages xx-xx in Proceedings of the Fifth Interior West Fire Council Meeting and Workshop, October 26-29, Yellowknife, N.W.T. Govt. NWT, Dept. Renewable Res., Ft. Smith, NWT. [Abstract].

Hirsch, K.G.; Baxter, G.J.; Halon, C.M.; Maffey, M.E. 1992. A collection of wildland/urban interface resource materials. Pages 102 in minimizing the Risk of Wildfire: a symposium to address wildfire problems in the wildland/urban interface. Proceedings of a symposium held September 27-30, 1992, Jasper, Alberta. Partners in Protection, Edmonton, Alberta. [Abstract].

Hirsch, K.G.; Alexander, M.E.; Anderson, K.R. 1993. Dew-point temperature tables for fire weather stations with ventilated psychrometers. For. Can., North. For. Cent., Edmonton, Alberta. Forest Management Note No. XX. [in press].

Hirsch, K.G.; Ogilvie, C.J. A discussion paper on fire research at the Northern Forestry Centre. For. Can., North. For. Cent., Edmonton, Alberta. Study NOR-05-08, File Rep. No. 3.

iv) Lectures, courses, seminars and scientific addresses

- a) Presentation on the FBP System at the Western Region Fire Weather Committee, March 23, 1992.
- b) Presentation on the FWI System and the FBP System at the Arctic Weather Centre's spring workshop.
- c) Served as Unit Leader (Fire Science) and made presentations on wildfire documentation, fuels classification, FBP System, and regional case studies at the Advanced Fire Course, Forest Technology School, Hinton, AB., January 31 - February 5, 1993.
- d) Conducted a lecture for FOR 340 (Fire Management) at the University of Alberta on the implications of the 1989 fire season in Manitoba. Instructed at two laboratory exercises on the FWI System, also for the FOR 340 course.
- e) Poster presentation on the NoFC wildland/urban Interface Resource Material collection given at the Partners in Protection Symposium.
- f) Presentation and demonstration of the hyper media training program for the FBP System. Given to Apple Canada in September 4, 1992 and at the Interior West Fire Council Annual Meeting and Workshop, October 26-29, Yellowknife, NWT.

v) Technology transfer:

16. Goals 1993-94

1. a) In cooperation with fire management agencies, collect and compile initial attack effectiveness and production data for a second field season. Analysis of this data will be completed in 1993 to determine if further data collection is required. A preliminary report will be produced. (Hirsch: C/M PAIF 8021; C/S PAIF 8033; C/A PAIF 8036; C/NWT CAIF: 8005; Green Plan - Fire Management; Fire Management Agencies).
- b) In cooperation with Dr. Gwynn Richards (and other interested individuals), proceed towards the development of a initial attack containment model. Complete a prototype model and determine its value to fire suppression/behavior training. (Hirsch: C/M PAIF: 8021; Brandon University).
- c) Develop new or revised fire suppression effectiveness guidelines. Publish as a Forest Management Note or miscellaneous publication (Hirsch; Alexander (NOR 05-05); Fire Danger Group).
2. a) Publish a training guide/workbook on the FBP System as an NoFC miscellaneous report and distribute nationally and internationally (Hirsch).
- b) Complete development and beta testing of an interactive, hyper media training program the FBP System. Make a formal presentation and demonstration on the training system and its development at the Forest and Fire Meteorology Conference (October 93). A paper will be published in the conference proceedings. (Hirsch; C/M PAIF; Forest Technology School; Apple Canada; University of Manitoba; Fire Danger Group).
- c) Serve as a Unit Leader and instructor at the Advanced Fire Behavior Course (Hirsch, Forest Technology School).
3. a) Cooperatively publish a bibliography (3000 citations) on the wildlands/urban interface (Hirsch, Association of Wildland Fire, Editors).
- b) Co-chair the Partners in Protection Planning and Development sub-committee. Initiate plans for the creation of a "model" subdivision within the Foothills model forest. (Hirsch; Partners in Protection; Foothills Model Forest; C/A PAIF: 8009).
- c) Publish a journal article or Forest Management Note on a minimum tree spacing required to reduce crown fire rate of spread (Hirsch).
- d) Collect and analyze data on the effectiveness of thinning at reducing crown fire rate of spread on the Red Deer River prescribed burn in Banff National Park. A preliminary report will be produced. (Hirsch, Maffey (NOR 05-03), PFC, CPS)
4. Provide Technical services to clients and maintain liaison with fire management agencies and fire researchers in North America.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Northwest Region	NOR-05-02		C.J. Ogivlie
	NOR-05-05		M.E. Alexander/ M.E. Maffey
	NOR-05-04		B.S. Lee K. Anderson
	PAIFS - Saskatchewan - Alberta - Manitoba - NW Territories		
Pacific Forest Centre	Fire Research		Bruce Lawson
Great Lakes Forest Centre	Fire Research		Brian Stocks
Petawawa National Forest Institute	Fire Behavior Research		Rob McAlpine
Headquarters	Fire Research Coordinator		Al Simard

ii) External -

Establishment	ID#	Title	Contact name
Brandon University	Dept. Math and computers Science		Gwyne Richards
Canadian Fire Management Agencies			
University of Manitoba	Dept. of Computer and Science		Ian Hoskins Bill Hoskins
Apple Canada			Gary Wynn
Forest Technology School			Terry Van Nest Rob Thorburn
Association of Wildland Fire			Jason Greenlea
Weldwood Canada (Hinton Division)			Warren Kehr
Canadian Parks Service	Banff National Park		Ian Pengelley
University of Alberta	Forest Science		Paul Woodard Peter Murphy
Partners in Protection			Kelly O'Shea

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: February, 1993

1. **STUDY TITLE:** Fire Environment Research
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Resources
4. **Project Title:** Fire Management Research
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	W. de Groot
Team Members	M. Maffey
Total	

8. **Study Key Words:** Prescribed fire, fire use, fire effects, fire ecology, integrated resource management, fuels, fire history
9. **Study Activity:** 2231
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
DeGroot	FO-2 (P)	0.42	0.42	1.00		
Maffey	EG-5 (T)	0.67	0.67	0.00		
FTEs		1.09	1.09	1.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	6.46	9.00			
Capital	7.90	6.00			
G & C					
TOTAL:	14.36	15.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries:						
Alta.	A8022		6.2			
O&M:						
Alta	A8022		10.8			
Capital						
G & C:						
TOTAL:			17.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	05-89	6.34	7.00			
Capital						
G & C						
TOTAL:		6.34	7.00			

STUDY TOTAL			39.00			
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11. Study Background and Problem Analysis

With establishment of new National and Regional Strategic Plans, there has been considerable emphasis placed on sustainable development in forestry. This, of course, goes beyond sustained yield principles to include consideration of environmental values in forest management decisions. As a result, there will be new initiatives to support multiple land-use planning and integrated resource management (IRM).

Fire management plays a significant role in attaining the various objectives of IRM. This is demonstrated by the increased use of fire by client agencies in the Northwest Region. Consequently, the demand for new information and assistance in the application and role of fire is also increasing.

Because of the size of the region and the number of clients, there is a variety of areas in which clients are interested. These include the use of fire for wildlife habitat, range management, maintenance of ecological condition, control of weed species, site preparation, fuel hazard reduction, and control of insect and disease. There is also interest in fire history studies for resource planning purposes.

12. Study Objectives:

i) Objectives

1. To determine fire use applications, problems, and considerations for an array of management objectives and vegetative situations in the region.
2. To develop information on the effects of fire on various ecosystems in the region; and to develop information on the environmental role of fire.
3. To establish guidelines for the application of prescribed fire in various fuel and vegetation types within the Northwest Region.

ii) Deliverables

Short Term (1-5 years)

Long Term (5 years and beyond)

iii) Significant Linkages:

iv) Methodologies

13. Progress and Achievements

All client agencies have been contacted and consulted in regards to needs in Fire Environment Research. A project client survey indicates that prescribed fire and fire effects are the highest priority research item of concern in the Northwest Region. Several studies

were initiated with client agencies to address individual agency concerns in prescribed fire and fire effects. Cooperative efforts were used to collect field information for use in development of regional prescribed fire guidelines.

14. Goals and Accomplishments (1992-93)

1. *Conduct experimental thesis burns during the 1992 field season in the east slopes region (de Groot); Maffey will provide field assistance.*

Completed experimental thesis burns along the East Slopes. Preliminary results have been collected and analysis is underway (de Groot).

2. *Complete a draft version of the fire history study for the Mackenzie Bison Sanctuary by the end of August (de Groot); Maffey will continue to sand and age tree disc samples as required.*

Completed an interim report on the Fire History Study of the Fort Providence Management Plan Area (de Groot). Several weeks of field work were conducted in the NWT during 1992, with initial results of the study being presented at the Interior West Fire Council Workshop Proceedings, and in a report to the Management Plan Committee (de Groot).

3. *Attend graduate school full-time beginning in September.*

Started full-time graduate studies in September. Thesis outline and preliminary chapter drafts have been started and reviewed by the Thesis Committee (de Groot).

4. *Assisted with operational burns at Little Rat Lake, NWT and Riding Mountain National Park (Maffey).*
5. *Participated on the AFS Prescribed Burn Manual Task Force by supplying chapters on fuel sampling and fire behavior calculations (de Groot).*
6. *Provided procedural guidelines to AFS on developing prescribed burn prescriptions using currently available decision aids (de Groot).*
7. *Presented a lecture on fuel sampling, fire behavior prediction and prescription building at Advanced Fire Ecology class at U of A (de Groot).*
8. *Assisted with fuel sampling at planned prescribed burn in Fort a la Corne Forest, Saskatchewan (de Groot, Maffey).*
9. *Presented a talk on prescribed fire and fire effects work taking place in the Northern and Western Region at the annual meeting of ForCan's Prescribed Fire Working Group in Pasadena, Newfoundland (de Groot).*
10. *Presented a paper on 'Predicting Prescribed Fire Effects on Ecosystems' at the 'Maintaining Healthy Ecosystems' conference in Saskatoon. (de Groot)*

11. Presented course instruction on the CFFDRS and prescription development at the U of A Extension course on Prescribed Burning (de Groot).

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports

de Groot, W.J. 1993. Examples of Canadian Forest Fire Behavior Prediction System Fuel Types in Canada. Govt. Can., For. Can., North. For. Cent., Edmonton Alta. Poster (w/text) [in press]

- iv) Lectures, courses, seminars and scientific addresses

de Groot, W.J. 1992. Predicting prescribed fire effects on ecosystems: present capabilities and future research needs. *In* 'Ensuring Healthy Ecosystems: A Canadian Conference on Vegetation Management in Parks and Protected Areas' (Nov. 18-20, 1992, Saskatoon, Sask.). University of Saskatchewan, Extension Division. 7 p. [in press]

de Groot, W.J. and T. Chowns. 1992. Fire history in the Fort Providence, NWT Area: a preliminary assessment. *In* 1992 Annual Meeting and Workshop Proceedings of the Interior West Fire Council on 'Managing Fire Dependant Ecosystems: options and technologies' (Oct. 26-29, 1992, Yellowknife, NWT). Govt. of the NWT, Dept. of Renewable Resources. 8 p. [in press]

- v) Technology transfer:

de Groot, W.J. and T. Chowns. 1992. Initial results of the fire history study for the Fort Providence area. Interim report submitted to the Fort Providence Management Plan Committee, GNWT. 15p.

16. Goals 1993-94

1. Complete M.Sc. degree: course work to be completed by April 1993; thesis response data to be collected through the 1993 field season; final draft of thesis to be completed by October 1993, with thesis defense to be done shortly after.
2. Present thesis study results at 12th Conference on Fire and Forest Meteorology (Atlanta, Georgia, Oct. 1993); and present activities in prescribed fire and fire effects at joint Canada/US Prescribed Fire Working Group meeting immediately following 12th conference.
3. Continue with Fort Providence Fire History Study: collecting additional field data during 1993 summer and proceed with writing final report after completion of thesis.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Forest Economics Research
2. Responsibility Centre: Northwest Region (8151)
3. Activity: 1334, 2224
4. Program: Regional Development
5. Status: Continuing
6. Last Evaluation: January 3, 1992
7. Next Evaluation:

B. KEYWORDS:

007 Economics
 012 NFEP
 021 Sustainable Development
 100 Green Plan
 120 Working Groups
 121 University Support
 207 Wildlife
 218 Fish
 235 Rec/Parks
 240 Multiuse

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	2.00	2.00	3.00	0.00	0.00
Salaries	\$105.5	\$105.5	\$156.2	\$0.0	\$0.0
O & M	\$93.2	\$18.0	\$56.3	\$0.0	\$0.0
Capital	\$2.9	\$0.0	\$0.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$201.6	\$123.5	\$212.5	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS:

The project provides high quality theoretical and applied economics research through individual studies as well as joint interdisciplinary studies with NoFC scientists from all program areas and industrial, academic and government clients. Study areas include the economics of silviculture, integrated resource management and environmental issues, community stability and forest sector dependence, economics of pest control and other areas of client interest. FORCAN's forest economics research activities in the region are coordinated from this project and committee participation to discuss provincial, regional and national research issues and opportunities is provided. The project is also responsible for initiating and supervising economics research contracts generated through federal-provincial/territorial accords, the Green Plan and other such initiatives as well as promoting and developing support and cooperation for the forest resource economics research project with other projects at NoFC and with external clients.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary (\$s & PYs):

	Previous	Budget	Revised \$000	Upcoming	Planning 1
Primary					
Secondary					
Total					
Green Plan	43.95	33.25			

3. Collaborators:

Secondary

University of Alberta, Department of Rural Economy
Saskatchewan Environment and Resource Management
Canadian Wildlife Service
Mistik Management (Sask.)

4. Green Plan:

Green Plan Initiatives and Activities

Funding has been received under the Forestry Practices Technology Transfer initiative to initiate the study of the economics of logging practices.

5. Milestones:

1993-94:

1. Develop project proposals and act as a project authority for existing and developed contracts under PAIFs, Green Plan and other programs.
2. Continue exploring and establishing linkages with scientists at NoFC, focusing on non-timber resource relationships and pest problems.
3. Initiate the Forestry Sociology Study at NoFC through the retention of a Research Associate at the University of Alberta and the development of a study work plan.
4. Continue with research efforts into the travel cost method (TCM), focusing on the linkages between non-market economic values and the management and condition of forests in the Northwest Region.
5. Conduct research into the effects of environmental quality changes on non-market economic values. Construct a Decision Support system to illustrate how various environmental and resource changes affect economic values for moose hunting. (Boxall)
6. Continue with applied economic research efforts funded under the Federal-Provincial PAIF's. These include the relationships between economic values and forestry for: big game hunting in northwestern Saskatchewan, woodland caribou, and recreational canoeing in Nopiming Park, Manitoba. (Boxall, McFarlane, Kuhnke)
7. Initiate studies on the "Principal-Agent Problem and Forest Resource Management", "Forestry and Ecological Economics" and investigate with Mistik Management their interest in a study on the "Economics of Hybrid Poplar in NW Sask."
8. Provide advice, guidance and assistance to the Program Director Regional Development and the NoFC Management Committee.

6. Accomplishments:

1. Acted as project authority for existing and new contractor under PAIFs, Green Plan and other programs. Joint research projects with scientists were continued with emphasis on pest problems.
2. Research was carried out on the social aspects of the nonconsumptive utilization of wildlife as it relates to forestry. Articles on travel cost methodologies were submitted to refereed journals.
3. Strong relationship with University of Alberta was maintained and relationships established with other regional and United States Universities.
4. Advice was provided to management as required.

7. Link to Strategic Plan:

National:

The Forest Economics Research project is involved in many areas included in the National Strategic Plan. Key areas include better wood utilization, pest and disease control, technology transfer and human resources.

Regional/Institute:

NOR-6 links to the Regional Strategic Plan include research to stimulate economic use of the forest resource. Work on pine regeneration and the economics of silviculture tie in with efforts to improve and sustain the wood supply. Cooperative research with FIDMSS Western Gall Rust and Jack pine budworm is aimed at the issue of reducing losses. Multiple use forest management is an important area of research within NOR-6 supported by funding from the PAIFs and the Green Plan.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: JAN 13, 1993

1. **STUDY TITLE:** Forest Economics Research and Coordination
2. **Responsibility Centre:** Northwest Region (8151)
3. **Program:** Regional Development
4. **Project Title:** Forest Economics Research
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Edmonton, Prince Albert, Meadow Lake
7. **Study Staff:**

	Name
Study Leader	B. White
Team Members	B. McFarlane
	M. Pattison
	D. Kuhnke

8. **Study Key Words:** Forest economics, cost effectiveness, financial analysis, ecological economics
9. **Study Activity:** 1334
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
B. White	ES-05 (P)	1.00	1.00	1.00		
B. McFarlane	SI-01 (T)					
M. Pattison						
D. Kuhnke	FO-02 (P)	0.00	0.00	1.00		
FTEs		1.00	1.00	2.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	12.91	13.00			
Capital					
G & C					
TOTAL:	12.91	13.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries:						
Alta.	A8016	13.60				
	A8034	11.28				
	A8051	2.28				
NWT	N8013	2.40				
O&M:						
Alta.	A8016	3.40				
	A8034	4.72				
	A8051	2.32				
Man.	M8017	10.00				
NWT	N8013	2.20				
Capital						
G & C:						
Alta.	A5003	26.45				
	A5005	26.00				
	A5017	36.13				
Sask.	S5001	34.50				
	S5012	36.10				
TOTAL:		211.38				

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries						
O&M						
Capital						
G & C						
TOTAL:						

STUDY TOTAL		257.63				
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11. Study Background and Problem Analysis

As Forestry Canada personnel document biological responses of the forest to various management treatments and attacks from pest and fire, it is imperative that the economic impact of these be understood in order to efficiently maintain a wood supply for industrial, recreational and other users. Decisions by forest users can also be influenced by existing tenure arrangements and policies. These impacts need to be well understood so effective policies can be designed. Forestry Canada is also committed to sustainable development. To achieve this goal, existing and future values of the forest must be understood. Decisions taken with respect to forests not only influence the forests but people as well. Studies in forest sociology are required to understand the role of forests to Natives and other citizens dependent on the forest for their livelihood or who depend on the forest for its social, cultural and spiritual values.

12. Study Objectives:

i) Objectives

1. To provide high quality theoretical and applied economics research through individual studies as well as joint interdisciplinary studies with NoFC scientists from all program areas and industrial, academic and government clients. Research will be conducted by study personnel and through contracts. Study areas could include the economics of silviculture, integrated resource management and environmental issues, community stability and forest sector dependence, economics of pest control, ecological economics and other areas of client interest.
2. To oversee a new thrust in forest sociology including but not limited to studies of social and cultural importance of the forest to both natives and others, forest dependent communities and other issues such as "co-management".

3. To coordinate NoFC's forest economics and sociology research activities in the region and provide committee participation to discuss provincial, regional and national research issues and opportunities.
4. To develop and provide supervision of economics research contracts generated through federal-provincial/territorial accords, the Green Plan and other such initiatives.
5. To promote and develop support and cooperation for the economics research project with other projects at NoFC, with universities and other external clients.

ii) Deliverables

Short Term (1-5 years)

1. To produce articles suitable for publication in scientific journals. Focus in the short term will be on papers in the area of ecological economics and the principal agent problem as it relates to forest tenure. Interdisciplinary studies will focus on armillaria root rot, western gall rust and pine regeneration and aspen competition.
2. A program in forest sociology will be developed.
3. To bring the project up to strength by covering off key areas in social science research as it relates to forestry. This will include investigators studying problems at the stand level, the forest level as well as studies in human dimensions and sociology.
4. To continue to develop contracts in areas when our internal strength is insufficient. In the short term this will include cost and benefit studies of forest management practices, studies of the importance of forestry to the region and the collection data on logging and silvicultural costs and investigations of prices for wood products. As this is contract work, it will be contingent on continued funding.
5. To establish stronger linkages with universities both inside and outside the region. To maintain and/or establish linkages with other projects at NoFC and with industry in the region. Within NoFC, a particular effort will be made to develop linkages with NOR-05 Fire Management research.

Long Term (5 years and beyond)

As NOR-06-01 is responsible for the coordination of economics research in the region, it is appropriate to address the long term focus for the project. In three years time, under the direction of the project leader, studies should exist in the areas of non-timber valuation, stand level economics, forest level planning and sociology. Each of these would be led by an A-Base professional. While areas of study would be dictated by the pressing issues of the day and by the particular skills and expertise of the incumbents, it is anticipated areas of focus will be the impact of forest management on non-timber values, costs and benefits of regeneration activities, the effect of non-timber values on forest level planning, native forest issues and forest dependent communities.

Economics research should be more closely linked to the other projects in the building. Nearly every study in the building has an economics component. Where the economics

component is significant, cooperation could ensure that data be collected that will allow for parallel economics studies of projects by NoFC economists or by contractors. Too often interest in the economics component is not expressed until after the fact and proper data is not in place.

The number of important problems for study will certainly exceed the capacity of the personnel in NOR-06. Therefore, strong linkages with the university community will be developed. Linkages in the form of summer student appointments, internships, joint research projects with academic personnel, contribution agreements, research associates, co-op students and post-doctoral fellows will be established. The development of this network will be dependent on the continuation of monies from Federal-Provincial agreements, Green Plan, etc. and a strong commitment to economics and sociology research by NoFC managers and district managers.

iii) Significant Linkages:

National Economics Research Working Group

NOR-06-02 Economic and social analyses of non-timber resources.

NOR-10 Mixedwood silviculture

NOR-11-05 Damage appraisal of major forest pests

NOR-11-09 Operational research studies into economically important tree diseases

NOR-11-11 ...western gall rust of hard pines in the Northwest Region

NOR-18-03 Increasing wood production through forest land drainage

NOR-42,44,46 Federal-Provincial Agreements

University of Alberta

University of Wisconsin

Mistik Management, Meadow Lake Saskatchewan

TAEM Consulting, Meadow Lake Saskatchewan

Weyerhaeuser, Prince Albert, Saskatchewan

Saskatchewan Environment and Resource Management

13. Progress and Achievements

Since its establishment in 1990, significant progress has been made in establishing NOR-6 as the centre of economics research at NoFC with internal and external clients. Linkages have been established with some NoFC scientists and cooperative studies are ongoing. A close working relationship has been established with the University of Alberta which has resulted in NOR-6 personnel teaching and cooperating in research activities and significant support being given to graduate students at the university. Areas of study have included stand level management problems, non-timber evaluation and an investigation of forest dependent communities.

14. Goals and Accomplishments: (1992-93)

1. *Develop project proposals and act as project authority for existing and developed contracts under PAIFs, Green Plan and other programs.*

The following projects are in place:

Alberta PAIF

Short Run Supply of Timber Quota Holders in Alberta - Marty Luckert University of Alberta (50-05)

Environmental and Financial Sustainability of Forest Management Practises - Frank Novak and Vic Adamowicz (50-03)

Post-Doctoral/Visiting Scholar Position in Forest Economics- Bill Phillips U of A ()

Forest Economics Graduate Support - Michelle Veeman University of Alberta ()

Economic Importance of Forest Sector in Alberta - TBA - (80-34)

Manitoba PAIF

Assessment Framework for Costs and Benefits of harvesting and regeneration Systems - Dan Needham U of A (50-02)

Saskatchewan PAIF

Costs and Benefits of Environmental Improvements on Forest Lands - U of A (50-01)

Green Plan

Economic Evaluation of Integrating Forestry and Wildlife Objectives Within the Boreal Forests of Saskatchewan - ESSA Ltd. (06-81)

2. *Carry out joint research with scientists including:*

- i) *Economics of Western Gall Rust (NOR 11-06)*

A literature review on economics and western gall rust was completed. Funding was obtained under the Manitoba PAIF but was returned as project overlapped with another. Under that project data is being obtained which cites level of disease incidence.

- ii) *Economics of Jack Pine budworm (NOR 11-05)*

Funding for collaborative work was unsuccessfully sought from both the Manitoba PAIF and Green Plan IPM initiative.

iii) *Economics of Peatland Drainage (NOR 28-03)*

A paper was prepared with Marilea Pattison and submitted to the Western Journal of Applied Forestry.

iv) *Pine Regeneration and Aspen Competition (NOR 10)*

Meetings were held with NOR-10 and a project outline was prepared. NOR-10 personnel did not have enough time to continue with this project so, it has been postponed.

v) *Vegetation Management (NOR 07)*

This project was not pursued.

vi) *Economically Important Tree Diseases (NOR 11-08)*

Funding was obtained from the Alberta PAIF (80-16) to study the Economic Impact of Armillaria Root Rot with Ken Mallett (NOR 11-09). A literature review is being prepared, field data has been collected and is being analyzed.

3. *Continue to meet with staff at U of Alberta and other universities in the region, NoFC scientists and industrial clients to identify current client priorities for forest economics research.*

Discussions were held with the Universities of Alberta, Regina and Manitoba; with NOR 11-09 and with scientists at PFC; with Weldwood, Mistik and Weyerhaeuser (P.A.). These discussions led directly to new initiatives being developed in the current fiscal year.

4. *Provide peer reviews and comments for journal articles, FORCAN reports and contract proposals as required by NOFC and act as associate editor of the Forestry Chronicle.*

Provided reviews for journal article submissions and project proposals as required. Continued to function as Associate Editor-Economics for the Forestry Chronicle and reviewed and arranged reviews for papers as necessary. With collaborators at the U of Alberta produced a project report containing the papers presented at the "Forestry and the Environment: Economic Perspectives Conference" held in Jasper in March of 1992. With same collaborators selected and edited papers and prepared forwards and introductions for a book of the same title to be published this year by Commonwealth Abstracts Bureau International.

5. *As an adjunct professor at the U of Alberta, Department of Rural Economy, provide teaching as required and otherwise maintain close relations with the department by serving on graduate thesis committees etc.*

Close relations with the university and its students have been maintained as evidenced by the number of cooperative projects in place. I continue to sit on the graduate committee of Dan Needham.

6. *Act as project leader for NOR-06 and NoFC representative on national, provincial and regional committees such as the FORCAN Economics Research Working Group, (ERWG) Green Plan Committees etc.*

Continued as project leader. I am heading up the initiative to bring a forest sociologist to NoFC. I am chairman of the FORCAN ERWG and have held a national meeting and performed other responsibilities as required.

7. *Provide advice, guidance and assistance to the Program Director Regional Development and the NoFC Management Committee.*

These duties were carried out as required.

15. Information Activities

i) Journal Publications

Adamowicz, W., W. White, W. Phillips. eds. 1993. *Forestry and the Environment: Economic Perspectives*. Commonwealth Abstracts Bureau International. Wallingford U.K.(In Press)

Arnott, J., W. White. 1992. *The Influence of Nursery Systems on Plantation Establishment in British Columbia*. Pages 56-66 in *Efficiency of Stand Establishment Operations*. Proceedings of a IUFRO Symposium held at Rotorua, N.Z. 11-15 September 1989. FRI Bulletin 156. IUFRO Subject Group S3.02-00.

ii) Information Reports

White, W. *Dynamic Programming: A Tool for Financial Analysis of Stand Management Regimes*. BC-X-???. Pacific Forestry Centre, Forestry Canada. Victoria, B.C. (In press)

iii) Other reports

University of Alberta, Dept. of Rural Economy. *Forestry and the Environment: Economic Perspectives*. Project Report. U of Alberta, Dept. of Rural Economy. Edmonton, Alberta.

Phillips, W.;White W. 1992. *Measures of Dependency and Policy Impacts of the Forest Industry on Rural Places in Proceedings of the ARRG Rural Economic Conference Stimulating Rural Economies for the 2000s*, Camrose Alberta 23-25 October, 1991. P Apedaile ed . ARRG Working Paper Series Number 2. Richard Rounds, Brandon University, ARRG Series Editor. The Canadian Agriculture and Rural Restructuring Group.

iv) Lectures, courses, seminars and scientific addresses

Gave presentations on economics under the Sask. PAIF at Sask. PAIF Program in P.A. in June.

v) Technology transfer:

Career Day Grace Martin Elementary School

Chaired Meetings in Regina and Saskatoon outlining the Forest Sociology Program to Saskatchewan industry, academic and government people.

16. Goals 1993-94

1. Develop project proposals and act as a project authority for existing and developed contracts under PAIFs, Green Plan and other programs.
2. Continue joint research with scientists including:
 - a) Economics of Western Gall Rust (NOR-11-06)
Pine Regeneration and Aspen Competition(NOR-10)
Economic Impact of Armillaria Root Rot(NOR-11-09)
 - b) Continue to act as project leader for NOR-06 and chair of the FORCAN Economics Research Working Group. In these roles, meet with university, industry and scientific clients to identify current priorities and encourage cooperation between disciplines and institutions. Initiate contact with fire project (NOR-5)
 - c) Initiate the Forest Sociology Study at NoFC through the retention of a Research Associate at the University of Alberta and the development of a study work plan. Investigate the development of an internship program with the University of Wisconsin.
 - d) Initiate studies on the "Principal-Agent Problem and Forest Resource Management", "Forestry and Ecological Economics" and investigate with Mistik Management their Interest in a Study on the "Economics of Hybrid Poplar in NW Sask."
3. Initiate planning for the conference Forestry and the Environment II.
4. As an adjunct professor at the U of Alberta, Dept. of Rural Economy, provide lectures as required and otherwise maintain close relations with the department by serving on graduate thesis committees etc.
5. Provide advice guidance and assistance to the Program Director Regional Development and the NoFC Management Committee.

17. Major Co-operators: SEE 12.

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: Jan. 13 1993

1. **STUDY TITLE:** Economic and Social Analyses of Non-Timber Resources
2. **Responsibility Centre:** Northwest Region (8151)
3. **Program:**Regional Development
4. **Project Title:** Forest Economics Research
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Edmonton, Hinton, Meadow Lake, Winnipeg
7. **Study Staff:**

	Name
Study Leader	P. Boxall
Team Members	D. Kuhnke
	B. McFarlane
	D. Watson
	K. Mcleod

8. **Study Key Words:** Forest economics, non-market valuation, integrated resource management, socioeconomic impact analysis, interdisciplinary research, forest recreation, preservation and non-use values, fish and wildlife, economics of sustainable development and biodiversity, cost-benefit analysis
9. **Study Activity:** 1334, 2224

10. Study Resources:Personnel Information

		1992-93	Fiscal Year 1993-94			1994-95
Employee Name	Category	Previous	Budget	Revised	Forecast	Upcoming
P. Boxall	ES-04 (P)	1.00	1.00	1.00		
D. Kuhnke	FO-02 (P)					
B. McFarlane	SI-01					
FTEs		1.00	1.00	1.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	5.64	10.00			
Capital	2.84	00.00			
G & C					
TOTAL:	8.48	10.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries: Man.	M8047		23.90			
O&M: Man. Sask.	M8047 S8087 S8060		36.40 7.00 13.00			
Capital: Man.	M8047		0.70			
G & C: Alta.	A5014		28.00			
TOTAL:			109.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Other</u>						
S&T Opp. Fund						
O&M	6.92	30.70	31.50			
Capital			3.00			
G & C						
TOTAL:		30.70	34.50			

STUDY TOTAL			153.50			
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11. Study Background and Problem Analysis

In the past, forestry development proceeded without formal consideration of the values associated with non-timber goods and services provided by forests. Recent forest industry developments and conflicts between interest groups in Canada and the U.S., however, have underscored the need for planning and management to incorporate non-timber values in decision-making; both at a local industry and broad provincial scale. The problem is that little is known about the magnitude of these values in relation to timber values, how to measure them, and how to incorporate them into ongoing forest management.

12. Study Objectives:

i) Objectives:

1. To provide high quality theoretical and applied research through individual studies as well as joint interdisciplinary studies with NoFC personnel, federal and provincial government staff, and academics from Canada and abroad. Primary study areas include the development and application of non-timber valuation methodologies in integrated resource management and environmental issues, and the general application of social and economic analyses in forestry.
2. To establish and coordinate FORCAN forest economics research activities relating to non-timber resources in the region, to provide guidance and expertise in support of understanding the role of non-timber resources and values in forest management, and represent the region and department in various committees to discuss provincial, regional, and national research issues and opportunities.
3. To provide supervision of economics research contracts generated through federal-provincial accords, the Green Plan and other such initiatives.

4. To promote the incorporation of economic analyses, particularly relating to non-timber values, in the activities of other FORCAN researchers.

ii) Deliverables

Short Term (1-5 years):

The emphasis in this study is on research, and products resulting from applied research in the social sciences will result. These consist of manuscripts suitable for publication in refereed journals, other reports, and software suitable for use by planners and foresters managing land bases or setting policies and priorities.

Specific short term deliverables will consist of specific methodologies, or refinements of existing ones, for use by forest managers and other resource management specialists such as recreation planners. Initially, this will relate to travel cost models; however, later in the five year period contingent valuation and similar survey related methodologies will be examined.

Long Term (5 years and beyond):

The goal is to establish this study as a leader in the consideration of non-timber values in forest resource management in Canada; particularly in terms of research into non-market valuation. Accordingly, the establishment of databases, methodologies, and decision support systems in the forest management area are long term products. The training and development of a cadre of professionals in this area is also an output to be achieved by this study.

iii) Significant Linkages:

(Region): Technology Development Unit (NOR-37), Manitoba D.O. (NOR-42), Saskatchewan D.O. (NOR-46), Forest Insect and Disease (NOR-11), Alberta Agreement (PAIF) (NOR-44).

(National): Canadian Wildlife Service (Socioeconomic Division), Statistics Canada (in Ottawa)

see also 17 (ii) for linkages with university research establishments

13. Progress and Achievements

New study in 1992-93

14. Goals and Accomplishments (1992-93)

1. *Develop project proposals and act as project authority for contracts developed under funding initiatives such as: Science and Technology Opportunities Fund, federal/provincial PAIF's, the Green Plan etc.*

Seven project proposals were developed for S&T Fund, Alberta PAIF, Manitoba PAIF, the Integrated Pest Management line of Green Plan, and the Finland/Canada M.O.U. All proposals generated funds and research activity except for the Manitoba PAIF and the M.O.U., where both are pending.

2. *Establish and contribute to joint research efforts with other economists involved in studying non-market valuation methodologies and their application to forest and environmental management.*

Linkages were established with Dr. W. Adamowicz at the University of Alberta, Dr. T Heberlein at the University of Wisconsin-Madison, and Dr. J. Englin at University of Nevada-Reno. In addition, cooperative efforts were established with Dr. J. Louviere, at the University of Utah, a world authority on the theories and methodologies of choice behaviour.

3. *Establish priorities for joint studies with University of Alberta, Department of Rural Economy, NoFC scientists, and other clients, and commence work on studies of highest priority.*

Study Leader was Project Officer or Authority for the following Alberta PAIF studies:

- Environmental and Financial Sustainability of Forest Management Practices (50-03; F. Novak and W. Adamowicz)
 - Marten Use of Habitat in Natural and Logged Areas (50-07; J. Beck)
 - Measurement of Non-Timber Values Using the Travel Cost Method (50-06; W. Adamowicz)
 - Evaluation and Incorporation of Non-Timber Goods and Services in IRM Decisions (50-04; W. Adamowicz)
 - Distribution and Abundance Patterns of Forest Songbirds in West Central Alberta (50-08; J. Beck)
 - Integration of spatial aspects of wildlife habitat supply planning with timber supply planning (50-14; J. Beck)
4. *With University of Alberta collaborators, submit articles on travel cost methodologies to refereed journals.*

One paper was prepared - Boxall, P.C., W.L. Adamowicz, and T. Graham-Tomasi. 1992. A nonparametric test of the traditional travel cost model. This paper was presented at the 1992 meeting of the Western Forest Economists Meeting in Wemme, Oregon. The paper was produced as a University of Alberta Staff Paper (92-07), and is being submitted to the journal *Land Economics*. Another manuscript is being completed on valuing lottery-rationed recreation using the travel cost model (Boxall, P.C. 1993. The economic value of lottery-rationed recreational hunting). This paper will be submitted to the *Journal of Agricultural and Resource Economics* in the new year.

This goal was considerably enhanced by the Science and Technology Opportunity Fund Grant obtained in May. A major research effort was initiated comparing the TCM, CVM, and a new method from the marketing literature called choice experiments or stated preference. A study of moose hunters is underway in which values are being estimated using these models. The linkages between moose hunting values and forestry impacts is a major portion of this investigation.

5. *Represent the three prairie provinces on the Federal-Provincial Committee overseeing the development, analysis, and publication of results from the National Survey on the Importance of Wildlife to Canadians.*

Two meetings were attended, one in Edmonton which was hosted by NoFC and the other in Ottawa. Considerable progress was made in devising strategies for publishing the 1991 results, and the provincial wildlife directors and human dimensions agency staff were contacted regarding the survey, data needs, and publications. Planning was undertaken for NoFC driven research projects involving the forestry-wildlife interface, and the next meeting was planned in conjunction with the 1993 IUGB Congress in Halifax. One report was produced during the year.

6. *Continue with cooperative research project on modelling site-choice behaviour by prairie anglers, investigate the application of the model to forested sites, publish project reports, submit journal articles if possible, and provide guidance to graduate students at the University of Alberta involved in the project.*

Preliminary data analysis was completed by graduate students and two theses (titles below) will result from this effort to date. One Project Report was completed, and another will follow in the new year. No progress was made with regard to journal articles, although discussion on future research endeavours and some results of interest to Tree Plan Canada have been outlined. This study involves examining new methods and directions in non-market valuation. Specific issues include the influence of site awareness on site choice and the actual economic analysis of a specific mitigation plan (Oldman River Dam) including no net loss principles was examined. Further research efforts with this database will be included in the travel cost model goal for 1993.

Theses:

D. Watson. 1993. An economic analysis of recreational fishing and environmental quality changes in the Upper Oldman River Basin. M.Sc. thesis, Dept. Rural Economy

T. Peters. 1993. A random utility travel cost model of recreational fishing. M.Sc. Thesis, Dept. of Rural Economy.

7. *Continue with research on the economic issues of wildlife habitat in Alberta.*

Two drafts of the consultant's report were seen and numerous comments and suggestions were made. To date, the final report has not been completed, although drafts are available. This project is behind schedule.

8. *Initiate, conduct and coordinate research on the social aspects of nonconsumptive utilization of wildlife, particularly as it relates to forestry. Submit a paper to a journal on behavioral aspects of birdwatching.*

Two data bases were obtained: the 1988 Alberta Christmas Bird Count Survey (CBC), the 1990 Alberta Watchable Wildlife Survey (WWS), and one other one was collected as part of a PhD thesis (BLM). These data were converted to SAS formats suitable for use at NoFC, and research projects were explored and initiated. The first project involved the CBC data base and examined the role of marketing in expanding recreational opportunities to a participant base. An article was prepared (Boxall, P.C.

and B. McFarlane. 1992. Human Dimensions of Christmas Bird Counts: Implications for the study and marketing of nonconsumptive wildlife recreation) which is currently under review for publication in the *Wildlife Society Bulletin*. Ongoing projects involving the WWS include: i) the construction of participation models of various types of nonconsumptive recreation incorporating some forestry variables as explanators; and ii) a segmentation analysis of the types of nonconsumptive use. The project on birdwatchers involves Bonnie McFarlane's graduate thesis. A segmentation analysis, based on birdwatching specialization, is being used to describe and explain differences in motivations for birding, attitudes to wildlife, preferences in the development and management of birdwatching sites, and involvement in wildlife conservation. An interim report highlighting preliminary data analysis and findings was prepared for the main funding agency - The Recreation Parks and Wildlife Foundation.

9. *As a Research Associate at the University of Alberta, provide guidance and expertise to staff and students in support of study goals and represent Forestry Canada as competent and willing cooperators in the conduct of effective research in support of forest management.*

An office was maintained on the campus; weekly meetings with students were attended; one departmental seminar was given; several classes in graduate courses were taught.

10. *Provide peer reviews and comments on journal articles, FORCAN reports and contract proposals as required by NoFC, and editors of various journals and periodicals.*

Articles were reviewed for the *Forestry Chronicle* and the *Canadian Journal of Agricultural Economics*. Other reviews and comments were made on PAIF proposals and others as required.

11. *Provide advice, guidance and assistance to Project Leader; ensure the Project is running smoothly during his absences, and provide supervision for technical and other research staff.*

Duties were performed in an acceptable manner as required.

12. *Participate in the Northwest Region's Integrated Resource Management Task Force.*

Attended three meetings of the Task Force and two meetings of the IRM TAC where presentations on research efforts were described and discussed. Drafted the IRM recommendations presented to the Management Committee at NoFC.

13. *Organized the preliminary investigations of adding a forest sociology study to the Economics Research Project.*

Invited Dr. Tom Heberlein, one of the foremost environmental sociologists in the world, to visit NoFC to meet with the Management Committee and NoFC staff. Organized two seminars, at NoFC and the University of Alberta, and conducted a tour of the central Alberta for Dr. Heberlein. This interaction led to further invitations to other sociologists, and to some possible stronger ties, both research and training oriented, between Dr. Heberlein's institution (University of Wisconsin-Madison) and NoFC.

15. Information Activities

i) Journal and other Refereed Publications:

Adamowicz, W.L., J. Asafu-Adjaye, P.C. Boxall, and W. E. Phillips. 1991. Components of the economic value of wildlife: An Alberta case study. *Canadian Field-Naturalist* 105(3):423-429.

Adamowicz, W.L. and P.C. Boxall. 1993. Economic aspects of hoofed mammals in Alberta. In: B. Stelfox (Editor), *The Hoofed Mammals of Alberta*. Lone Pine Press (in press).

iii) Other reports:

Boxall, P.C., W.L. Adamowicz, and T. Graham-Tomasi. 1992. A nonparametric test of the traditional travel cost model. Staff Paper 92-07, Department of Rural Economy, University of Alberta.

Filion, F.L., A. Jacquemot, P.C. Boxall, R. Reid, P. Bouchard, E. DuWors, and P.A. Gray. 1992. The importance of wildlife to Canadians in 1987: Trends in wildlife recreation to 2006. Canadian Wildlife Service, Environment Canada.

McFarlane, B.L. 1992. Involvement in nonconsumptive wildlife recreation. Interim Report to the Recreation, Parks and Wildlife Foundation.

iv) Lectures, courses, seminars and scientific addresses:

Lectures to Graduate Students:

- Revealed Preference Theory to Ag Ec. 502, Department of Rural Economy
- The World of a Working Economist to Ag Ec. 565, Department of Rural Economy

Seminars and Presented Papers:

Departmental Seminar - Nonparametric Tests of the Traditional Travel Cost Model of Recreation Demand, presented at Department of Rural Economy

Paper presented at Western Association of Forest Economists' Meeting at Wemme, Oregon - A Nonparametric Test of the Traditional Travel Cost Model

Paper presented at Canadian Association of Forest Economists' Meeting at Stanhope, P.E.I. - Non-timber Values in a Private Woodlot Context

Study Leader was Chairman of the Non-Market Valuation and the Time Preference sessions at the conference: Forestry and the Environment: Economic Perspectives held in March at Jasper, Alberta.

v) Technology transfer:

Provided consultation services to:

1. The Watchable Wildlife Program on results of nonconsumptive wildlife recreation to assist in development of their strategic plan.
2. Alberta Tourism, where participation on a Steering Committee responsible for Eco-Tourism Management Plans where prepared.
3. Alberta Fish and Wildlife Division, East Slopes Region, where focus groups consisting of moose hunters were conducted, and opinions on hunting regulations and forestry practices were collected as part of another study.
4. Saskatchewan Parks and Renewable Resources staff on pricing and revenue models for resource licensing, and also to the Director of Wildlife on socioeconomic data usage and requirements.

16. Goals 1993-94

1. Continue with research efforts into the travel cost method (TCM), focusing on the linkages between non-market economic values and the management and condition of forests in the Northwest Region. Individual projects include:
 - i) Investigation of the validity of the TCM by evaluating the ability of the model to derive values similar to those using other economic valuation methods, such as the contingent valuation method and choice experiments. (Boxall, McFarlane, Kuhnke)
 - ii) Examining the consistency of some commonly used forms of the TCM with economic theory using nonparametric demand theory. (Boxall)
 - iii) Development of TCM's that can be used to estimate non-market values of lottery-rationed goods and services such as hunting permits for forest dwelling ungulates. (Boxall)
 - iv) Compare recreationists' perception of forest recreation site attributes with their revealed preferences for attributes using the TCM framework. (Boxall)

These projects are expected to be responsible for the preparation of at least four manuscripts suitable for publication in refereed journals.

2. Conduct research into the effects of environmental quality changes on non-market economic values. Construct a Decision Support System to illustrate how various environmental and resource changes affect economic values for moose hunting. (Boxall)
3. Continue representing the three prairie provinces on the Federal-Provincial Committee overseeing the analysis and reporting of results from the 1991 National Survey on the Importance of Wildlife to Canadians. Specific activities and achievements will include:
 - i) The exploration of forestry database linkages with the survey databases. (Kuhnke)

- ii) Establishment of a regional database using the 1981, 1987 and 1991 survey results. (Boxall, McFarlane)
 - iii) Continue to lead the provincial representation contingent in reworking the reports and publications to more accurately reflect provincial needs. Produce the first report from the 1991 survey during the year. (Boxall, McFarlane)
4. Continue to explore existing databases for information that contributes to the understanding of the nonconsumptive utilization of wildlife resources. Specific activities and products will include:
- i) The preparation of manuscripts on: market segmentation of nonconsumptive wildlife recreationists (McFarlane), the estimation of demand for nonconsumptive use (McFarlane, Boxall), and models of participation in nonconsumptive use incorporating forestry variables (Boxall, Kuhnke).
 - ii) The preparation of a research proposal to investigate forestry-nonconsumptive wildlife recreation interactions on a local level (i.e. model forest). (McFarlane)
 - iii) Data analysis and report preparation on birdwatchers' recreational preferences. (McFarlane)
5. Continue with applied economic research efforts funded under the Federal-Provincial P.A.I.F.'s. These include the relationships between economic values and forestry for: big game hunting in northwestern Saskatchewan, woodland caribou, and recreational canoeing in Nopiming Park, Manitoba. (Boxall, McFarlane, Kuhnke)
6. Continue exploring and establishing linkages with scientists at NoFC, focusing on non-timber resource relationships. Complete an information report on forest pests and impacts on forest recreation economic values. (D. Watson)
7. Confirm NOR 6-02 as one of the leading socioeconomic research programs in natural resource management in Canada by:
- i) Having Study Leader serve as President of the Human Dimensions in Wildlife Study Group, and broadening and establishing its role as the leading organization for international applied socioeconomic researchers in forestry, fisheries, and wildlife management.
 - ii) Having Study Leader serve as Co-Chairman (North America) at the Socioeconomic Session of the 1993 International Union of Game Biologists; Congress in Halifax.
 - iii) Strengthening existing relationships and establishing new ones with researchers and institutions in the United States and Canada.
 - iv) Under the Canada-Finland Forestry Memorandum of Understanding, submit a research proposal in conjunction with colleagues at the University of Wisconsin-Madison. If proposal is successful, establish joint research efforts with researchers in Finland on forestry and wildlife recreation linkages.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Northwest		Project Leader	Dr. J. Volney

ii) External -

Establishment	ID#	Title	Contact name
University of Alberta		Associate Professor	Dr. W.L. Adamowicz
Alberta Fish and Wildlife Division			H. Stelfox, K. Smith, M. Melnyk
Sask.Parks and Renewable Resources			B. Smith, B. Crouter
Canadian Wildlife Service		Chief, Socioeconomic Division	F. L. Fillion
University of Nevada - Reno		Associate Professor	Dr. J. Englin
University of Wisconsin - Madison		Professor and Department Chairman	Dr. T. Heberlein

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Environmental Stresses on Forest Ecosystems
2. Responsibility Centre: Northwest Region (8135)
3. Activity: 2212, 2251, 2233, 2211, 2316
4. Program: Forest Protection and Environment
5. Status: Continuing
6. Last Evaluation: January 10, 1993
7. Next Evaluation:

B. KEYWORDS:

018 Air pollution/LRTAP
 019 Environmental impacts
 020 Ecology/ecosystems
 065 Increased Prediction/Preparation
 100 Green Plan
 219 Environmental Assessment
 221 Non-targets
 239 Biomonitoring
 305 Nutrient Cycle
 439 Herbicides
 720 ARNEWS

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	10.01	9.41	9.80	0.00	0.00
Salaries	\$523.9	\$503.5	\$523.3	\$0.0	\$0.0
O & M	\$85.2	\$42.0	\$96.5	\$0.0	\$0.0
Capital	\$67.8	\$44.0	\$15.7	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$676.9	\$589.5	\$635.5	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS:

The potential impact on forest ecosystems (including forest aquatic ecosystems) from forest related activities (eg harvesting and site preparation), air pollution, climate change, recreational and other uses is of increasing concern to government, industry and the public. We have limited knowledge on the impacts of these disturbances upon the structure and processes of forest ecosystems in the NWR. Without a basic understanding of how forest ecosystems function and change over time and space, it is difficult to assess the effects of stresses, such as forest management practices and air pollutants on the sustainability of the ecosystem. The studies of NOR 7 are all related to assessing various disturbances on the forest ecosystems of the NWR. These include: impacts of acid deposition on forest ecosystems, (a specific study near point sources and the national ARNEWS program), the fate of herbicides (and residues); and the impact of herbicides on plant communities and soil nutrient dynamics; and the impact of forestry management practices on soils, plant communities and forest aquatic ecosystems. As support to the other programs within the NWR regarding environmental issues, NOR 7 also provides environmental screening reviews and analytical laboratory services.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan. The in-house screening of the studies Nor 0701, 0704, 0705 and 0706 was redone in January 1993. Studies 0707 and 0708 were new and in-house reviews were also done in January 1993. Study 0709 is the in-house screening and EARP screening study.

2. Collaborators/Green Plan Resource Summer

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u>	<u>Upcoming</u>	<u>Planning 1</u>
			\$000s		
Primary Total	78.76	23.34			
Green Plan	55.28	61.51			

3. Collaborators:

Primary

Husky Oil Ltd. and Gulf Canada Resources Limited have provided funding to Study 0701 of \$75.0 K for 1991-92, \$ 75.0 K for 1992-93 and \$ 10.0 k for 1993-94 to carry out a forest health survey in west central Alberta.

Secondary

Bob Wilson from Saskatchewan Parks and Recreation, Meadow Lake Provincial Park will provide in-kind support for the set up of a baseline ecological site in Meadow Lake Provincial Park.

Bill Rugg, Weldwood, Hinton Division and Roger Hayward, Foothills Model Forest are providing in-kind support for the Green Plan Forestry Practices initiative.

4. Green Plan:

The major objectives of NOR 7 are directly linked to Green Plan initiatives. The impacts of acid deposition on forest ecosystems, both the specific forest health survey and the ARNEWS monitoring are activities associated with the Green Plan biomonitoring/forest health initiative. The impact of forest management practices on soils, plant communities and forest aquatic ecosystems are directly linked to the enhanced Science & Technology section of the Green Plan Forestry Practices initiative. These objectives are also directly linked to the Model Forest initiative of the Green Plan. The hazard rating of soils for Armillaria root rot is directly linked to the Integrated Pest Management, Seed Orchard initiative of the Green Plan.

5. Milestones:

1. Complete the forest health survey near two sour gas processing plants in west central Alberta and prepare an Information Report on the results. (in collaboration with NOR 11-05 and 11-09).
2. Prepare and submit for review a draft report on the comparison of the baseline soil and foliage chemistry of the Northwest Region ARNEWS sites.
3. Complete the vegetation analysis of the herbicide plots from near Grande Prairie, Alberta. Prepare and publish 1 journal article and 1 report on hexazinone impacts on vegetation.
4. Present an invited paper at the International Air & Waste Management Association Annual Meeting in Denver June 13-18, 1993 (in collaboration with NOR 11-05 and 11-09, K.I. Mallett and W.J.A. Volney).
5. Complete a publication related to the effect of hexazinone on soil nutrient dynamics.
6. Complete the field and greenhouse studies on the relationship of nutrient stress and Armillaria root rot. Prepare a paper for review on the effects of nutrients on the incidence of armillaria infection (in cooperation with NOR 11-09, K.I. Mallett).
7. Provide quality analytical services for soil, plant, and water samples to various research scientists and cooperators as requested by doing analyses, maintaining quality control through participation in check sample programs, participating in various laboratory organizations and publishing methodology information.

8. Continue to measure soil and vegetation conditions at two baseline locations in Meadow Lake Provincial Park and in the Foothills Model Forest. Coordinate with cooperators for the harvesting of the plots at both sites. (in cooperation with Nor 0201, I. Corns)
 9. Install, activate and maintain integrated stream gauge/water sampling systems on two creeks in northern Alberta, Rocky and Bridlebit Creeks. Collect and analyze water samples for chemical content and dissolved organic carbon (DOC)
 10. Provide environmental impact assessment work by reviewing projects for environmental implications through NoFC's Environmental Screening Committee; represent NoFC on various regional and national impact assessment committees and provide specialist knowledge on request to other federal departments conducting environmental impact assessments.
6. Accomplishments:
1. The forest health survey of the mature and young stands was completed. The tree growth analysis, incidence of pests and chemical analysis was completed. A final report to industry (as an Information Report) is being prepared. (in collaboration with NOR 11-05 and 11-09, W.J.A. Volney and K.I. Mallett).
 2. An outline of this report was prepared but further progress was not made. Delays have occurred in completing the initial baseline report due to the resignation of the second author. The baseline report has been reviewed, edited and the tables and figure prepared. Completion of the report awaits corrections from the second author.
 3. Two journal articles on the fate of hexazinone and its metabolites in soils were accepted for publication. The residue analysis of soil and foliage samples collected up to 1992 has been completed.
 4. A paper on the environmental impacts of hexazinone was presented at the International Symposium on Forest Vegetation Management in Auburn in May of 1992. A review article has been submitted for review to the symposium proceedings.
 5. One paper on the effects of hexazinone on decomposition and mineralization has been accepted for publication in the Canadian Journal of Soil Science. The second paper is still in preparation.
 6. The initial greenhouse study has been completed. A poster on the preliminary results was presented at the American Phytopathological Annual Meeting in Portland, OR, August 1992. A paper is currently being prepared (in collaboration with K.I. Mallett, NOR 11-09).
 7. The analytical services laboratory completed about 25,000 analyses on 2,000 samples. The lab continued to produce high quality analysis as indicated by the results of a national check sample program. In addition, the lab has contributed papers to a national soils method manual, an International symposium on soil and plant testing

and taken a lead role in various lab organizations including Forestry Canada's analytical laboratory working group.

8. Two sites were established, one in Meadow Lake Provincial Park and the other in the Foothills Model Forest near Edson, AB. A detailed plan has been prepared for submission to the Green Plan Forestry Practices Initiative and a proposal has been submitted to the Foothills Model Forest Project Steering Committee. A detailed plan outlining the Meadow Lake study is being prepared.
 9. The initial site on the ALPAC-FMA was not suitable and a second site in the Spring Creek Watershed on Daishowa's FMA was selected. The water quality study will be conducted on this area in cooperation with Daishowa Canada, Alberta Environment and officials of the Peace River and Grande Prairie Forests.
 10. Proposals under the Climate change project and the first year operating plans for the three Model Forests within the NWR were reviewed by the NoFC's environmental screening committee. Five uranium mines proposals in northern Saskatchewan undergoing panel reviews were assessed and commented on. Forty-five applications were reviewed and screened for environmental implications by the Environmental Partners' Fund during 1992-93.
7. Link to Strategic Plan:

National and Regional/Institute:

The forest health survey and hazard rating of soils for Armillaria root rot are linked to the National Strategic Plan key initiative to increase our capacity to predict and prepare for consequences of human activities and natural disturbances (Increased prediction). The fate and impact of herbicides in forest ecosystems supports the environmental quality initiative of the National Strategic Plan and has indirect support for the Regional Strategic Plan under mixedwood management, including ecological impacts and vegetation management. The impacts of forest management practices on soils, plant communities and forest aquatic ecosystems all support the National Strategic Plan under forest environmental quality and the Regional Strategic Plan new initiative on integrated resource management.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 12, 1993

1. **STUDY TITLE:** Environmental impact assessment in relation to forest ecosystems
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection & Environment
4. **Project Title:** Environmental Stresses on Forest Ecosystems
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Region wide, emphasis on Alberta
7. **Study Staff:**

	Name
Study Leader	D.G. Maynard
Team Members	F.G. Radford
	J.J. Stadt
	C. Olive

8. **Study Key Words:** acid rain, advisory, ARNEWS, ICP-AES, forest health survey, bio-monitoring, reduction of forest losses, LRTAP, Armillaria
9. **Study Activity:** 2212

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
D.G. Maynard	SE-RES-2 (P)	0.30	0.30	0.30		
F.G. Radford	EG-6 (T)	0.60	0.60	0.60		
J.J. Stadt	BI-1 (T)					
FTEs		0.90	0.90	0.90		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	7.94	7.00			
Capital	22.09				
G & C					
TOTAL:	30.03	7.00			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries: Alta.	A8019	See NOR 11-09				
O&M: Alta.	A8019	See NOR 11-09				
Capital						
G & C						
TOTAL:						

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Other</u>						
Suspense - Husky Gulf						
O&M						
Capital						
G & C						
TOTAL:		78.76	23.34			

STUDY TOTAL		108.79	30.34			
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11. Study Background and Problem Analysis

Industrial development and emissions have potentially deleterious effects on forest vegetation and soils. Several studies were completed within the Prairie region that looked at potential problems. Expert advice on the effects of air pollutants, northern development and forestry operations to forest ecosystems is required to answer specific concerns in relationship to potential environmental impacts within the region. In addition, potential effects of acid deposition on forest ecosystems could go unnoticed until considerable damage to the forest has occurred. Maintaining an advisory role and carrying out all aspects of the chemical analyses of soil and plant materials in the Acid Rain National Early Warning System (ARNEWS) is essential to assure that any possible effects of acid deposition on the forest are detected. High quality analysis in a reasonable time is often required for this study and other studies within NoFC. Therefore, it is important for ICP-AES to be maintained with a minimum of down time.

Concerns have again been raised about the present and potential impacts on forest health due to sulfur emissions from sour gas processing plants in west central Alberta. These impacts include the direct effects of deposition in forest stands, including soils, and the predisposing effects these depositions may have on exacerbating latent forest insect and disease problems. A study was initiated in 1991-92, (in cooperation with the natural gas industry) that reexamined the existing sites sampled previously in 1981 and 1985, expanded the network, and completed a forest health survey (in collaboration with NOR 11). This is a multidisciplinary approach that will provide a more accurate assessment of sulfur emission impacts on the health of the forest ecosystem which could be used to improve methodologies and ARNEWS protocols.

Soil factors may play a role in the incidence of certain diseases particularly, root rots. Armillaria root rot is one of the most important diseases of coniferous regeneration in Canada. Different soils based on site productivity have been found to have variable incidence of Armillaria root rot; however, the soil properties (if any) associated with conduciveness or suppression of the disease have not been identified. It would be desirable

from a forest management perspective to be able to hazard rate sites for Armillaria root rot before regeneration takes place.

12. Study Objectives:

i) Objectives

1. Determine the impact of air pollutants on the forests of the Northwest Region by: assessing the effects of sulfur deposition on the forest ecosystem near two sour gas processing plants in west central Alberta (in collaboration with J. Volney, NOR 11-05, and K. Mallett, NOR 11-09) and the monitoring of ARNEWS plots (in collaboration with NOR 11-01, FIDS).
2. To determine the relationship between nutrient stress and Armillaria root rot in lodgepole pine (in collaboration with K. Mallett, NOR 11-09).
3. Provide consultative and advisory services to government agencies, industry and the public on environmental concerns in relationship to acid deposition (air pollution), herbicides, and northern development.

ii) Deliverables

Short Term (1-5 years)

A information report on the results of the forest health survey near the two sour gas processing plants must be submitted to industry by June 1993. In addition, several journal publications on the various aspect of the study will be written in the next one (1) to three (3) years.

Consultative and advisory services on environmental problems are provided as required. This is ongoing and will continue both in the short- and long-term.

The baseline ARNEWS report is being edited and is expected to be published within the next six (6) months. A second report comparing the initial baseline data with data collected five (5) years later will be published within the next two years. An additional six (6) ARNEWS sites are to be established and sampled in the next year including one in the Foothills Model Forest. Annual forest health surveys (done by NOR 11 FIDS staff) are to continue and a detailed sampling is scheduled for 1995.

Two journal articles are planned on the interaction of soil properties and Armillaria root rot (in collaboration with K.I. Mallet, NOR 11-09). A forest management field guide based on the study findings is scheduled for completion at the end of the current Alberta PAIF in 1994-95.

Long Term (5 years and beyond)

The industry contract will end in the fiscal year 1993-94 and further industry support is not anticipated. Consultative and advisory services on air pollution will continue to be provided as long as the expertise remains. The ARNEWS is a national program

to last about 50 years. Annual surveys are to be done and every 5 years a detailed soil and foliar chemical analysis will be done. A report detailing the results of the chemical analysis and comparisons to previous samplings will be written.

iii) Significant Linkages:

ARNEWS - Green Plan Biomonitoring initiative

Seed orchard - Green Plan Integrated Pest Management initiative

Alberta PAIF

NOR 11 - Studies 11-01, 11-05, and 11-09

National Strategic Plan to increase our capability to predict and prepare for the consequences of human activities and natural disturbances.

13. Progress and Achievements

The information report on the baseline ARNEWS chemical and vegetation analysis for the Northwest region has been reviewed and edited. It is currently being revised and is scheduled for publication in the next six (6) months. The resampling and analysis from the 12 ARNEWS sites has been completed and an outline for a second report comparing the baseline chemical data with the data collected five (5) years after will be prepared. Under the biomonitoring Green Plan section (in cooperation with NOR 11) five (5) additional ARNEWS were selected and set up; two are in Alberta, two in the Northwest Territories and one in Saskatchewan. A sixth plot will be established when additional funding under the Green Plan biomonitoring initiative is provided. Detailed soil and chemical sampling was postponed due to lack of funding but is scheduled for 1993-94.

The forest health survey study was initiated in 1991-92 with financial support provided by Husky Oil Ltd, and Gulf Canada Resources Limited. The study is for 3 years and includes resampling of sites, initially sampled in 1981, near two sour gas processing plants of west central Alberta. In addition, 5 more sites were set up in mature lodgepole pine. A detailed forest health survey including tree growth analysis (in cooperation with J. Volney, NOR 1105, and K. Mallett, NOR 1109) was done. The analysis of the data collected and chemical analysis of the soils and foliage is on-going. An interim report was prepared and submitted to the companies in March 1992. Sampling of 6 young lodgepole stands and 3 mature aspen stands was done during 1992. Laboratory analysis will be completed by fiscal year end and the final report is scheduled for completion in June 1993.

Consultative and advising services are on-going. Requests from private citizens have increased as a result of increasing environmental awareness.

14. Goals and Accomplishments (1992-93)

1. *Continue the forest health survey study near two sour gas processing plants of west central Alberta. This includes chemical analysis of soils and foliage, forest health survey of six (6) young stands, and collation of tree growth analysis data (in collaboration with K. Mallett and J. Volney, NOR 1105 and 1109).*

The forest health survey of the mature and young stands was completed. The tree growth analysis of the young trees has been completed and the chemical analysis of

the soils and foliage will be completed by the end of March 1993. The initial results found aspen was the most sensitive tree species to soil acidification. In order to assess this, an additional three (3) plots were established in aspen stands, two in elemental S contaminated areas and one remote location.

2. *Prepare a report on the results of the forest health survey near two sour gas processing plants in west central Alberta. The final report is to be submitted to industry no later than June, 1993 (in collaboration with K. Mallett and J. Volney, NOR 11-05 and 11-09).*

A interim progress report was submitted to Husky Oil and Gulf Canada in March 1992. A poster based on this report was presented at the Canadian Society of Soil Science Annual Meeting August 8-15, 1992 in Edmonton, Alberta.

3. *Prepare a draft report on the comparison of the baseline soil and foliage chemistry of the Northwest Region ARNEWS sites to the data collected in 1990.*

An outline of this report was prepared but further progress was not made. Delays have occurred in completing the initial baseline report due to the resignation of the second author from Forestry Canada. The baseline report has been reviewed, edited and the tables and figures prepared. Completion of the report awaits corrections from the second author.

4. *Initiate the soil and foliage chemical analysis of the six (6) new ARNEWS sites located in the NWR. The samples are to be collected by NOR 11 staff (Study 11-01); some assistance by NOR 7 staff may be required to familiarize them with sampling protocol.*

This goal was postponed due to funding cuts in the Green Plan Biomonitoring initiative. Funding for the sampling and analysis was originally reprofiled for 1993-94 but it has not been confirmed.

5. *Maintain the ICP-AES by preventative maintenance checks and quality control measures. (Radford)*

The ICP-AES was maintained with very little down time. A preventative maintenance check was completed in June. The majority of the samples analyzed were from NoFC associated projects related to the impact of forestry practices on forest ecosystem and the forest health survey. Approximately 30,000 analysis will be run on the ICP-AES during 1992-93 including 12, 000 for the Analytical Services Laboratory.

6. *Provide consultative and advisory services and undertake studies to resolve problems related to industrial development in natural areas as needs and opportunities arise in consultation with the Program Director. Attend workshops and symposia.*

Concern over environmental issues continues to be relatively high. Information and consultative services were provided to Alberta Environment and Alberta Forest Service with respect to potential air pollutant damage near several point sources including the Windfall sour gas processing plant near Whitecourt and the Fort MacMurray tar sands. The problem in the Whitecourt area involved considerable time including meeting with Alberta Environment and AFS and preparation of a file report (in cooperation with K.I. Mallett, NOR 11-09). Analyses of soils and foliage were done

in response to requests from the Alberta Forest Service. Requests for information were also received on the environmental impacts of forestry practices on soils and vegetation.

15. Information Activities

iii) Other reports

Maynard, D.G. 1992. An investigation into tree damage in the Whitecourt Forest. Supplemental Analysis to File Report NOR 1109-03 (K.I. Mallett).

Stadt, J.J.; D.G. Maynard; K.I. Mallett; W.J.A. Volney. 1992. Interim report on biomonitoring and forest health assessments near two sour gas processing plants.

iv) Lectures, courses, seminars and scientific addresses

Maynard, D.G.; J.J. Stadt; K.I. Mallett; W.J.A. Volney. 1992. A comparison of sulfur impacted and non-impacted lodgepole pine stands in west central Alberta. Can. J. Soil Sci. 72: 327 (abstract only, presented as a poster at the Can. Soc. Soil Sci Annual Meeting August 8-13, 1992, Edmonton, Alberta).

v) Technology transfer:

16. Goals 1993-94

1. Prepare a final report (information report) on the forest health survey near two sour gas processing plants in west central Alberta. The report is to be submitted to industry by June, 1993 (in collaboration with K.I. Mallett and W.J.A. Volney, NOR 1105 and 1109).
2. Prepare and submit for review a draft report on the comparison of the baseline soil and foliage chemistry of the Northwest Region ARNEWS sites to the data collected in 1990.
3. Initiate the soil and foliage chemical analysis of the six (6) new ARNEWS sites located in the NWR. The samples are to be collected by NOR 11 FIDS staff (Study 1101); some assistance by NOR 7 staff may be required to familiarize them with sampling protocol.
4. Maintain the ICP-AES by preventative maintenance checks and quality control measures. (Radford)
5. Invited to present a paper at the Air & Waste Management Association Annual Meeting in Denver June 13-18, 1993 (in collaboration with K.I. Mallett and W.J.A. Volney, NOR 11-05 and 11-09) (subject to conference approval).
6. Publish a paper entitled "The effect of hexazinone (Velpar) on the mineralization of N, P, and S from aspen litter". (transferred from NOR 07-05)

7. Prepare a paper on the "Soil nutrient dynamics following a hexazinone application" from the microplots in Grande Prairie. (transferred from NOR 07-05)
8. Complete a paper on the effect of soil nutrients on the incidence of Armillaria infection (in collaboration with K.I. Mallett, 1109). (transferred from NOR 07-05)
9. Complete the root rot field surveys and greenhouse studies on the correlation of soil properties and soil moisture on the incidence and mortality of Armillaria root rot in conifer stands. (in collaboration with K.I. Mallett, 1109)(transferred from NOR 07-05)
10. Provide consultative and advisory services and undertake studies to resolve problems related to industrial development in natural areas as needs and opportunities arise in consultation with the Program Director. Attend workshops and symposia.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Pacific & Yukon	ARNEWS	FIDS	A. Van Sickle

ii) External -

Establishment	ID#	Title	Contact name
Husky Oil Limited		Environmental Affairs	Mr. David McCoy
Gulf Canada Resources Ltd.		Environmental Affairs	Mr. Bernie Patterson

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The forest health and root rot surveys involved visual monitoring of the tree health, collection of soils and foliage for chemical analysis and the removal of two trees per site. No physical, chemical or biological agents were applied in this study. This would have no adverse environmental effects. The ICP-AES and analytical services laboratories follow current safety practices with respect to the Workplace Material Information System (WHMIS) and Hazardous waste disposal.

ii) FC-NWR EARP Committee Approval Date: December 21, 1992.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 12, 1993

1. **STUDY TITLE:** Environmental impact and chemistry of forestry herbicides
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection and Environment
4. **Project Title:** Environmental Stresses on Forest Ecosystems
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	S. Sidhu
Study Leader	J. Feng
Study Leader	C. Feng
Team Members	L. Lywak
	S. Roadhouse
	S. Raven
	L. Pham
	T. Oishi

8. **Study Key Words:** Herbicides, metabolites, persistence, degradation, adsorption, desorption, residue chemistry, environmental impact, forest ecosystem, site preparation, vegetation management.
9. **Study Activity:** 2212

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
S. Sidhu	SE-RES-4 (P)	0.30	0.30	0.30		
J. Feng	SE-RES-2 (P)	0.30	0.30	0.20		
C. Feng	CH-2 (P)	0.40	0.40	0.30		
M. Fairbarns	EG-6 (T)	0.00				
S. Roadhouse	EG-2 COSEP					
L. Lywak	EG-3 (T)	0.20	0.20	0.20		
S. Raven	PSC-EE					
L. Pham	PSC-EE COSEP					
T. Oishi	PSC-EE					
M. Vitt	COSEP					
FTEs		1.20	1.20	1.00		

Financial Resources (\$000s)

A-base	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
Salaries	0.00	0.00			
O&M	7.28	1.00			
TOTAL:	7.28	1.00			

Agreements	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
O&M: Alta.	A8013	0.00	20.00			
TOTAL:	A8013	0.00	20.00			

STUDY TOTAL		21.00				
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11. Study Background and Problem Analysis

Herbicides, as well as nonchemical methods of weed control such as site scarification, prescribed burning, mechanical and manual treatments provide a wide range of options for forest vegetation management. Even though the effectiveness of herbicides for control of weed species in forestry has been recognized since the introduction of the phenoxy herbicides, their use in forestry has lagged far behind that of agriculture. At present, forestry use of herbicides in Canada is less than 0.5% of the total used in agriculture. The limitation in the use of herbicides as a silvicultural tool is to some extent a result of the lack of information available on the environmental effects of these compounds in the natural environment. While various herbicides have been tested by Forestry Canada over the last several decades, herbicide studies have never constituted a top priority in forest management research activities. In addition, the agrochemical industry has never had a research and development program of any duration for forestry use of herbicides in Canada.

Currently, the Forest Pest Management Institute (FPMI) of Forestry Canada, as a National Institute, has the mandate to conduct herbicide research for forest resource management in Canada. The aims of FPMI's Herbicide Research Project are to accelerate the development of new herbicides, to refine and improve methods of utilizing existing products, and to improve application technology and formulation characteristics to enhance effectiveness of the herbicides while minimizing the impact on the forest ecosystem.

At the time the study was initiated, one of the major areas of concern, with significant data gaps, was the fate of herbicides entering the forest ecosystem. Available information on residue chemistry and environmental impact of forest herbicides under Canadian climatic conditions, particularly in the boreal forest, was very limited. Therefore, NoFC proposed to carry out research, relevant to the Western and Northern Region, on the persistence, mobility, degradation, and fate of forest herbicides and their metabolites in the terrestrial environment. In addition, attempts were made to assess the impact of herbicide application on the plant community as a whole to evaluate the influence of this silvicultural practice on plant community structure and forest productivity. These studies were considered essential if sufficient information is to be generated to make informed decisions regarding the use of herbicides in this region.

In order to avoid fragmentation of environmental impact and residue research studies, NoFC will ensure that the data collected is available to FPMI, provincial governments, and the public. Also, the information obtained from this study will be integrated into vegetation management guidelines/prescriptions to be developed through a parallel study on "Field Testing and Evaluation of Forestry Herbicides" in NOR-10. Initially, three major herbicides, namely Roundup, Velpar, and Garlon, will be considered for study.

12. Study Objectives:

i) Objectives

1. Determine the fate of herbicides in the forest ecosystems, by studying persistence, leaching, lateral movement, degradation, metabolism, and adsorption/desorption characteristics in regionally important forestry substrates under laboratory and field conditions.

2. Evaluate the impact of herbicides on the structure, composition, and dynamics of forest plant communities, including mycorrhizal aspects.
3. Provide federal, provincial, and industrial resource managers in the region with advice on the environmental effects of the use of herbicides in forestry applications.

The study supports the "environmental quality" initiative of the Forestry Canada's National Strategic Plan by providing environmental impact information for the integrated forest management systems while maintaining the forest environmental quality; supports the "Regional Research Priority" under mixedwood management, including ecology and vegetation control; and develops environmentally friendly forestry practices for sustainable forestry under the Green Plan.

ii) Deliverables

Short Term (1-5 years): Study has already resulted in a number of PAIF-reports, journal papers and presentations at workshops, symposia and technical abstracts documenting environmental impacts of hexazinone and selected mechanical methods of vegetation control for site preparations.

Long Term (5 years and beyond): A report evaluating the efficacy and environmental impact of Pronone 10G and selected mechanical methods of vegetation management beyond 5 years after application of treatments will be prepared in 1995-96.

iii) Significant Linkages:

Alberta Forest Service: Grande Prairie Forest; Reforestation & Reclamation Branch;
 Research Branch (terminated in 1990)
 Alberta Environment, Chemical Control Branch
 Weyerhaeuser Canada Ltd. (formerly Procter & Gamble Cellulose, Grande Prairie)
 DuPont Canada; United Agriproducts; and Pro-Serve, Inc.
 Expert Committee on Weeds, Western Canada Section
 CAPCO-National Check Sample Program
 Forest Pest Management Institute
 University of Toronto, Forestry Science
 University of Alberta: Forest Science; Soil Science

13. Progress and Achievements

The Herbicide Environmental Impact Study has progressed well during the last 6 years. Several new herbicide application systems were evaluated for drift control or for reducing the amount of herbicide used in research trials. Vegetation, forest litter, soil, soil leachate, water, and sediment samples have been collected for the last 6 years after the herbicide application in the fall, 1986. Residues of hexazinone and its metabolites were analyzed for all samples collected during and before 1992. New methodologies for determining the hexazinone residues in soil and vegetation were developed.

A total of 12 journal papers, two government reports, one review, abstracts, 29 Expert Committee on Weeds (ECW) research reports resulted from the Grande Prairie study, and

one review paper (proceedings) on the environmental behavior and safety of forestry herbicides (glyphosate and hexazinone) in Canada. The information in these publications is summarized as follows:

The journal papers were related to the effect of glyphosate, hexazinone (Velpar and PRONONE 10G), and triclopyr on the seedling growth and mycorrhizal fungi; the distribution pattern of PRONONE 10G granules from aerial and ground applicators; the release of hexazinone from PRONONE 10G granules under laboratory and field conditions; vertical movement of hexazinone residues in soil leachate; the application of liquid hexazinone (Velpar L) by a logarithmic sprayer; the soil sampling method for zero-time residues; the spatial distribution of hexazinone in soil; and analytical methods.

A final report on the environmental impacts of the vegetation management project (Canada-Alberta FRDA) and a research report for the Canada-Alberta FRDA project were published. The review paper and ECW research reports as well as presentations at its annual meetings were intended for the purpose of technology transfer to allow forester, forestry managers, forestry industries, chemical company, and regulatory agencies making decisions on the proper and responsible use of forestry herbicides. Several papers were also presented at scientific conferences, symposia, workshops, and meetings.

As the role of FPMI within Forestry Canada in herbicide research is recognized as to accelerate the development of new herbicides, to refine and improve methods of utilizing existing products, to improve application technology, and to enhance effectiveness of the herbicides while minimizing the impact on the forest ecosystem, the continued collaboration with FPMI is essential. The collaboration with FPMI resulted in 12 journal and proceeding papers and Information Reports.

An application of PRONONE 10G was made by using a newer tractor-mounted granule applicator to the crop release plots (Method I) of the Grande Prairie study in spring 1989. The plots are monitored for the herbicide deposition rates and granule distribution pattern, as well as the off-site movement and persistence of herbicide residues in the low, wet areas where soil samples were collected on an on-going bases for three years after application, and completed in 1992/93. The final vegetation sampling of site preparation plots (Method II) was completed in 1992/93 (6th year); those of crop release plots (Method I) is scheduled for 1993/94 (6th year).

Consultation and advice were provided to various provincial, federal and industrial agencies on a continuing basis. Under technology transfer, available information was communicated in the form of published papers, reports, and presentations at professional meetings. Acknowledgements were received from chemical industries who had successfully registered their products by including research results of our studies as the support.

Scientific excellence has also been demonstrated in being invited to an ad hoc committee to review scientific information on forestry herbicides for ministers of Alberta Environment and Alberta Forest Service to update their regulation; in referring numerous journal papers submitted to leading scientific journals, including *J. Agric. Food Chem.* (a American Chemical Society's journal), *J. Environ. Sci. Health*, *Weed Science*, *Weed Technology*, and *Can. J. For. Res.*; and research proposals on forestry herbicides, including those proposed by Alberta Forest Service, forestry industries, and Ontario Ministry of Natural Resources.

The experimental plots of the Grande Prairie study should be maintained for further sampling for the detection of longer term (8 or 10 years) impacts of site preparation and clearcut, site preparation and crop release methods on vegetation and soil. This would result in maximizing the scientific information returns from the high initial cost of the study.

The study has been extended for three years till the end of March 1995 to complete field trials, data synthesis, and reporting.

14. Goals and Accomplishments (1992-93)

1. *Publish a journal paper, "Hexazinone and its metabolites in boreal vegetation". (Sidhu, J. Feng)*

Accepted for publication in Weed Science.

2. *Publish a journal paper, "Spatial distribution of hexazinone and metabolite residues in soils". (J. Feng, Sidhu, C. Feng)*

Published in J. Environ. Sci. Health. (see 15. Information Activities)

3. *Submit the paper, "Foliar nutrient dynamics in some boreal mixedwood species for 3 years following hexazinone application", to Forest Ecology and Management Journal. (Sidhu)*

A draft manuscript was prepared. Its revision was delayed because of other commitments for the Meadow Lake study (NOR 07-07) and writing of the paper (goal # 5) for the Can. J. For. Res. A draft for internal review is likely to be completed by 31st March 1993.

4. *Subject to conference approval, present a paper at the International Conference on Forest Vegetation Management: Forest Ecology, Practice and Policy. (Sidhu, J. Feng, Maynard).*

A 20 minute talk, "A 5-year Scenario of vegetation management in mixedwood cutover in Alberta", was given at the International Symposium, Auburn, Alabama, 27 April to 1 May 1992. Abstract was printed in the Symp. 'Program and Abstracts' and a 52-page manuscript has been submitted for its publication either in the Can. J. For. Res. or Special Conference Issue by the Auburn University, Alabama.

5. *Process 1991-field data and review vegetation component of the Grande Prairie study and identify the subcomponents which may be followed up in future to generate information on the long-term impact of clearcut in aspen mixedwoods. (Sidhu)*

Prepared summaries and reviewed the 1991-field data from crop release plots of the Grande Prairie Study and used the findings from 1991 and previous years for deciding the intensity of sampling and selecting the treatments for the drawing the proposals for the contract study under Canada-Alberta PAIF in 1992-93. [study-8013]

6. *Prepare a report on the hexazinone degradation in air-dried soil during cold storage. (J. Feng, C. Feng)*

Deferred for one year due to other priorities (re. NOR 07-08).

7. *Complete analysis of Grande Prairie samples collected in the previous year and initiate analysis for the 1992 samples. (J. Feng, C. Feng)*

Backlog of soil and foliage samples collected in both Method I and II areas was cleared, and analysis was completed.

8. *Participate in the CAPCO-National Check Sample Program (CAPCO=Canadian Association of Pest Control Officials) as the coordinator for forestry herbicides, coordinate and conduct check sample studies, and publish results (J. Feng). Modify and streamline analytical methods for herbicide residues. Initiate and maintain laboratory Quality Assurance programs. (J. Feng, C. Feng)*

Continue to be the coordinator of forestry herbicides in the CAPCO-National Check Sample Program. An analytical method for hexazinone and metabolites was published in Can. J. Chem. (see 15. Information Activities)

9. *Provide information and advice to federal, provincial and industrial agencies in the region on environmental effects of the use of herbicides in forestry. Participate in various committees (ECW-Soil Residue Carry-over Committee, For. Can. Weed Management Working Group and other scientific committees). (Sidhu, J.Feng, C. Feng)*

Active and on-going. There is a recent trend showing interests in the use of forestry herbicides (with and without other treatments) in the Northwest Region. Advices was provided to four projects, including three in Alberta and one in Saskatchewan; and being invited to an ad hoc committee to review scientific information on forestry herbicides for ministers of Alberta Environment and Alberta Forest Service to update their regulation.

10. *The study will be terminated at the end of fiscal year 1992-93, if no funds are available from Alberta-PAIF.*

For the years 1992-93 to 1994-95 20K funding was approved and the study is extended for three years to March 1995.

11. *Analyze vegetation data and identify level of sampling which is essential to sample the vegetation plots for the eighth year or longer period of sampling for monitoring the impacts of the chemical and non-chemical methods of vegetation management. Sample selected plots for density and cover. Maintain environmental plots for future sampling. C/A PAIF:A8013 (Sidhu)*

Based on the analysis of the past data on vegetation composition and structure, and seedling growth, a contract study was undertaken funded by the Alberta-PAIF. The study included Control, 2 herbicide treatments [2 and 4 kg hexazinone/ha], and 2 mechanical treatments [disk-trenched and double rom disk] on the site-preparation area of the Grande Prairie study. The sampling intensity was 25% of that of 1986-87 level. Some 690 plots were sampled for vegetation composition and structure, estimated cover, woody species density and seedling growth and competition. Data on seedling growth and competition has been handed over to S. Navratil as a part of his commitments to

the study. S. Navratil contributed \$2874.0 from NOR 10-03 to the contract study. The results will be included in a PAIF-report in 1994-95.

12. *Continue and complete soil sample collection and residue analysis from the Method I area, Grande Prairie, treated with PRONONE 10G in 1989. (J. Feng, C. Feng)*

Because of the delay in field work in NOR 07-08 and additional funding obtained from the Public Service Canada (PSC; under OPTION Program – Summer Training Program for Female Students), we are able to complete and terminate the field sampling in this fiscal year. The analytical work was also completed.

- 13 and 14. *Initiate a new study on the modelling of temperature effect on hexazinone degradation in soils (Goal 13); and initiate a new study on the modelling of hexazinone leaching in soils (Goal 14). (J. Feng, C. Feng)*

The originally proposed studies were not initiated because of lack of funding from Alberta-PAIF. However, effects of temperature and rainfall on leaching processes can be investigated through computer simulation modeling – a new approach to save cost and to provide the forestry herbicide users with an effective tool in predicting the herbicide behaviour in forestry soils. The simulation model will provide a foundation for modeling the movement of other soluble, synthetic or naturally occurring chemicals in the forest ecosystems before and after disturbance – a linkage to NOR-7-08. With the additional funding from PSC–OPTION Program and the assistance of Dr. R. Grant, University of Alberta, we are able to build and test several submodels, including soil water movement, herbicide adsorption and desorption in soils, and thermal flux. The combined performance of these submodels was tested using field and laboratory data of this study and showed promise towards a practical computer simulation model for the use of forestry managers, foresters, and regulatory agencies in effective prediction of herbicide persistence and leaching without paying the high cost of intensive field sampling and residue analysis.

15. *Initiate a new study on the metabolism of hexazinone in rat. Alberta-PAIF. (J. Feng)*

No funding was approved for this year.

15. Information Activities

i) Journal Publications

Feng, J.C. 1992. A microcolumn method for hexazinone and metabolite residues in soil and vegetation. *Can. J. Chem.* 70(4): 1087-1092.

Feng, J.C., Sidhu, S.S., Feng, C.C. 1992. Spatial distribution of hexazinone and metabolites in a luvisolic soil. *J. Environ. Sci. Health Part B Pestic. Food Contam. Agric. Wastes*, B27: 639-654.

iii) Other reports

One abstract (see iv below)

iv) Lectures, courses, seminars and scientific addresses

1) Sidhu, S.S., Feng, J.C., Maynard, D.G. 1992. A 5-year Scenario of vegetation management in a mixedwood cutover in Alberta. The International Conference on Vegetation Management- Ecology, Practice and Policy. April 27 to 1 May 1992, Auburn, Alabama. Cosponsored by Auburn University and IUFRO. Program and Abstracts p.23.

2) Feng, J.C. 1992. Chemical Applications. Vegetation Management on Mixedwood Sites for the Practitioner – A Practical Workshop. August 24-27, 1992, Waskesiu, Sask. Cosponsored by Forestry Canada, Saskatchewan Natural Resources, Regional Reforestation Technical Committee.

v) Technology transfer:

See "Sect. 13. Progress and Achievements" above for activities in technology transfer.

16. Goals 1993-94

1. Publish a journal paper, "Hexazinone and its metabolites in boreal vegetation". (Sidhu, J. Feng)
2. Submit the paper, "Foliar nutrient dynamics in some boreal mixedwood species for 3 years following hexazinone application", to Forest Ecology and Management Journal. (Sidhu)
3. Publish a paper, "A 5-year Scenario of vegetation management in mixedwood cutover in Alberta" in Can. J. For. Res. (Sidhu, J. Feng, Maynard)
4. Prepare a contract proposal for sampling vegetation in the crop release plots of the Grande Prairie study and serve as scientific authority for the contract (C/A PAIF:A8013) (Sidhu and Navratil)
5. Calculate, examine, and evaluate results of gas chromatography on all residue samples; organize and process field and soil data collected from Grande Prairie Method I & II areas; and enter all resulting data into database manager files using personal computer and FOXPRO software. (C. Feng)
6. Perform statistical analysis and interpretation, and building and testing simulation modeling for herbicide persistence and movement using Grande Prairie data. (J. Feng)

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Forest Pest Management Institute		Research Scientist Research Scientist Chemist Research Scientist Biologist Biologist	P. Reynolds N. Payne D. Thompson R. Prasad P. Kingsbury D. Kreutzweiser

ii) External -

Establishment	ID#	Title	Contact name
AFS Grande Prairie Forest		Forester In Charge	E. Ritche
AFS Reforestation & Reclamation Branch		Forester Director	G. Ehrentraut T.J. Drew
AFS Research Branch (terminated in 1990)		Director	S. Navratil
Weyerhaeuser Canada Ltd. (formerly Procter & Gamble Cellulose, Grande Prairie)		Environmental Protection, Manager	L. Steeves
Alberta Environment, Chemical Control Branch		Biologist	V. Servant
Pro-Serve, Inc.		Chemists	V. Stornes R. Rogers
CAPCO-National Check Sample Program		Co-chairpersons	B. Wakeford G. Graham
University of Toronto, Forestry Science		Professor	D.N. Roy
University of Alberta: Forest Science; Soil Science		Professors	R. Wein F. Yeh

18. Environmental Implications:

i) Environmental Impact/Assessment Review:

Prior to the implementation of the Study, public consultations and field tours were held in May 1986 in Grande Prairie jointly by Forestry Canada, Alberta Forest Service, Alberta Environment, and Procter & Gamble Cellulose. Agriculture Canada and

Alberta Environment permits were obtained for the application of herbicide. The NoFC Environmental Screening Committee evaluated the proposed study activities. On the basis of information provided by the study leaders, the committee concluded that these activities were not potentially detrimental to the environment (for environmental implications of herbicide application, also see NOR-10 & NOR-36-02-01). There were no treatment following the initial experimental set up. The subsequent years (1988 to 1995) will only involve standard vegetation and soil monitoring.

- ii) FC-NWR EARP Committee Approval Date: 1986

Original approval date: 1986

Updated: January 12, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 12, 1993

1. **STUDY TITLE:** Nutrient cycling and dynamics, in relation to chemical substances and silvicultural practices
2. Responsibility Centre: Northwest Region (8135)
3. Program: Forest Protection & Environment
4. Project Title: Environmental Stresses on Forest Ecosystems
5. Office Location(s): Edmonton, Alberta
6. Work Location: Region wide, emphasis on Alberta
7. Study Staff:

	Name
Study Leader	D.G. Maynard
Team Members	F.G. Radford

8. Study Key Words: Nutrient cycle, herbicides, ecosystem stability, tree growth, Armillaria, Increased prediction, soils
9. Study Activity: N/A
10. Study Resources:

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
D.G. Maynard	SE-RES-2 (P)	0.20	0.20	0.00		
F.G. Radford	EG-06 (T)	0.10	0.10	0.00		
FTEs		0.30	0.30	0.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00		
O&M	0.01	0.00	0.00		
Capital					
G & C					
TOTAL:	0.01	0.00	0.00		

STUDY TOTAL	0.01	0.00			
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11. Study Background and Problem Analysis

Much of Canada's previously harvested forests are significantly understocked and the use of chemical control (eg herbicides) of weed species is seen as one of the major tools that can be used to establish a commercial forest. Environmental groups have expressed their concern about the spraying of herbicides and what effects may occur as a result. The forest industry and Provincial Regulatory Agencies would like to use this silvicultural tool but lack essential scientific information on either the direct effects on various ecosystem processes and components (e.g. decomposition of organic matter) or the long-term influence on fundamental ecosystem functioning (nutrient cycling and uptake). This information is essential if the forest resource is to be managed for sustained yields in an environmentally acceptable and ecologically stable manner.

Soil factors may also play a role in the incidence of certain diseases particularly, root rots. Armillaria root rot is one of the most important diseases of coniferous regeneration in Canada. Different soils based on site productivity have been found to have variable incidence of Armillaria root rot; however, the soil properties (if any) associated with conduciveness or suppression of the disease have not been identified. It would be desirable from a forest management perspective to be able to hazard rate sites for Armillaria root rot before regeneration takes place.

12. Study Objectives:

i) Objectives:

1. Determine the influence of herbicide applications on the decomposition of organic matter and nutrient cycling within forest soils. This objective addresses the enhanced Science & Technology section of the Green Plan Forestry Practices Initiative.

2. Determine the transformations and fractionation of nitrogen, phosphorus and sulfur in relation to the cycling of these elements in forested ecosystems as affected by herbicide applications.
3. To determine the relationship between nutrient stress and Armillaria root rot in lodgepole pine (in collaboration with K. Mallett, NOR 1109). This objective is related to the national strategic plan key initiative; to increase our capability to predict and prepare for the consequences of human activities and natural disturbances. This objective is also linked to the Green Plan initiative, Integrated Pest Management, seed orchard section.

ii) Deliverables

Short Term (1-5 years)

The remaining goals and deliverables will be transferred to NOR 0701 in 1993-94.

Long Term (5 years and beyond)

NOR 07-05 is terminated.

iii) Significant Linkages:

Green Plan, Integrated Pest Management, seed orchard section

Alberta PAIF

NOR 11 - Study NOR 11-09 (K.I. Mallett)

13. Progress and Achievements

A paper on the effects of hexazinone on the mineralization of N, P, and S has been completed and has been reviewed internally. The microplots have not been sampled since 1990; Analysis of the soils for all years has been completed. Differences in soil nutrient concentrations of the LFH as a result of the herbicide application persisted in 1990. The most drastic change was with potassium; however, it is not known what are the long-term implications for site productivity. A draft paper on the results of the microplots will be prepared next year.

The analysis of the operational herbicide plots has been completed and a paper on the vegetation, residue analysis and soil nutrients composition was presented by S. Sidhu (NOR 07-04) at a vegetation management symposium in April 1992. The paper was submitted to the Canadian Journal of Forest Research for review in July (co-authors S.S. Sidhu J.C. Feng, NOR 07-04).

Two greenhouse studies on the relationship between nutrient stress and Armillaria root rot and moisture content and Armillaria root rot have been completed. The results suggest a possible link between Ca and incidence of Armillaria. An additional 13 field sites were established and soil and foliage samples from the sites were collected. The analysis is currently being done and should be completed by the end of March 1993. Preliminary results have been presented at the Canadian Phytopathology Society meeting

and the American Phytopathological Society meeting (co-authored with K. I. Mallett). A third greenhouse study has been started to look at the role of calcium in the incidence of Armillaria ostoyae infection. A journal article on the results of the field survey is currently in preparation.

Study 07-05 was terminated as the major objective related to nutrient dynamics and herbicides has been completed except for the preparation of two journal articles. These goals plus goals related to the Armillaria study have been transferred to NOR 701.

14. Goals and Accomplishments (1992-93)

1. *Publish a paper entitled "The effect of hexazinone (Velpar) on the mineralization of N, P, and S from aspen litter".*

The paper has been submitted for internal review. Three of the four reviews have been completed. Changes to the paper are being incorporated prior to submission to the Canadian Journal of Soil Science.

2. *Prepare a paper on the "Soil nutrient dynamics following a hexazinone application" from the microplots in Grande Prairie.*

An outline of this paper has been prepared. An increased field schedule related to NOR 07-07 precluded any further work on this paper. The paper will be prepared next fiscal year.

3. *Complete the greenhouse study started in 1991, on the relationship between nutrients, and moisture stress and Armillaria root rot in white spruce and lodgepole pine seedlings. Complete foliage and soils analysis from the greenhouse study and collate data. Prepare a paper for review on the effect of nutrients on the incidence of Armillaria infection (in collaboration with K.I. Mallett, Study NOR 11-09)*

The greenhouse and field work have been completed. Soil and foliage from the field study will be completed by the end of March 1993. A poster on the preliminary results of the greenhouse fertilizer experiment was presented at the American Phytopathological Annual Meeting in Portland, August 1992. A paper is currently being prepared and a first draft should be completed by the end of March 1993 (in collaboration with K.I. Mallett, NOR 11-09).

4. *Terminate Study NOR 07-05 and transfer all remaining goals to NOR 07-01.*

NOR 07-05 has been terminated. Goals related to finishing up the herbicide study and work related to Armillaria root rot have been transferred to NOR 701 for 1993-94.

15. Information Activities

- iv) Lectures, courses, seminars and scientific addresses

Mallett, K.I.; D.G. Maynard. 1992. The effect of fertilizer on Armillaria infected lodgepole pine grown in the greenhouse. *Phytopath.* 82: 1151 (abstract only, presented as a poster at the American Phytopathological Society Annual Meeting, August, 1992, Portland Oregon.

v) Technology transfer:

16. Goals 1993-94

This study has been terminated and the remaining activities have been transferred to NOR 07-01.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

This study has been terminated. Refer to NOR 701.

ii) FC-NWR EARP Committee Approval Date: N/A

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 12, 1993

1. **STUDY TITLE:** Analytical Services Laboratory
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection & Environment
4. **Project Title:** Environmental Stresses on Forest Ecosystems
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northern Forestry Centre
7. **Study Staff:**

	Name
Study Leader	Y.P. Kalra
Study Leader	D.G. Maynard
Team Members	J. Shuya
	F.G. Radford

8. **Study Key Words:** Analysis, soils, vegetation, water, chemistry, Research support
9. **Study Activity:** 2251

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
Y.P. Kalra	CH 2 (P)	0.90	0.90	1.00		
D.G. Maynard	SE-RES 2 (P)	0.10	0.10	0.10		
J. Shuya	EG 4 (T)	1.00	1.00	1.00		
F. Radford	EG-6 (T)	0.20	0.20	0.20		
FTEs		2.20	2.30	2.30		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	10.48	11.00			
Capital	1.75				
G & C					
TOTAL:	12.23	11.00			12.0

STUDY TOTAL	12.23	11.00			
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11. Study Background and Problem Analysis

Many of the studies at NoFC require high quality analysis of soil, plant and water samples in order to meet their objectives. In some cases, analytical techniques must be modified or developed to meet the specific requirements of the users. Maintaining a high quality analytical laboratory suitable to support ongoing research and the continuing improvement, modification and development of techniques are essential to meet the needs of the users at NoFC.

12. Study Objectives:

i) Objectives

1. Maintain a high quality analytical laboratory suitable to support ongoing research studies by providing precise analyses of soil, vegetation, and water samples. High quality analysis is provided to the ARNEWS biomonitoring program of the Green

Plan through the analysis of soils and foliage from the Pacific/Yukon and Northwest Regions.

2. Develop analytical techniques as required by user request.

ii) Deliverables

Short Term (1-5 years)

Continue to provide high quality analysis to support ongoing studies within the NWR.

Publish a paper on the current soil analytical laboratories in North America
Publish scientific articles on new and modified soil analytical techniques as the opportunities arise

Long Term (5 years and beyond)

Continue to provide high quality analysis to support ongoing studies within the NWR.

iii) Significant Linkages:

Various studies within NoFC including Nor 4, 10, 11, 16, 28, and 42, 44, 46.

Green Plan - ARNEWS

Group of Analytical Laboratories (GOAL - Forestry Canada Working Group

Canadian Society of Soil Science

Western Enviro-Agricultural Laboratory Association (WEALA)

Association of Official Analytical Chemists (AOAC)

13. Progress and Achievements

The analytical services laboratory provides support services to NOR-4, 7, 11, 16, 28, and 42, 44, 46 on an ongoing basis. The laboratory will do approximately 25 000 analysis on 2 000 samples in 1992-93. Quality control has been maintained through participation in the LRTAP check sample program. The Information Report on analytical methods (NOR-X-319) has been well received in the analytical laboratory community. The original print run of 1500 copies have been distributed and a second printing was run. The french version was published in November, 1992.

The working group for Forestry Canada's analytical laboratories (GOAL) has enhanced the communication among Forestry Canada's laboratories and increased the profile of the labs within the organization. The third annual meeting was successfully held in Victoria, B.C. with participation from every lab except LFC. The analytical laboratory continues to gain international recognition through participation in the International Symposium on Soil Testing and Plant Analysis and Mr. Kalra's status as Associate Referee for the AOAC in the standardization of pH measurements in soils. Over 60 laboratories from five (5) countries, participated in the AOAC program coordinated by Mr. Kalra.

14. Goals and Accomplishments (1992-93)

1. *Provide analytical services to research scientists and cooperators as requested and approved by the Program Directors. This may include a substantial commitment to do the analysis of the 6 new ARNEWS plots established within the Northwest Region and possibly eight (8) new ARNEWS plots in the Pacific/Yukon region. (Kalra)*

Analytical services were provided to NOR-4, 7, 10, 11, 16, 28 and 42, 44, 46. Approximately 25,000 analyses on 2, 000 samples were completed as requested.

2. *Manage and arrange safe disposal of old chemicals. Undertake duties related to the storage of chemicals and WHMIS. (Shuya)*

Approximately 2500 L of liquids and 62 kg of solids were disposed of according to the hazardous waste legislation.

3. *Participate in two inter-laboratory check sample program (Long Range Transport of Air Pollutants, GLFC, Forestry Canada and Wageningen Agricultural University, Wageningen, The Netherlands). (Kalra, Maynard)*

The laboratory completed one round robin on foliage analysis for the Long Range Transport of Air Pollutants and round robin on soil analysis for Wageningen Agricultural University. Results from the most recent round robins indicate the laboratory is maintaining high quality analysis.

4. *Publish a chapter on nitrate and ammonium nitrogen in soils in the Canadian Society of Soil Science methods manual, 3rd edition. (Maynard, Kalra)*

The methods manual has been completed and is currently in press. The manual is scheduled for release in May of 1993.

5. *Publish (co-author with J. Benton Jones Jr.) the paper on the status of soil testing and plant analysis in North America presented at the plenary session of the 1991 International Symposium on Soil Testing and Plant Analysis in the Global Community, Orlando, Florida, August 22-27, 1991. (Kalra)*

The paper on soil and plant analysis in North America was peer reviewed and accepted and is currently in press with Communications in Soil Science and Plant Analysis. Publication is expected sometime in March or April 1993.

6. *Serve as Associate Referee for the method validation on pH measurements in soils for the Association of Official Analytical Chemists (AOAC). This will include submission of methods and the general validation procedure to the General Referee. (Kalra)*

Four methods for pH on soils were tested on a variety of soils. Approximately 65 laboratories from 5 countries participated in the program. The results have been sent to our laboratory for compilation and preliminary statistical analysis.

7. *Participate in the activities of the Group of Analytical Laboratories (GOAL); Serve as chairperson for 1992 (2nd year of a two-year term). Assist in the preparation of a Forestry*

Canada methods manual. This will be a supplement to Information Report NOR-X-319 and will include additional methods not included in NOR-X-319 from other Forestry Canada analytical laboratories. (Kalra)

The third meeting of GOAL was held at PFC, Victoria. Yash Kalra's term as chairperson will be completed this year. No further work was done on a supplement to NOR-X-319 to include methods of other analytical laboratories. Further discussions were held at the GOAL meeting but no action was taken. The French version of NOR-X-319 was published in November, 1992.

8. *Participate in the activities of the Western Enviro-Agricultural Laboratory Association (WEALA). (Kalra)*

Attended the annual workshop of WEALA on heavy metals held in Edmonton, at the Alberta Research Council. No additional activities were done because of a large commitment for handling registration at the Canadian Society of Soil Science Annual Meeting held in Edmonton, August 8-13, 1992 at the University of Alberta.

15. Information Activities

ii) Information Reports

Kalra, Y.P.; Maynard, D.G. 1992. Methodes d'analyse des sols forestiers et des tissus vegetaux. For. Can., Reg. Nord-Ouest, Cent. for. Nord, Edmonton (Alberta). Rapp. inf. NOR-X-319F.

16. Goals 1993-94

1. Provide analytical services to research scientists and cooperators as requested and approved by the Program Directors. This may include a substantial commitment to do the analysis of the six (6) new ARNEWS plots established within the Northwest Region and possibly eight (8) new ARNEWS plots in the Pacific/Yukon region. (Kalra)
2. Manage and arrange safe disposal of old chemicals. Undertake duties related to the storage of chemicals and WHMIS. (Shuya, Kalra)
3. Participate in two inter-laboratory check sample program (Long Range Transport of Air Pollutants, GLFC, Forestry Canada and Wageningen Agricultural University, Wageningen, The Netherlands). (Kalra, Maynard)
4. Publish a chapter on nitrate and ammonium nitrogen in soils in the Canadian Society of Soil Science methods manual, 3rd edition. (Maynard, Kalra)
5. Continue as Associate Referee for the method validation on pH measurements in soils for the Association of Official Analytical Chemists (AOAC). This will include compilation of the data from the 65 laboratories and some basic statistical analysis. A report on the results of the method validation is to be presented to the AOAC

International meeting, Washington, D.C. between July 25-29, 1993. (Kalra, subject to conference approval)

6. Present a poster paper entitled "A comparison of extractants for the determination of cation exchange capacity and extractable cations by a mechanical vacuum extractor" by Y.P. Kalra and D.G. Maynard at the 1993 International Symposium on Soil and Plant Analysis, Olympia, Washington, August 14-19, 1993 (subject to conference approval).
7. Participate in the activities of the Group of Analytical Laboratories (GOAL), Western Enviro-Agricultural Laboratory Association (WEALA) and Canadian Society of Soil Science (CSSS). (Kalra)

17. Major Co-operators:

- i) Internal - FC

Region	ID#	Title	Contact name
Ontario	LRTAP		Ian Morrison

- ii) External -

Establishment	ID#	Title	Contact name
Wageningen Agriculture University	Inter-laboratory check sample program		

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement

The analytical service laboratory follows current safety practices with respect to the Workplace Hazardous Material Information System (WHMIS) and Hazardous waste disposal.

- ii) FC-NWR EARP Committee Approval Date: January, 1993.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 12, 1993

1. **STUDY TITLE:** Baseline Ecological Studies of Mature Forest Communities
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection & Environment
4. **Project Title:** Environmental Stresses on Forest Ecosystems
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Alberta, Saskatchewan
7. **Study Staff:**

	Name
Study Leader	D.G. Maynard
Study Leader	S.S. Sidhu
Team Members	L.L. Lywak
	F.G. Radford

8. **Study Key Words:** Forestry Practices, Integrated Forest Resource Management, biodiversity, long-term, forest productivity, soils, vegetation, impact on forests
9. **Study Activity:** 2233, 2211

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
D.G. Maynard	SE-RES 2 (P)	0.30	0.30	0.50		
S.S. Sidhu	SE-RES 4 (P)	0.60	0.60	0.60		
L.L. Lywak	EG 3 (T)	0.70	0.70	0.60		
F.G. Radford	EG-06 (T)	0.10	0.10	0.20		
FTEs		1.70	1.70	1.90		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	3.90	6.00	10.00		
Capital	2.46	0.00	0.00		
G & C					
TOTAL:	6.36	6.00	10.00		

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries:						
Alta.	A8038		12.00			
Sask.	S8056		14.00			
O&M:						
Alta.	A8038		38.00			
Sask.	S8056		21.00			
Capital						
G & C:						
Alta.	A5009		10.00			
TOTAL:			95.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	07-87	11.71	31.85			
Capital		9.53	0.00			?
G & C						0
TOTAL:		21.24	31.85			

STUDY TOTAL			132.85			
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11. Study Background and Problem Analysis

The stresses on forest ecosystems from forestry related activities, air pollution, climate change, recreational and other uses is increasing. Variations in and controls on ecosystem productivity are not well understood. Fundamental research on a long-term basis is required to understand the structure and function of the major forest ecosystems in the Northwest Region. Without a basic understanding of how these systems function and change over time and space, it will be difficult to assess the effects of stresses, such as forestry practices and climate change on sustained productivity of the ecosystem.

Soil is fundamental to any forest management and productivity strategy. Present and future concerns will be the result of new technologies or of intensification of forest management in areas where relevant information is lacking. Management strategies such as whole tree harvesting, shorter rotations, and intense site preparation are being proposed. Increased nutrient losses associated with harvest raises questions about adequate long-term soil nutrient supplies for future stands and hence productivity declines. At present we can not answer questions regarding long-term productivity of most sites. There are few appropriate analytical procedures, sampling is often inadequate and published estimates of soil nutrient supply are not always meaningful as the information has been determined on unmanipulated, undisturbed stands.

Vegetation is one of the key components of a forest ecosystem and is an expression of interactions of the biological and physical factors operative in the system. The current vegetation composition and structure of a forest ecosystem is an imprint of the past interactions among soil, biota, climate, and disturbances. Baseline information on vegetation of selected forest ecosystems within the Northwest Region is essential for establishing a base against which future natural changes and impacts of human disturbances can be evaluated. This includes: i) species composition and their dominance, ii) structure, diversity, and species interactions, and iii) vegetation dynamics in relation to short- and long-term natural variations.

The National Strategic Plan of Forestry Canada recognizes forest environmental quality as one of the four areas of its strategic initiatives. Integrated resource management is one of

five new initiatives identified in the Northwest Region strategic plan. Canada's Green Plan stresses the "sustainability" of our forest resources which includes the maintenance of their ecosystem productivity and biodiversity. An opportunity for studying the forest ecosystem and how various stresses impact on productivity could be provided through the Model forests program outlined in the Green Plan. The purpose of the proposed baseline study is to provide needed scientific information against which changes in forest ecosystems as a result of impacts such as forestry management practices, acid rain, and climate change can be compared.

12. Study Objectives:

i) Objectives

1. To provide baseline information on Boreal Mixedwood ecosystems against which short- and long-term changes related to forestry practices can be compared.
2. To determine the nature and causes of patterns of natural variation in an ecologically and silviculturally important forest community.

ii) Deliverables

Short Term (1-5 years)

1993-94: Reports on the baseline soil and vegetation conditions at the two sites.

1994-96: Reports and scientific articles of the initial impacts of different harvesting techniques on the soils and vegetation.

Long Term (5 years and beyond)

Maintain undisturbed sites within Meadow Lake Provincial Park. Continue to monitor soil and vegetation at the harvested sites and assess differences in soils and vegetation with those in undisturbed sites. This may provide information on the long-term impacts of forestry practices on site productivity.

iii) Significant Linkages:

I. Corns NOR 02-01
 I. Edwards NOR 10-13
 I. Bella NOR 04-01
 Canada/Saskatchewan PAIF
 Canada/Alberta PAIF
 Weldwood, Hinton Division
 Green Plan, Forestry Practices Initiative
 Foothills Model Forest
 Meadow Lake Provincial Park
 Vegetation Management Program - Canada/Saskatchewan PAIF

13. Progress and Achievements

Considerable time has been spent in locating and establishing sites. The location of the sites depended upon several factors, two of the key parameters being protection from future development and location of the Green Plan Model Forest. Two sites were established, one in Meadow Lake Provincial Park, Saskatchewan (Canada/Saskatchewan PAIF funding) and the other in the Foothills Model Forest, near Edson (Green Plan Forestry Practices and Canada/Alberta PAIF). A contract under the Green Plan Forestry Practices initiative was issued and several old Forestry Canada sites were found. Measurement of selected soil properties, successional studies and vegetation analysis will be done on a limited number of these old plots over the next two years.

Twelve plots, eight (8) in jack pine stands of various ages and four in aspen stands were established in Meadow Lake Provincial Park in 1992. Soils were classified and samples collected from all twelve sites. Vegetation descriptions and samples were collected from seven (7) of the jack pine and one of the aspen sites. Tree measurements were also done at all 12 sites. Two of these sites (about five (5) ha) are scheduled for harvesting in the late summer and fall of 1993.

Thirty-one plots, 15 x 100 m were established in two areas within Weldwood's FMA and the Foothills Model Forest. Soil descriptions, tree measurements and soil samples were collected at all 31 plots. Baseline vegetation data and additional soil data will be collected prior to harvesting in August 1993.

14. Goals and Accomplishments (1992-93)

1. *Select a minimum of two (2) sites to develop baseline studies for the assessment of the impact of forest management practices on soils and vegetation. (Sidhu, Maynard, in cooperation with I. Corns, Study Nor 02-01)*

Two sites were established, one in Meadow Lake Provincial Park under the Canada/Saskatchewan PAIF and the other in the Foothills Model Forest near Edson, in (Marlboro 6 of Weldwood FMA) under the Green Plan Forestry Practices initiative and Alberta PAIF).

2. *Develop a detailed 5-year plan on baseline ecological studies in mature forest communities. This will include methodology on collection and analysis of data, outputs including technology transfer to various clients, and linkages to other programs (e.g. Green Plan, National and Regional Strategic Plans, PAIF's, and other studies within NoFC).*

A detailed plan has been prepared for submission to the Green Plan Forestry Practices Initiative for continued funding and a proposal has been submitted to the Foothills Model Forest Project Steering Committee. A detailed plan outlining the Meadow Lake study is being prepared.

3. *Establish permanent plots (random and feature-oriented sampling design) and initiate sampling and soils and vegetation descriptions on a minimum of two (2) sites.*

Plots were established at both the Meadow lake and Model Forest sites. The Meadow Lake site consisted of 12 plots, eight (8) in jack pine stands and four (4) in aspen stands. Within each plot, 10 transects were established to carry out the detailed soil and vegetation analysis. At the Model Forest site, 31.15 x 100 m plots were established. These plots are to be harvested under nine (9) different harvesting scenarios (3 rates of compaction and 3 different organic matter removal practices). Baseline soil chemical analysis and tree measurements were taken at both locations. Detailed vegetation analysis (i.e. cover estimates and diversity) were done in Meadow Lake Provincial Park. Because of the timing of the Model Forest announcements and delays in the final site selection, it was too late for any detailed vegetation sampling to be done at the Model Forest location. Further baseline measurements of the soil and vegetation are to be done in 1993 prior to harvesting at both locations in late August through the fall of 1993.

4. *Initiate a publication on a review of the impacts of forestry practices in mixedwood boreal forests. This will be a collaborative goal with other members from NoFC associated with the Green Plan Forestry Practices enhanced Science & Technology Initiative (I. Corns, Nor 201; D. Boylen and D. Kuhnke, NOR 03).*

Additional material on biodiversity, organic matter additions to recently harvested land and soil compaction was compiled but no work was started on a review of the impacts of forestry practices because of the effort put into locating and establishing the plots at the two locations.

15. Information Activities

v) Technology transfer:

A talk on soil and forests was presented as a part of the Meadow Lake Provincial Park's summer public information program, July 24, 1992.

16. Goals 1993-94

1. Continue to measure soil and vegetation conditions at Meadow Lake Provincial Park and the Foothills Model Forest sites prior to harvesting in late August through the fall of 1993 (Model Forest location is in collaboration with I. Corns NOR 02-01 and I. Edwards 1013).
2. Coordinate with co-operators, the harvesting of the plots at both sites (Model Forest location is in collaboration with I. Corns NOR 02-01 and I. Edwards NOR 10-13).
3. Sample selected 30 to 40 year old Forestry Canada sites (A-15) for soil nutrients, plant cover estimates, and biodiversity (in collaboration with I. Corns NOR 02-01 and I. Bella 04-01).
4. Prepare interim reports for the various funding agencies (Canada/Alberta PAIF, Canada/Saskatchewan PAIF, Green Plan and Foothills Model Forest) on the baseline soil and vegetation data.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name
Meadow Lake Provincial Park		Park Management Specialist	Bob Wilson
Weldwood Canada Ltd, Hinton		Silviculture	Bill Rugg Diane Renaud

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The first year of the study involved the establishment of plots and collection of samples. Harvesting is to be done in late August and fall of 1993 by the cooperating agencies. The harvests at both locations fall within the jurisdiction of the provincial governments. In the case of the Meadow Lake Provincial Park study, the two harvested areas will be in the order of 5 ha and are not near any water bodies. The logging must be approved by the Meadow Lake Provincial Park Superintendent and Park Management Specialist following public consultations. The area harvested under the Foothills Model Forest is part of Weldwood's current harvest plan and the clearcuts will be about 20 ha. The harvesting plan has been approved by Alberta Forest Lands and Wildlife. At both sites the major objective is to assess the environmental impact of various forestry practices on the soil and vegetation productivity.

ii) FC-NWR EARP Committee Approval Date: January 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 12, 1993

1. **STUDY TITLE:** Water Quality Impact and Recovery from Forest Management Practices
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection and Environment
4. **Project Title:** Environmental Stresses on Forest Ecosystems
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Boreal Forest, Alberta
7. **Study Staff:**

	Name
Study Leader	J. Feng
Study Leader	C. Feng
Study Leader	G. Hillman
Team Members	B. Robson
	P. Du
	S. Roadhouse
	L. Lywak
	Y. Kalra

8. **Study Key Words:** Forest practices, stream water quality, hydrology, decision support system, database program, research and development, mitigation, boreal forest.
9. **Study Activity:** 2211

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
J. Feng	SE-RES-2 (P)	0.60	0.60	0.70		
C. Feng	CH-2 (P)	0.60	0.60	0.70		
G. Hillman	SE-RES-2 (P)	0.50	0.50	0.50		
B. Robson	EG-5 (T)	0.50	0.50	0.50		
S. Roadhouse	EG-2 (T)					
P. Du	SE-RES-1					
L. Lywak	EG-3 (T)	0.10	0.10	0.20		
Y. Kalra	CH-2 (P)	0.10	0.10	0.00		
T. Singh	SE-RES-2					
FTEs		2.40	2.40	2.60		

Financial Resources (\$000s)

A-base	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
Salaries	0.00	0.00	0.00		
O&M	9.81	6.00			
Capital	42.58	15.70			
TOTAL:	52.39	21.70			

Agreements	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
Salaries: Alta.	A8030		22.60			
	A8031		24.12			
O&M: Alta.	A8030		24.40			
	A8031		25.80			
Capital: Alta.	A8030		3.00			
TOTAL:			99.92			

STUDY TOTAL		124.02			
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11. Study Background and Problem Analysis

Part of the complex relationship between forests and water lies in the contribution of 1) the forest in regulating soil moisture, water table, stream flow, and maintaining water quality and 2) the water as a vital life support medium, transporting agent, chemical solvent, and catalyst. The complexity depends upon the type of forest, nature of precipitation; upon geology, topography and soils; and upon the interaction of physical and biochemical cycles within the aquatic ecosystem.

Human activity, such as logging and forest site preparation (chemical, mechanical or prescribed burns) for tree planting, may adversely affect many components of the aquatic biota. Removal of the forest canopy (clearcutting) and the subsequent disturbance by mechanical site preparation and prescribed burning have adverse impacts on overall microbial biomass and metabolism, and may cause soil erosion leading to movement of particulate and dissolved organic matter and nutrients through forested watersheds. Increased streamflow and concentration of suspended sediments and debris in streamwater may also occur.

Changes in aquatic concentrations of chemicals (dissolved organic matter, nutrients, and elements) due to logging and other forest management practices have direct impact on the aquatic ecosystem by altering pH, dissolved oxygen, energy pool, and available food sources sustaining aquatic biota, and may lead to changes in the structure of the food-web.

Both particulate and dissolved organic matter are important food sources for fish and freshwater biota. Dissolved organic matter is also an important component of the organic energy budget of temperate stream ecosystems and is frequently measured as dissolved organic carbon (DOC) in fresh water quality studies. Increases in particulate organic matter and concentration of DOC may last for three years or more following forest clearcutting. Benthic algae, fungi, and bacteria are the organisms most likely to assimilate naturally occurring DOC from the water column.

In the Coweeta watershed study, Meyer *et al.* (1988) reported that the concentration of tannins, lignins, and sugars in streamwater accounted for less than 30% of total DOC and that a large fraction (70%) of DOC remained unidentified. They also suggested: 1) streamwater DOC changes with watershed disturbance and recovery, 2) the ultimate fate of DOC in the stream trophic structure is an important topic for future research, and 3) benthic meiofauna may prove to be an important link between DOC-utilizing bacteria and benthic macroinvertebrates.

A few forestry related DOC studies were reported for forest catchments in New Zealand, boreal watersheds in Quebec, and peatlands of north-central North America. Changes of naturally occurring DOC in headwaters associated with forest management practices in the Northwest Region have not been studied previously. Because of the potential adverse impact on fresh water biota, a data base on DOC and their species in streamwater (associated with other water quality data, such as concentrations of nutrients and elements, pH, and dissolved oxygen) should be established before and after disturbance

from logging and planting site preparation (mechanical, chemical and prescribed burns) in the forest management agreement (FMA) areas of northern Alberta.

Major portions of northern Alberta are classified as mixedwoods and hardwood forests which produce more biomass annually than pure coniferous forests. Therefore, the forest land disturbance is expected to induce greater response from and interaction with the aquatic ecosystem in these areas, including flooding (as experienced in Daishowa FMA areas) and changes in stream water quality. The rate of recovery from the disturbances will also be affected.

Initially, a characteristic forest site in northern Alberta will be selected to study the components and profile of chemical compounds in the aquatic ecosystems as well as their forest land sources of origin. The physical and hydrological characteristics of stream systems before and after harvesting, and during subsequent recovery, will also be investigated. Initial protocols for sampling and chemical analysis will be tested, evaluated, and further developed to enable data collection towards a full understanding of the mechanism between forest land disturbance and aquatic impact.

The general approach to be adopted entails the selection of two, preferably adjacent, watersheds that are similar with respect to climate, vegetation, hydrology, soils, geology and other features. One of the two watersheds which is to be treated should contain at least 25% of merchantable timber for the first pass as well as an upstream, internal control area. This watershed will be logged one year after establishment, but the second (parallel control) watershed will not be disturbed in any way.

Stream flow measuring and water quality sampling stations will be established at appropriate and corresponding locations on each watershed, and instrumented with automatic stream gauges and water samplers. The water samplers will be set to sample during spring runoff, storm runoff and low flow periods, before and after treatment.

Results of the initial studies will provide information towards the evaluation and future improvement of timber harvest operating ground rules in Alberta. Scientific data on the change and recovery of stream water quality and hydrology will enable the regulatory agencies and forestry companies to establish mitigation measures necessary to minimize future aquatic impact resulting from logging and other forest management practices.

The power of prediction using dynamic simulation modeling cannot be over-emphasized. Forest ecosystem simulation in Alberta and across Canada needs to be intensified and improved. In contrast, agroecosystem simulation has been intensively studied in the past decade, and because the fundamental principles governing physical and biological processes in the soil, vegetation, and aquatic systems are very similar in both ecosystems, the knowledge gained can be applied to forest ecosystems as well. Simulation models, such as the Hydrology Simulation Program-Fortran (HSPF) and the Leaching Estimation And Chemistry Model (LEACHM) of Cornell University, should be tested and compared with in-house developed models, which will then be designed for boreal forest conditions. The best approach in testing and modifying the existing models, and in building in-house models for the boreal forest ecosystem is to select one water soluble chemical which is applied to the forest ecosystem at known amount. Then, using site data for soil, climate and management, the simulation model may be run under conditions that reproduce those under which the field data are recorded. Comparison of simulated and recorded

results will reveal the predictability and sensitivity of the existing and in-house models. A large database of hexazinone transport and transformation (an ideal synthetic solute applied with known amount under reforestation conditions in boreal forests) is currently being collected from the Grande Prairie forest, including site data for soil, vegetation, and climatic characteristics. This large database developed under FRDA funding provides an ideal means of testing forest ecosystem simulation models. Development of in-house simulation models for solute transport and transformation will undergo two stages: 1) build and test models using Grande Prairie field data (NOR 07-04) to obtain parameters and boundary conditions, and 2) extend the model to include other types of synthetic and naturally occurring chemicals in conjunction with other hydrological and climatic data collected from this study (NOR 07-08).

12. Study Objectives:

i) Objectives

1. To sample, analyze, and determine the total concentration and species of naturally occurring dissolved organic carbon, nutrients, and chemical elements in the streams of typical forestry watersheds before and after forest management practices such as logging and forest site preparation.
2. To monitor, assess and correlate the effects of logging, subsequent forest management and eventual recovery on the hydrological and physical processes and properties of streams (streamflow, suspended sediment, temperature, dissolved oxygen, pH and conductivity).
3. To assess the potential for, and to build and test, simulation models for solute movement in the forest land/stream ecosystems in response to disturbances resulting from forest harvesting and management practices.
4. To provide federal, provincial, and industrial forest resource managers in the region with guidelines for minimizing the impact of forest management practices in the boreal forest on the hydrology and water quality of affected waterways.

The four objectives relate to the Forest Environmental Quality section of the national strategic plan which states the need for increased capability to predict and prepare for the consequences of human disturbance (logging in this case) on forest ecosystems.

The objectives are part of regional strategic initiatives to develop decision-making tools and guidelines for resource management in environmentally benign ways (Issue V). They are also part of new program thrusts (#5) to integrate valuation and management of timber and non-timber forest resources.

ii) Deliverables

Short Term (1-5 years)

Results of the initial studies will provide information for evaluating and improving timber harvest operating ground rules for Alberta. Scientific data on the change and recovery of stream water quality and hydrology will enable the regulatory agencies and forestry companies to determine the mitigation measures necessary to minimize aquatic impact resulting from logging and other forest management practices.

Results on the rate of recovery in water quality and stream hydrology will provide a basis for determining the time interval required between the first and second pass of timber harvesting to minimize flooding and maintain water quality.

Long Term (5 years and beyond)

User-friendly statistical and simulation models developed in this study will provide powerful, dynamic, and cost-effective tools to forest resource managers in governments and industries, enabling them to effectively estimate impact on stream water quality and hydrology and to mitigate potential impact through preventive planning in forest management practices.

Utilization of hardwoods in aspen forests is relatively new. With the introduction of advanced technology in hardwood pulping, demonstration of environmentally conscientious and scientifically sound research on the interaction of forest-aquatic ecosystems related to logging and other forest management practices will be valuable. Research sites for this study located at the Spring Creek, Grande Prairie Forest, near Valleyview may be set up as a demonstration area by Alberta Environment to display how the advanced forest-environmental research work is conducted through the combined efforts of federal, provincial, industrial, and private researchers.

iii) Significant Linkages:

The most significant linkages are intra-provincial (Alberta). To achieve the objectives of this study, it is necessary to cooperate closely with the Hydrology Division, Alberta Environment, Daishowa Canada Co. Ltd., Peace River, and officials of the Peace River and Grande Prairie Forests, Alberta Forest Service.

13. Progress and Achievements

In line with Forestry Canada's mission, the bioenergy research program emphasizes the need to improve our environmental quality and to focus on environmental concerns, including understanding the environmental impacts of biomass production and developing measures to mitigate any potential negative consequences. Results of numerous discussions and meetings indicated that the basic concept of this study in providing scientific data for the evaluation and improvement of mitigation methods, such as timber harvest operating ground rules in Alberta, to protect water quality from the disturbance of biomass harvesting is supported by managers, researchers, and regulators of the provincial and federal departments of forests, environment, and fisheries as well as forest industries. Research proposals on water quality and stream hydrology were submitted by Forestry Canada and accepted by the Canada-Alberta Partnership Agreement in Forestry (PAIF) committee for funding. The study will be undertaken at Spring Creek, near Valleyview, as recommended by AFS Directors of Reforestation and

Reclamation Branch, Land Use Branch, and Timber Management Branch. Research collaborators in the Spring Creek Project include Alberta Environment (Technical Service Division, Hydrology Branch and Hydrogeology Branch), Alberta Forest Service (Grande Prairie Forest, Peace River Forest, and Forest Land Use Branch), Daishowa Canada Co. Ltd., and University of Alberta. The Spring Creek Project is coordinated by Mr. John Taggart, Alberta Environment, and jointly planned by staff of this Study and the above described collaborators with each participating research group conducting independent studies on the same watersheds. Interim and final results will be discussed and reported jointly by the group. With the assistance of the collaborators of the Spring Creek Project, staff of this Study are able to evaluate the site characteristics and determine the most suitable sampling and analytical equipment and methodologies for the proposed research. Streamlining of the analytical laboratory, testing of equipment and methodology, and designing and construction of field equipment housing are in progress. Setting up of sampling stations and field data collection will begin in the spring of 1993.

14. Goals and Accomplishments (1992-93)

1. *Continue collecting and reviewing pertinent literature on DOC and forest ecosystem simulation modeling for information, knowledge, and methodologies. (J. Feng, C. Feng, Hillman)*

On-going.

2. *Investigate potential experimental sites in the tributary and headwaters areas of the Al-Pac FMA; select from them the most suitable sampling sites; and prepare a general experimental plan. (J. Feng, C. Feng, Hillman)*

A reconnaissance survey of possible experimental sites was conducted on the Al-Pac FMA with the assistance of Al-Pac and Alberta Forest Service officials from the Lac La Biche Forest. Subsequent meetings and discussions with Al-Pac and the Alberta Forest Service led to the decision to conduct the water quality study on Daishowa's FMA. Daishowa, in conjunction with Alberta Environment, was considering the possibility of reopening the Spring Creek watershed project—a watershed study near Valleyview in which comprehensive meteorological and streamflow data were collected for 20 years. (A forest clearance for agriculture was planned but never carried out). Surveys completed in 1992 showed that on the Rocky Creek subwatershed of Spring Creek, the hydrologic boundaries could be defined, and 25-30% of the timber on the subwatershed could be removed during the first logging pass. Consequently, Rocky Creek was chosen as the to-be-treated subwatershed. The adjacent subwatershed, Bridlebit Creek, was selected as the control. The water quality study will be conducted on these areas in cooperation with Daishowa Canada Co. Ltd., Alberta Environment and officials of the Peace River and Grande Prairie Forests.

3. *Prepare detailed field workplan and acquire tools, sampling materials, temporary storage facilities, and sample shipping equipment, when funding is secured. (J. Feng, Hillman)*

Major sources of funding are Canada-Alberta Partnership Agreement and A-Base. Development of field plan is in progress (a joint effort of all collaborators). The plan

provides for improved road access into Spring Creek and for Alberta Environment to install stream gauges at three watershed outlets (Spring Creek (main stem), Rocky Creek and Bridlebit Creek). Daishowa will oversee the logging phase. Most of acquisitions for field materials, tools, and equipment have been made. Valleyview Ranger Station agreed to provide storage facilities for field vehicles and refrigerators.

4. *Set up laboratory protocol, acquire analytical instruments and materials, when funding is secured. (J. Feng, C. Feng)*

Major effort has been made on the evaluation of the most suitable Total Organic Carbon Analyzer. Water samples were collected at different times and locations in Spring Creek and sent, in different types of containers and caps, to CCIW and other analytical laboratories for the assessment of DOC levels and best equipment. As a result, a Dohrmann DC-190 High Temperature Total Organic Carbon Analyzer was selected and ordered from Folio Instruments, Montreal. A Barnstead compact ultrapure water system was also purchased and intended for use in the field lab in Valleyview. Testing of automated water sampler and protocol is in progress.

5. *Establish field sampling stations and collect samples, when funding is secured. (J.Feng, Hillman, Robson)*

No field sampling stations were established in 1992. However, several reconnaissance trips were made to different locations in Spring Creek. Some random water samples were collected from the general area of the watershed for preliminary information.

6. *Establish weather stations on study areas when funding is secured. (Hillman, Robson)*

Alberta Environment has accepted responsibility for installing meteorological instrumentation and collecting weather data. These data will be made available to all collaborators.

7. *To design, assemble and test a rugged integrated automatic stream gauge/water sampling system suitable for field use. (Hillman, Robson)*

Most of the instruments and materials required to assemble 12 systems have been acquired. Some of the materials will be salvaged from stream gauges used in earlier studies. The prototype system, the design of which is nearly complete, consists of three components: stream gauge/data collecting system, automatic water sampler, and a floating sensor platform, all powered by a 24v DC battery arrangement.

Equipment purchases, field work and additional help were funded through the Canada/Alberta PAIF, Projects 8030 and 8031.

15. Information Activities: N/A – new project

16. Goals 1993-94

1. Install, activate and maintain integrated stream gauge/water sampling systems on Rocky and Bridlebit Creeks; and establish stage/discharge rating curves for each hydrometric station using natural control sections, water elevation readings and current meter measurements. (Hillman, Robson)
2. To collect suspended sediment samples and stream water data for dissolved oxygen, pH, conductivity and temperature. (Hillman, Robson)
3. Develop, modify, streamline, and maintain operations in water chemistry sampling, field laboratory in Valleyview, and analytical laboratories at NoFC. (J. Feng, C. Feng)
4. Collect, process and analyze water samples for chemical contents, including DOC, nutrients and elements. (C. Feng)
5. Process and compile hydrologic data to useable form. (Hillman, Robson)
6. Process and compile water chemistry data for statistical evaluation. (C. Feng, J. Feng)
7. Study the potential approaches for simulation modeling of dissolved chemicals in streamwater. (J. Feng)

17. Major Co-operators:

i) Internal - FC

ii) External -

Establishment	ID#	Title	Contact name
Alta. Environ., Tech. Serv. Div., Hydrology Br.		Peace River Basin Hydrologist	John Taggart
Daishowa Canada Co. Ltd.		Woodlands Biologist	Bob Wynes
AFS, Grande Prairie Forest, Valleyview Ranger District		Chief Ranger	Jim Maitland
AFS, Peace River Forest HQ		Forester	Paul King
AFS, Land Use Branch, Watershed Management Section		Head	Glen Bergstrom
Alta. Environ., Tech. Serv. Div., Hydrogeology Branch, Evaluation Section		Head	Bernard Dousse
		Sr. Hydrologist	Marc Zobel
University of Alberta, Forest Sci.		Professor	Richard Rothwell
via Daishowa Canada		Consultant	Bob Swanson

18. Environmental Implications:

The experimental plan was reviewed by the NoFC Environmental Screening Committee for environmental implications on January 6, 1993.

The actual statement of the NoFC Environmental Screening Committee is as follows:

"We have reviewed the proposed water quality research study for Rocky Creek. The harvesting operation will follow the Daishowa Canada Co. Ltd. Timber Harvesting Planning and Operating Ground Rules agreed to by the company and Alberta Forest Service. Mitigation of any problems are to be dealt with under the contents of the agreement. The logging operation falls under provincial jurisdiction and is not subject to the Federal screening process. The monitoring and study of water quality falls within the mandate of the screening committee. The monitoring and study of water quality will have no significant adverse environmental effects."

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 12, 1993

1. **STUDY TITLE:** Environmental Impact Assessment in Relation to Forest Ecosystems
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection and Environment
4. **Project Title:** Environmental Stresses on Forest Ecosystems
5. **Office Location(s):** Edmonton
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	J.D. Johnson
Team Members	D.G. Maynard
	S.S. Sidhu
	J.C. Feng
	M. Newman
	J. Ball

8. **Study Key Words:** Environmental Assessment and Review Process (EARP), regional screening committee, specialist knowledge, forestry activities, sustainable development
9. **Study Activity:** 2211, 2316

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
J.D. Johnson	BI-2 (P)	0.41	0.41	0.80		
D. Maynard	SE-RES-2 (P)	0.10	0.10	0.10		
S. Sidhu	SE-RES-2 (P)	0.10	0.10	0.10		
J. Feng	SE-RES-2 (P)	0.10	0.10	0.10		
M. Newman						
J. Ball						
FTEs		0.71	0.71	1.10		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	4.53	2.00			
Capital					
G & C					
TOTAL:	4.53	2.00			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M		3.34	15.00			
Capital		2.50				
G & C						
TOTAL:		5.84	15.0			

STUDY TOTAL	10.37	17.00			
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11. Study Background and Problem Analysis

Increasing public concern for maintenance of a quality environment, greater emphasis on pollution control, and increased recognition of the non-timber value of the forest has increased awareness of the need for environmental assessment in Forestry Canada. The 1984 EARP Guidelines Order and the Canadian Environmental Assessment Act (Bill C-13) have increased the importance of the assessment of potential environmental impacts related to Forestry Canada activities. Public participation in the environmental impact assessment process will be greater under the new Act and Forestry Canada must be prepared to accommodate this. Involvement in the evaluation of potential environmental impacts of Forestry Canada initiated projects and the provision of expert advice to other federal government departments in aid of their environmental impact assessment work will continue and likely expand as a result of the new Act. Greater participation in regional environmental impact assessment technical committees is anticipated. Greater liaison with Forestry Canada Headquarters will be necessary to standardize environmental impact assessment procedures, practices and management across the country. This study was set up specifically to deal with the increasing demand for environmental impact assessment work.

12. Study Objectives:

i) Objectives

1. To provide reviews of projects/studies for environmental implications through the Northern Forestry Centre's Environmental Screening Committee. This objective has linkages to forest environmental quality under the National Strategic Plan and integrating multiple-use forest management activities and increasing public awareness of forest research and development under the Regional Strategic Plan.
2. To provide a Forestry Canada representative to the regional Environmental Assessment Coordinating Committee (EACC) and its related technical subcommittees. This objective is linked to overall environmental quality under the National Strategic Plan and integrating multiple-use forest management activities, especially in the area of interdepartmental cooperation, under the Regional Strategic Plan.
3. To provide specialist knowledge on request to other federal government departments conducting environmental impact assessments. Strategic Plan linkages for this objective are similar to those of Objective 2.
4. To provide a Northwest Region representative to Forestry Canada's national EARP committee. This objective is strongly linked to forest environmental quality under the National Strategic Plan and public information and integrated multiple-use forest management under the Regional Strategic Plan.

ii) Deliverables

Short Term (1-5 years)

Adoption of a more participatory approach to environmental assessment at the project planning stage as required under the new Canadian Environmental Assessment Act will lead to a more environmentally conscious approach to Forestry Canada activities, strongly linked to forest environmental quality under the National Strategic Plan. Greater cooperation with other federal government departments is likely because of the need to standardize the approach to environmental assessment across the country.

Long Term (5 years and beyond)

Acceptance of environmental assessment as a routine part of the project planning process and a commitment to the principles of sustainable development and the maintenance of biodiversity as a regular part of Forestry Canada's activities.

iii) Significant Linkages:

Most studies conducted in the Northwest Region will be involved in the environmental assessment process to some extent. Liaison with other Forestry Canada establishments will be maintained through the national EARP committee. Interaction with other federal government departments, particularly DOE and DFO, will likely increase as a result of the new Canadian Environmental Assessment Act.

13. Progress and Achievements

Certain aspects of this study date back nearly 20 years. In the 1970s, environmental impact studies were carried out in the Mackenzie Valley and Keewatin District, and advice was provided at formal hearings (Berger Commission, EARP Panel hearings). Later CFS, as part of Environment Canada, was represented on the Regional Screening and Coordinating Committee (RSCC) and all of its technical subcommittees, providing expert advice on development proposals relating to impacts on forestry, vegetation and terrain. The RSCC has evolved into the Environmental Assessment Coordinating Committee (EACC) with continuing participation of Forestry Canada. Environmental assessment work has also been ongoing for a number of years under other projects and studies (eg., NOR-7-01). All studies initiated since 1985 have been reviewed by NoFC's regional Environmental Screening Committee.

Review and advisory services are continuing. Five uranium mine proposals in Saskatchewan are currently undergoing panel reviews. Operational activities under the Green Plan, including the Model Forest proposals, are undergoing environmental review. The national Forestry Canada EARP committee is developing guidelines for the implementation of standardized environmental assessment across the Department.

14. Goals and Accomplishments (1992-93)

1. *Continue the review of projects/studies for environmental implications through NoFC's Environmental Screening Committee. (Maynard, Johnson, Sidhu, Feng)*

Proposals under the Boreal Forest Transect Case Study (Batoche, Sask.), the Initial Environmental Evaluations (IEEs) for the BOREAS project for areas within and outside of Prince Albert National Park, and the first year operating plans for the three Model Forests in the region were reviewed.

2. *As Forestry Canada's representative on the regional EACC, review development proposals for potential environmental impacts. (Johnson)*

The five uranium mine proposals in northern Saskatchewan undergoing panel reviews consumed most of the review time expended for the year.

3. *Act as Forestry Canada's representative on the Mining, Transportation, Hydrocarbon, Tar Sands and Heavy Oils, and Pulp and Paper Technical Subcommittees of the EACC. (Johnson)*

These committees were basically inactive during the year.

4. *Provide expert advice to other federal government departments on request to assist them with their environmental impact assessments. (Johnson)*

Advice was provided to DOE and DFO personnel as part of their mandated environmental assessment work.

5. *Act as the Northwest Region's representative on Forestry Canada's national EARP committee. (Johnson)*

A meeting was held in December to finalize the Forestry Canada draft directive on EARP. (Distribution expected in January, 1993.)

6. *Develop categorical assessment screening forms for regional Forestry Canada staff to use in assessing the environmental implications of their projects. (Environmental Screening Committee)*

Progress on this goal was minimal, awaiting headquarter's finalization of the draft directive on EARP.

7. *Represent Forestry Canada on the Application Review Committee of the Environmental Partners' Fund, Alberta and N.W.T. Region. (Johnson)*

Forty-five applications were reviewed and screened for environmental implications by the Environmental Partners' Fund during 1992.

8. *Attended a two-day interactive workshop sponsored by Environment Canada on the new Canadian Environmental Assessment Act.*

15. Information Activities

- i) Journal Publications - nil.
- ii) Information Reports - nil.
- iii) Other reports - nil.

- iv) Lectures, courses, seminars and scientific addresses - nil.
- v) Technology transfer - nil.

16. Goals 1993-94

1. Continue the review of projects/studies for environmental implications through the NoFC Environmental Screening Committee. (Maynard, Johnson, Sidhu, J. Feng, Boxall, Edwards; Ball - Manitoba; Newman - Saskatchewan)
2. As Forestry Canada's representative on the regional EACC, review development proposals for potential environmental impacts. (Johnson)
3. Provide expert advice to other federal government departments on request to assist them with their mandated environmental impact assessment work. (Johnson)
4. Act as the Northwest Region's representative on Forestry Canada's national EARP committee. (Johnson)
5. Develop categorical assessment screening and project register forms for regional Forestry Canada staff to use in assessing the environmental implications of their projects. (Environmental Screening Committee)
6. Represent Forestry Canada on the Application Review Committee of the Environmental Partners' Fund, Alberta and N.W.T. Region. (Johnson)

17. Major Co-operators:

- i) Internal - FC
- ii) External -

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
N/A
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION

1. Title: Mixedwood Silviculture
2. Responsibility Centre: Northwest Region (8133)
3. Activity: 2222, 2223, 2211
4. Program: Forest Resources
5. Status: Continuing
6. Last Evaluation: January 7, 1993
7. Next Evaluation:

B. KEYWORDS

024 Reforestation
 100 Green Plan
 201 Soils
 306 Stocking
 315 Hardwoods: aspen, balsam poplar
 326 Silviculture
 340 Stand development
 341 Management systems
 345 Conifers: white spruce, lodgepole pine, jack pine
 354 Natural regeneration
 438 Vegetation management

C. RESOURCES

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	8.50	8.50	9.40	0.00	0.00
Salaries	\$427.5	\$427.5	\$467.5	\$0.0	\$0.0
O & M	\$83.5	\$85.0	\$89.0	\$0.0	\$0.0
Capital	\$13.1	\$0.0	\$5.0	\$0.0	\$0.0
G & C	\$18.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$542.1	\$512.5	\$561.5	\$0.0	\$0.0

D. PROJECT DESCRIPTION

Increased utilization of aspen and mixedwood stands has caused the focus of the project to shift from softwood-oriented R & D on mixedwood sites to an emphasis on aspen silviculture in mixedwood and hardwood management. It also focuses on research into innovative approaches to mixedwood management, targeting silviculture systems that complement successional trends and take advantage of the natural regeneration capabilities of both coniferous and hardwood species in mixedwood and hardwood ecosystems. It adopts ecological principles of site classification as the basis for development of silviculture systems and stocking standards, and studies soil-plant interactions that impinge on silvicultural operations associated with site disturbance and productivity decline. It integrates appropriate knowledge bases into Regeneration/Silviculture modules for Decision Support Systems used in aspen and mixedwood management.

1. Environment Assessment Review Process

None of the activities of the project (NOR 10-08, NOR 10-12, NOR 10-13) were found by the NoFc Environmental Screening Committee to be detrimental to the environment. The experimental application of herbicides in Study NOR 10-12 is done under permits issued by Alberta Environment.

2. Collaborators/Green Plan Resource Summary

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u>	<u>Upcoming</u>	<u>Planning 1</u>
	\$000s				
Primary					
Total					
Green Plan					

3. Collaborators:

Secondary

The Forest Engineering Research Institute of Canada (FERIC)
 Alberta Environmental Protection
 Saskatchewan Department of Environment and Resources Management
 Manitoba Department of Natural Resources
 Weyerhaeuser Canada Ltd., Drayton Valley, Alberta
 Millar-Western Industries Ltd., Whitecourt, Alberta
 Weldwood of Canada Ltd., Hinton, Alberta
 Daishowa Canada Co. Ltd., Peace River, Alberta
 MacMillan-Bloedel Ltd., Hudson Bay, Saskatchewan
 Abitibi-Price Ltd., Pine Falls, Manitoba

Green Plan

Provided (from NOR 10-03) recorded historical information to contractor (I.D. Systems Ltd.) in preparation of a Green Plan report, "Sustainable development in boreal mixedwood ecosystems".

5. Milestones

1993-94:

1. Remeasure plots for aspen and white spruce regeneration and growth in the first white spruce understory project; collect data for wind damage assessment; initiate post-harvest assessment of co-op trees on second understory trial at Peace River, and establish plots for monitoring wind damage.
2. Maintain study plots in 35-year old lodgepole pine stands at Hinton to determine cause of 1992-93 damage and mortality.
3. Continue vegetation management study by analysis and interpretation of 1992 data; submit for publication manuscript on site preparation effects on aspen regeneration; prepare draft of journal publication, "Glyphosate residuals in the wood of treated trees", complete manuscript on fifth year performance of planted white spruce and lodgepole pine on a vegetation management trial.
4. Coordinate competition and juvenile stands study by publishing FMN on application of competition index to aspen stands, submitting journal paper on interactive growth of aspen and lodgepole pine in juvenile stands, and analyzing and modelling competition relationships.
5. Revise file report, "Silviculture systems for minimizing wind damage in release of white spruce understory", for publication.
6. Continue work on aspen regeneration knowledge base for DSS by analyzing and interpreting Saskatchewan regeneration survey data, and formulating the knowledge base and decision trees for an aspen regeneration module.
7. Participate in development of mixedwood DSS by providing recommendations regarding the feasibility of using externally-developed silviculture modules for DSS in this Region.
8. Draft journal papers, "Juvenile growth of aspen of seed and sucker origin", and "Aspen ingress of seed origin on lodgepole pine cutovers in Alberta".
9. Continue studies on site sensitivity to harvesting impacts by interpreting site sensitivity survey and soil data in Saskatchewan, interpreting 1992 skid trail data at Edson, and initiating harvesting impact study in cooperation with FERIC and Weyerhaeuser Canada Ltd.
10. Draft Information Report on the effect of soil disturbance on growth of lodgepole pine on 15-year old cutblocks at Grande Prairie.

11. Develop protocol for greenhouse study to determine the effect of soil compaction on suckering of aspen root cuttings.
12. Initiate soil characterization of experiment areas within the first white spruce understory project at Drayton Valley, Whitecourt, and Hinton.

6. Accomplishments

1992-93

1. Remeasured white spruce understory project for aspen/white spruce regeneration, growth and blowdown; published contract report, "Protecting white spruce understories when harvesting aspen" and assessed feasibility of conducting similar trials with younger age classes and site differences.
2. Prepared Information Report "Factors affecting survival of immature lodgepole pine in Foothills of west-central Alberta.
3. Completed remeasurement of satellite trials and single-tree preharvest trial, and drafted publication on site preparation and aspen regeneration.
4. Prepared FMN for review and initiated draft of journal publication on competition and growth of young lodgepole pine-aspen stands.
5. Initiated and completed contract on planning for new white spruce understory project, completed wind damage assessment on operationally harvested cutblocks and prepared technical report, "Silvicultural systems for minimizing wind damage".
6. Continued literature review, compiled database from Saskatchewan regeneration survey.
7. Assessed development of silviculture modules and related components, nationally; managed contract for preparation of white spruce monograph and initiated contract for assessing availability of information for white spruce regeneration knowledge base.
8. Reviewed second year of field data collected on aspen cutblocks in Saskatchewan and completed soil survey (under contract); initiated retrospective study of the impact of skid trails and landings on aspen regeneration in Alberta.
9. Completed field data collection in the study of the effects of site disturbance on growth of lodgepole pine on 15-year-old cutblocks; data analysis in progress.
10. Completed analyses of soil bulk density and porosity data, collected to determine the effect of skid trails on aspen regeneration.

7. Link to Strategic Plan:

National:

The project is linked to two of the four national strategic areas, namely, a) forest environmental quality, and b) science and technology. Its work seeks to minimize forestry activities that are harmful to the environment and, in a broader sense, addresses the sustainability of forest development, through research.

Regional:

The project is linked to the 1988-95 Strategic Initiatives as follows:

i) Improvement and sustainability of wood supply

It conducts silviculture research in the context of mixedwood and hardwood management, and

ii) Research, development, and innovation

Innovative research programs are conducted. An example is the white spruce understory project which received the Forestry Canada Forestry Innovation Award.

Among the program thrusts for 1990-95, the project is linked most closely to:

iii) Development of operational DSS for integrated management of boreal mixedwood and aspen forests;

iv) Development of research priorities for integrating and applying forest management activities in support of sustainable development of nontimber forest resources and values;

v) Establishment of a Technology Development Unit; and

vi) Development of an Aspen Innovation Centre.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 7.1993

1. **STUDY TITLE:** Silvicultural investigations
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Mixedwood Silviculture
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Alberta, Saskatchewan, Manitoba
7. **Study Staff:**

	Name
Study Leader	S.Lux
Team Members	C. Rentz
	S. Navratil
	P. Todd

8. **Study Key Words:** Mixedwoods, planning, free-to-grow, stand tending, early stand development, harvesting and mechanization of silviculture, forest management systems, technology transfer
9. **Study Activity:** 2223, 2211
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
S. Lux	EG-05 (T)	0.50	0.50	0.50		
C. Rentz	EG-05 (T)	0.75	0.75	0.70		
S. Navratil	SE-RES-03 (P)	0.00	0.00	0.10		
P. Todd	FO-01 (P)	0.00	0.00	0.50		
FTEs		1.50	1.50	1.80		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	00.00	00.00			
O&M	23.88	33.60			
Capital		5.00			
G & C					
TOTAL:	23.88	38.60			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	10-83	1.90	0.00			
Capital						
G & C		18.00	0.00			
TOTAL:		19.90				

STUDY TOTAL		38.60			
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11. Study Background and Problem Analysis

A sustained and even increased supply of economically usable timber is a key element in the long-term economic health of Northwest Region and of Canada as a whole. Timber supply is affected by many factors, including available capital, accessibility and marketability of different species, utilization standards, process technology and efficiency, land base and changes in land allocation, losses to insects, disease and fire scale and effectiveness of silvicultural practices and possibly major climatic shifts (greenhouse effect).

Changes in any of these factors can affect timber supply and the nature and extent of silvicultural problems.

Currently one of the most acute regional silvicultural problems revolves around the need to successfully establish and bring softwood (both pine and spruce) to a free-to-grow state on mixedwood sites. Mixedwoods occur in a wide variety of site, age, composition and condition classes in the Northwest Region. Spruce understories are common. Previous work on harvesting to protect understories has not addressed the urgent need for layout and harvesting strategies to mitigate blowdown, especially on fresh to moist sites. Stand selection criteria which adequately reflect blowdown risk based on tree, stand

and site factors are required. This requires a landscape rather than individual cutblock or stand approach. There is a need for modified standards and survey techniques which address common density-stocking patterns in various mixtures of "advanced" growth protected understory and new deciduous regeneration following harvest, and subsequently for growth and yield methodologies which can deal with such conditions.

12. Study Objectives:

i) Objectives:

1. To assess harvesting and tending options in mature mixedwood stands on fresh to moist sites to mitigate spruce blowdown risk following aspen harvest.
2. Develop stand selection criteria based on tree stand stability and site to factors which reflect blowdown risk for spruce.
3. Develop and initial growth and yield framework for stands following harvest to protect understory spruce.
4. To conduct silviculture R&D and publish scientific and technical reports of silvicultural interest, regionally and nationally, within a forest management systems (DSS) framework, including harvesting, regeneration and early stand tending sub-systems.
5. To provide liaison and input as required to harvesting and mechanization of silviculture programs (FERIC), emphasizing biological aspects, and to promote the development and dissemination of silvicultural knowledge through work with national, regional, and local committees, workshops and other related techniques.

ii) Deliverables

Short Term (1-5 years)

To provide baseline information for project 1480 of aspen and spruce regeneration, and white spruce residuals for growth and yield.

To collect pre and post harvest baseline inventory data relating to C/A PAIF 8032

Long Term (5 years and beyond)

To develop silvicultural and harvesting options for management of Boreal Mixedwoods.

iii) Significant Linkages:

Provide data for NOR 10-12 and C/A PAIF 8033 in regard to wind damage information

13. Progress and Achievements

Project 1480 demonstrated the integration of silvicultural and harvesting techniques for protecting white spruce understoreys in mixedwoods. The operational testing of the two-stage harvesting and tending model was completed on a variety of mesic sites. The results of this experiment will be valuable for future R&D supportive of new provincial and industrial mixedwood management strategies.

14. Goals and Accomplishments (1992-93)

1. *Continue protection of understorey white spruce project. (Lux, Navratil, Rentz)*

a. *Remeasure all plots for aspen and spruce regeneration, and white spruce residuals for growth and blowdown.(Lux, Rentz)*

All planted and naturally regenerated white spruce were tallied and added to the data base. The remeasurement of the aspen regeneration and the white spruce residuals was postponed until fall of 1993 to give 5-year growth results. All blowdown in the plots was assessed.(Lux,Rentz)

b. *Publish Progress report prepared on contract by Brace. (Navratil and Lux)*

Three reports were prepared by Brace Forest Services under contract. These include an establishment report, a status report and a Canada-Alberta progress report all entitled "Protecting White Spruce Understories When Harvesting Aspen". (Navratil, Lux)

c. *Provide input to wind damage study report (NOR-10-12) (Lux)*

All wind damage data collected under NOR-10-03 is available for input to wind damage study NOR-10-12 (Lux, Rentz).

d. *Assess feasibility and design, and coordinate continuation of white spruce understorey trials addressing younger age classes and site differences, link to wind damage work of NOR-10-12 and FERIC studies. (Navratil, Lux)*

A proposed C/A PAIF study Project 8032 "Harvesting to Favor White Spruce in Boreal Mixedwoods" was approved. Contracts with Brace Forest Services and FERIC are in progress to develop work and logging plans to assess harvesting and tending options in mature mixedwood stands on a variety of sites to mitigate spruce blowdown risk following aspen harvest. These harvesting options are based on the report "Silvicultural Systems for Minimizing Wind Damage in Released White Spruce Understory" by S.Navratil. Sites have been selected and a preliminary layout has been established.

e. *Participate in white spruce understorey committee. (Lux)*

Have participated in white spruce understorey committee relating to C/A PAIF 8032 (Navratil, Lux)

2. *Participate in evaluation of old Forestry Canada field trials related to mixedwood management. (Lux, Rentz)*

Approximately 40 plots have been located and reestablished throughout Alberta of A-15 "Growth of white spruce following partial cutting in Alberta" and PAIF funding provided to remeasure and analyze next year NOR-0402 under proposed contract. (Lux, Rentz)

3. *Continue and coordination with FERIC future studies of harvesting and tending in mixedwoods and participate in FERIC review committee. (Lux)*

Continued to work with FERIC on new mixedwood harvesting study.

4. *Continue to maintain and update plot reservation files on vax (Lux, Rentz)*

Plot reservation assistance and updating of reservation system was upgraded as required.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports

Three reports produced on contract by Brace Forest Services:

1. Establishment report "Protecting White Spruce Understories When Harvesting Aspen"
2. Status report "Protecting White Spruce Understories When Harvesting Aspen"
3. PAIF report "Protecting White Spruce Understories When Harvesting Aspen"

- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer:

16. Goals 1993-94

1. Remeasurement of Project 1480 on all plots for aspen and spruce regeneration and white spruce residuals for growth and yield after the growing season. (Lux, Rentz, Todd)
2. Collect baseline data for C/A PAIF project 8032 consisting of pre-harvest inventory and data required for wind damage assessment. (Rentz, Lux)
3. Establish pre-harvest plot boundaries and initiate post-harvest assessment of future crop trees on the new trial of project #8032, Daishowa Canada FMA. (Lux, Rentz)
4. Establish wind damage monitoring plots on new trial of project C/A PAIF 8032, Daishowa Canada FMA (Todd, Navratil) (Cross-reference to NOR-10-12)

5. Complete supervision of FERIC and Brace Forest Services contracts of project C/A PAIF 8032 (Navratil) b (NOR 10-12)

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name
Weldwood Canada	C/A FRDA 1480	Understory Protection	Bob Udell
Daishawa	C/A PAIF 8032	Understory Protection	Steve Luchkow
Blueridge Lumber	C/A FRDA 1480	Understory Protection	Brian Davies

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment. PAIF study 8032 has not been reviewed and will be passed on when logging plan and project plan become available for review.

ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 7, 1993

1. **STUDY TITLE:** Evaluation of mortality in stands of young trees in plantations and scarified areas
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Mixedwood Silviculture
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Alberta
7. **Study Staff:**

	Name
Study Leader	C.L. Rentz

8. **Study Key Words:** Jack pine, Pinus banksiana Lamb., lodgepole pine, Pinus contorta Dougl., white spruce, Picea glauca (Moench) Voss, insect damage, tree diseases, stocking standards, site classes, reforestation, browsing, rodent damage, technology transfer, juvenile tree survival and growth
9. **Study Activity:** 2222
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
C.L. Rentz	EG-05 (T)	0.25	0.25	0.20		
FTE		0.50	0.50	2.20		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	0.01	0.00			
Capital					
G & C					
TOTAL:	0.01	0.00			
STUDY TOTAL			0.00		

11. Study Background and Problem Analysis

In recent years, there has been an increased awareness that Canada's forests are not going to last forever without assistance from forest managers. Many of the areas that are harvested, or have been burned do not naturally regenerate themselves with the desired tree species and density, and require site preparation or planting in order to provide satisfactory stocking levels. Whatever the procedure used, the operation is expensive, especially if it has to be repeated on the same site. Surveys are therefore conducted in order to determine whether or not the area under consideration is adequately stocked. However, the standards for making this decision are somewhat arbitrary because of the tree mortality that will occur between the time when the survey is conducted and when the tree is finally ready for harvesting. At the moment, a value of 80% stocking is considered to be adequate, but this is not necessarily valid for all sites. With jack pine and lodgepole pine especially, there is every reason to believe that the amount of mortality will vary between sites. Some of this variability will be related to edaphic factors, but some will also be due to the differing effects of insect and disease attacks on trees in various sites.

What seems to be required, then, is an assessment of tree mortality from the time of establishment until crown-closure at age 25 to 35 years. An estimate of this mortality can be obtained by establishing plots in a number of different age classes, on a variety of sites, and assessing the mortality for a relatively short period of time. This will allow a composite survival curve to be drawn up for each ecological site, possibly in about 5 years, which can be modified as more information becomes available. These curves should provide the information needed to determine what modifications, if any, of the stocking standards in relation to site class are required.

Each sampling unit will be a plot of 20 trees, and as many of these plots will be established in each area as is practical, typically 40 such plots per area. Several replicates will be established in a number of site and age classes. They will then be examined periodically to determine the amount and cause of mortality.

Insect and disease attack on jack pine and lodgepole pine are probably more important than in white spruce. Therefore, initial emphasis will therefore be concentrated on these two species.

12. Study Objectives:

To determine whether or not pine tree survival from establishment to age 35 years is related to site conditions, and if so, to prepare a set of survival curves for each site class.

ii) Deliverables

Short Term (1-5 years)

Publish information report "Factors Affecting the Survival of Immature Lodgepole Pine in the Foothills of West-Central Alberta".(Ives)

Long Term (5 years and beyond)

iii) Significant Linkages:

13. Progress and Achievements

Analyses of the data collected in the Hinton study indicate that continuing the study for another five-year period would be very worthwhile. The present data cover a 7-year period (1981-88), and therefore do not include a complete snowshoe hare cycle. These animals are apparently increasing in numbers at the present time, and fresh damage is starting to increase. Atypical hare damage to the basal stem of 25-year-old trees was common in three sample areas during the peak of the last cycle, but may be an unusual case. The trees in several widely spread out areas are now approaching the same age, and continuation of study would allow an evaluation of how common this type of damage is.

Also, present life table construction depends upon pooling data from a large number of areas in order to cover the desired range in age classes. Another five years data for most of the areas would allow construction of more life tables since the amount of pooling required for their construction would be reduced. Four new plots have been established since 1984. A few plots should therefore be established in young regeneration, in order to provide an estimate of current mortality in young stands.

Analyses of the data on jack pine survival in Manitoba indicate that factors responsible for most of the mortality of lodgepole pine in Alberta are of minor importance for jack pine in Manitoba. The infrequency of examination precluded the construction of life tables for jack pine survival, but drought appears to be the most important factor. It was suggested that these plantations be examined in 1990 and again in 1991 but this was not possible and the future of the Manitoba data is now in question.

Rentz has been conducting all of the field work and data coding and editing for this study during the last six years. Ives retired in March 1989, and Rentz is now study leader. Ives will be available for advice on a part-time basis and should be able to prepare the information reports in 1991-92 if this is desirable.

14. Goals and Accomplishments (1992-93)

1. *Complete preparation of information report summarizing data collected between 1981 and 1991 inclusive.*

Preparation of information report entitled "Factors Affecting the Survival of Immature Lodgepole Pine in the Foothills of West-Central Alberta" is with author for revision and approval. Should be published after April 1 because of budget constraints.

2. *Prepare an establishment report.*

A rough draft has been prepared (Rentz)

3. *Upgrade established plots in Hinton area by replacing lost tags, moving tags from pins to branches, and repainting tagged trees as required.*

Upgrading of established plots in Hinton area was not accomplished due to lack of funding.

4. *Conduct an examination of sample trees in late July and August to determine the 1990-1992 mortality rate, assessing the amount due to various factors wherever possible.*

Twenty-six areas were examined and mortality and damage was assessed.

5. *Code, edit and store the data obtained from goals 3&4, and prepare a file report summarizing the data.*

Coding, editing and storage of data obtained from the twenty-six areas was completed. A file report was also completed.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports
- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer:

16. Goals 1993-94

1. Upgrade the twenty six areas in Hinton area by replacing lost tags, moving tags from pins to branches and repainting tagged trees as required.

2. Conduct an examination of sample trees in late July and August to determine the 1992-1993 mortality and damage rate due to various factors whenever possible.
3. Code, edit and store data obtained from goal 2, and prepare a summary file report.
4. Participate in a panel to discuss options regarding the future of this study and the direction it will follow.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name
Weldwood Canada Ltd.		Mortality Study	Bill Rugg

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: Jan. 07/03

1. **STUDY TITLE:** Aspen silviculture in mixedwood and hardwood management.
2. **Responsibility Centre:** Northwest Region (8133)
3. **Program:** Forest Resources
4. **Project Title:** Mixedwood Silviculture
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	S. Navratil
Team Members	D. MacIsaac
	F. Dendwick
	vice - R. Hayward (until Jan. 31/93)
	P. Todd
	3 summer students

8. **Study Key Words:** Aspen regeneration, aspen silviculture, white spruce regeneration, mixedwood silviculture, silviculture systems, vegetation management, competition estimates, release treatments, regeneration prescriptions
9. **Study Activity:** 2223

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
S. Navratil	SE-RES-03 (P)	1.00	1.00	0.90		
D. MacIsaac	FO-01 (P)	1.00	1.00	1.00		
F. Dendwick	EG-05 (T)	1.00	1.00	1.00		
P. Todd	FO-01 (P)	1.00	1.00	0.50		
FTEs		4.50	4.50	3.40		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	28.65	43.40			
Capital	5.34				
G & C					
TOTAL:	33.99	43.40			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries:						
Alta.	A8028	18.10				
	A8032	6.80				
	A8033	8.60				
	A8037	11.30				
	A8040	8.30				
	A8045	6.00				
Man.	M8026	6.60				
O&M:						
Alta.	A8028	27.90				
	A8029	85.00				
	A8032	103.20				
	A8033	41.40				
	A8037	8.70				
	A8040	31.70				
Man.	M8026	23.40				
	M8031	20.00				
Sask.	S8026	6.80				

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
Capital						
G & C: Sask.		8.20				
TOTAL:		422.20				

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries			0.00			
O&M						
Capital						
G & C	10-83		0.00			
TOTAL:			0.00			

STUDY TOTAL			465.40			
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11. Study Background and Problem Analysis

With dramatic increase in aspen utilization in the Prairie provinces successful renewal and management of hardwood and mixedwood stands becomes critical. In Alberta alone, annual harvest of aspen will reach 6 million m³ in 1991 and 8.5 million m³ in 1993 to satisfy the consumption of the current and newly announced forest industry. The 1991 aspen utilization level can be projected to about 50,000 ha of cutover area to be regenerated to aspen annually.

Necessary knowledge and techniques are urgently required to develop aspen silviculture systems responsive to the objectives of intensive and extensive management and hardwood and softwood production. R&D and technology transfer on regeneration, stand establishment and stand development that;

- a) encourage aspen regeneration and promote hardwood growth
- b) deter and control aspen competition for the benefit of softwood regeneration and resource on designated areas,
- c) ensure the optimal growth and stand development of mixed (aspen & conifer) regeneration and juvenile stands has become the most significant and pressing challenge.

NoFC has been in the forefront of R&D on aspen and vegetation management and the study in its present form combines current research needs and past experience. Foresters need tools, alternatives to herbicide use, for controlling unwanted aspen competition. Non-chemical methods of aspen control such as site preparation and mechanical release need to be tested more vigorously than in the past and their biological specifications developed. Similarly, pre-harvest, single-tree treatments are becoming more significant as environmentally safe methods. The trials in progress established under the 1989-90 Canada-Alberta FRDA Vegetation Management - Aspen control project reflect the above needs and new approaches such as mechanical release trials are in progress.

Industry and provincial governments have acknowledged the magnitude of regeneration and juvenile stand problems on mixedwood and softwood cover types. Competition assessments and free-to-grow projections to decide whether the renewal phase has been successful are in the forefront of current forestry issues. Particularly needed is information that will enable us to accurately estimate future growth, species composition, development and yield of new, largely mixed forest. In response, the work on aspen ingress, competition, growth trajectories in aspen-conifer regeneration and juvenile mixed stands has been expanded. This knowledge is a prerequisite for evaluating silvicultural treatments and for modelling and forecasting juvenile stand development. Its linkage with site classification (NOR-02) and Growth and Yield (NOR-4) will make it possible to rank sites and stands for treatments and silviculture investments and to relate juvenile stand growth to wood supply projections and management planning.

The expected greater use of forest management systems using a multidisciplinary approach and a variety of silviculture systems will require a synthesis of the knowledge on regeneration capabilities of aspen and associated species - white spruce, balsam poplar, white birch - and its integration with the better understanding and linkage of harvesting-renewal cycle. The ultimate goal of the acquisition of knowledge base is an expert system that predicts regeneration density and initial growth and stand development and advises decision-makers on the most suitable harvesting and silviculture strategies and treatments.

12. Study Objectives:

i) Objectives

1. To develop silviculture systems for management of the aspen resource in pure hardwood stands and as a component of mixedwood stands.
2. To conduct silviculture R&D on chemical and non-chemical means of aspen competition control for the maximum establishment and early development of conifers in mixedwood stands.
3. To assess aspen and balsam poplar ingress, competition, growth trajectories and juvenile stand development for formulation of silviculture treatments and management strategies for mixed stands.
4. To develop silviculture systems to enhance white spruce regeneration in the renewal of mixedwood and hardwood stands.

- 5. To develop knowledge bases and concepts for aspen and white spruce Regeneration/ silviculture modules of Decision Support Systems.

ii) Deliverables

Short Term (1-5 years)

- a. Silviculture prescription for the renewal of aspen stands including site sensitivity and harvesting impact guidelines.
- b. Vegetation management strategies for aspen control in Boreal mixedwoods.
- c. Stand tending guidelines for juvenile aspen-conifer stands, including juvenile growth projections and aspen reproductive biology.

Long Term (5 years and beyond)

- a. Alternative silvicultural systems for management of hardwood and mixedwood stands.
- b. Silviculture modules for Aspen and Mixedwood Decision Support Systems in the Northwest Region.

iii) Significant Linkages:

NOR 10-13	Edwards	Man. District Office (NOR 42)	Ball
NOR 10-12	MacIsaac	Sask. District Office (NOR 44)	Froc
NOR 04	Cieszewski, Bella	NoFC-TDU (NOR 37)	Sidders
NOR 07-04	Sidhu		
NOR 02	Corns		

13. Progress and Achievements

Direction and scope of the study has widened in response to the current R&D needs in mixedwood and hardwood management and NoFC Strategic Plan initiatives. The development of silviculture system for the aspen resource in hardwood and mixedwood stands and for associated species - white spruce and balsam poplar, remains the overall, ongoing goal.

The need for R&D into management of hardwood and mixedwood stands under the framework of forest land management system and for the development of Aspen and Mixedwood DSS (Northwest Region's Strategic Plan 1990-95) will require a sizable synthesis of the current and past knowledge on aspen regeneration and silviculture and white spruce regeneration.

As a result, the acquisition of knowledge bases and formulation of the Regeneration Modules for Aspen DSS and Mixedwood DSS have gained a high priority among the study components. A variety of regeneration options will need to be formulated for silviculture prescriptions (PHSPs) addressing a multitude of management, site and

silviculture alternatives. The Regeneration modules aim to integrate the regeneration silvics of aspen and associated forest tree species such as white spruce, balsam poplar and white birch, intensity levels of management, harvesting principles, site suitability and site limitations and other. Simultaneously, a strong emphasis is being placed on the concepts of silviculture systems, autecology and synecology of the species, dynamics of the renewal processes and stand development as opposed to decision-making on separate treatments.

Some aspects of this were initiated at a limited scale in 1991-92. The major efforts are now underway funded by the new PAIFs in the region and Green Plan initiatives.

Regeneration surveys (e.g., Saskatchewan Productive Forest Land Depletion Survey) in the region have raised concerns about deficiencies in aspen regeneration after harvesting hardwood and mixedwood cover types. The observed inadequate aspen regeneration likely results from a combination of site factors, topography and harvesting activities. One solution how to alleviate and prevent the problem is to develop a hazard rating system for predicting aspen regeneration deficiencies. The system, structured later as an expert system, would become an essential component of the Regeneration module of Aspen DSS. This work is linked to soil research study NOR 10-13.

The main components of R&D on aspen control are the trials established under the 1985-90 Canada-Alberta FRDA Vegetation Management project and the Single-tree treatment trial jointly with Weyerhaeuser Canada, Drayton Valley. All trials have progressed well and their continuation has been extended by funding from the new Alberta PAIF. Three new trials of competition release by non-chemical, mechanical means have been established and monitored in Alberta (Alberta Forest Service, Rocky Mountain House Forest and Weldwood, Hinton) and in Saskatchewan.

Further work concentrates on a better understanding of the processes that create competition linking aspen regeneration, aspen control and competition studies, and economic analysis of renewal alternatives for mixedwoods.

The extent of mixed regeneration after harvesting mixedwood and softwood cover types is increasing in the region. Our work on aspen ingress and competition in mixed regeneration has been designed to answer some of the concerns about competition, free-to-grow status and yield performance of mixed juvenile stands. Modelling approaches are, and will be increasingly used to define the dynamics of competition and stand development in mixed regeneration and to evaluate the validity of renewal and stand tending strategies. Intensive competition studies involving PSP establishment and long-term, sequential measurements will be needed to explain and model the interactive processes in crop tree response to competition and site. The outcome of this work will be recommendations to clients on free-to-grow issues and a Competition/Mixed regeneration module of Mixedwood DSS.

14. Goals and Accomplishments (1992-93)

1. *Act as Project Leader NOR-10 (pending staffing).*

Supervised and administered the project; the work involved research planning, staff work allocation and performance and management of financial resources.

Supervised the studies NOR-10-03 and NOR-10-08 in vice-Brace and vice-Ives capacity; supervised and managed 14 external contracts.

2. *Chair and report to SRAC on September 1992 RRTC meeting in Saskatchewan.*

Chaired the 1992 RRTC meeting and organized jointly with the TDU, NoFC Vegetation Management For Practitioners Workshop, Waskesiu, Sask.; reported to the Director General and MANFRAC.; on RRTC plan and R & D priorities.

3. *Continue Vegetation Management studies.*

a. *remeasurements of Satellite trials and Major Grande Prairie trial with modified methodology (Todd/Hayward/Sidhu C/A PAIF 8013; C/A PAIF 8037)*

All remeasurements completed as planned.

b. *remeasurements of Single-tree, preharvest treatment trial, Weyerhaeuser Canada (Hayward).*

Remeasurements completed by contract.

c. *report in a Forest Management Note on Site preparation effects on aspen regeneration (Navratil/Hayward).*

Draft of publication on Site preparation and aspen regeneration is in progress (Navratil/Hayward).

d. *prepare a draft of a paper Glyphosate residuals in the wood of treated trees, co-authored with J. Feng NOR-7-04 (Navratil).*

No progress in writing; partial results reported in two verbal presentations.

4. *Coordinate and provide input to the Competition study.*

a. *Complete and publish a Forest Management Note Application of competition index to young lodgepole pine-aspen stands in west-central Alberta, coauthored with MacIsaac.*

Forest Management Note has been reviewed and accepted for publication; currently with NoFC editors.

b. *Prepare a draft of a journal paper Competition and growth in young lodgepole pine-aspen stands in west-central Alberta, coauthored with MacIsaac.*

Initiated a draft; targeted for publication in Scand. Journal of Forest Research.

c. *Initiate a new study (MacIsaac).*

Pending the indeterminate staffing of D. MacIsaac.

Added Accomplishment:

- d. obtained funding for two projects on competition and juvenile stand development from C/A PAIF 8028 and C/M PAIF 8026 (Navratil, MacIsaac); field work and data collection initiated in Manitoba and Alberta (MacIsaac).
5. *Provide input into white spruce understory project (NOR-10-03) by:*
- a. *Planning and assessing opportunities for future studies of harvesting relevant to younger age classes, site differences and wind damage in cooperation with AFS, FERIC and forest industry jointly with Lux.*
- Obtained funding for the new project C/A PAIF 8032 (with Lux, Dermott, Alberta Forest Service and FERIC); coordinated the project with the Alberta white spruce understory committee (industry, AFS, FERIC); planned and managed as the scientific authority three contracts (Brace Forest Services, FERIC-West) for preparation of the report on C/A FRDA: 1480 and for planning of the new harvesting trials. The report has been completed and published.
- b. *Continuing wind damage studies in relation to goal (a).*
- Completed retrospective measurements of wind damage in operationally harvested cutblocks in Whitecourt, Peace River and Edson (with Todd).
- c. *Completing and publishing a review paper "Minimizing wind damage in the silviculture systems of boreal mixedwoods".*
- Prepared a technical report "Silvicultural systems for minimizing wind damage" The report has been accepted by Alberta White Spruce Understory Committee as a major guideline for the new harvesting trials.
- d. served as a member of Alberta White Spruce Understory Committee and supervised the ForCan component of the project Harvesting options to favor white spruce, C/A PAIF: 8032.
6. *Continue work on aspen regeneration knowledge base for DSS including:*
- a. *Extraction and interpretation of aspen literature;*
- Review of literature continued.
- b. *Compilation of data base on aspen regeneration and juvenile growth from available old and new ForCan studies, and provincial surveys, C/S PAIF:8035 (Todd) (pending C/A PAIF).*

The PAIF proposal for preparation of aspen regeneration knowledge base in Alberta was not funded; acquired Saskatchewan Provincial regeneration survey data and compiled data base (Todd).

7. *Participate in development of mixedwood DSS by planning and coordinating Regeneration/silviculture modules.*

Assessed the stage-of-progress in development of silviculture modules and related components in Canada.

8. *Continue work on aspen regeneration including, balsam poplar component, juvenile growth, dynamics of regrowth after release; link to the goal 6.*

- a. *participate in evaluation of aspen suckering trials of "old" CFS projects in Manitoba.*
- completed data collection in aspen-balsam poplar regeneration in Edson Forest (Dendwick);
 - established "Aspen response to release cut" study in Edson Forest (with Dendwick); to be linked to the Foothills Model Forest project.
- a. Prepared a workplan (see 9b) and made the field reconnaissance of the Riding Mountain CFS projects; priority in the 1992 remeasurements was given to the white spruce regeneration and silviculture systems trials.

9. *Plan and coordinate the project Silviculture systems for white spruce natural regeneration including:*

- a. *Scientific authority of white spruce natural regeneration monograph, C/M PAIF: 8031;*

Prepared and managed the contract for stage 1 of white spruce monograph (Western Ecological Services, Victoria); C/M PAIF:8031).

- b. *planning and supervising contracts for assessments of "old" CFS silviculture trials in Saskatchewan and Manitoba, C/M PAIF:8008; C/S PAIF:8022;*

Prepared a workplan (with J.Ball, Manitoba District Office) for the 1992 re-measurements of the Riding Mountain CFS trials, and supervised the contract (Waldron Forestry Services) in support of the project (C/M PAIF:8008).

- c. *Coordinating development of white spruce regeneration knowledge base for DSS;*

Initiated contract for assessing the feasibility of building up the knowledge base for white spruce regeneration module from publishing information.

- d. *Preparing a Compendium on silviculture systems;*

Information has been incorporated in the report "Silvicultural systems for minimizing wind damage in released white spruce understory"; further work on the compendium was not pursued due to duplication of efforts with the same work in progress at ForCan GLFC.

- e. *Participating in submissions of silviculture components under the Green Plan initiatives.*

Prepared proposals to the Foothills Model Forest, jointly with Weldwood of Canada and Univ. of Alberta; initiated field work, jointly with V. Lieffers, Univ. of Alberta on Green Plan, Forestry Practices project Dynamics of white spruce establishment.

10. *Continue work on site sensitivity/risk rating system for aspen regeneration under C/S PAIF:8026 jointly with Edwards (NOR 10-13) and Sidders (TDU). Assess the feasibility of similar work in cooperation with FERIC in Alberta, pending C/A PAIF.*
 - a. C/S PAIF:8026; 2nd year of field data collection in hardwood cutblocks completed according to the plan developed in 1991 (Hayward); soil survey of the same cutblocks completed by contract (R. Froc, Prince Albert District Office)
 - b. obtained funding C/A PAIF:8040) for the project "Site sensitivity systems for preventing aspen regeneration deficiencies" jointly with Edwards; retrospective study of hardwood cutblocks in Edson Forest involving the following tasks have been completed, regeneration assessments on skid trails and landings (Dendwick), large-scale air-photography and interpretation (contract), soil survey (contract), soil bulk density studies (Edwards). Plans for "active" harvesting impact study in 1993 jointly with FERIC, Weyerhaeuser Canada and Edwards (NOR 10-13) are in progress.

11. *Publish the paper "Aspen ingress of seed origin on lodgepole pine cutovers in Alberta".*

No progress in writing. Results in part reported in technology transfer presentations.

12. *Draft a paper on Juvenile growth of aspen suckers and seedlings, coauthored with C.Cieszewski. (NOR-4-10).*

No progress in writing.

13. *Continue technology transfer and committee involvement:*

- a. *Adjunct Professor and Graduate Studies Committees member, Department of Forest Science, University of Alberta.*
- b. *Adjunct Professor, School of Forestry, Lakehead University, Thunder Bay.*
- c. *Member of CIF/RMS Executive council.*
- d. *Forestry Canada Boreal Forest Silviculture Committee.*

a,b,c,d - served in the above capacities as needed;

Added accomplishments:

- e - served as the Co-chairman for North America of IUFRO S1.05.12 Working Party, Northern Silviculture

- f - responded to the technology transfer inquiries and gave presentations as listed under 15).

15. Information Activities

- i) Journal Publications: no journal publications in 1992/93
- ii) Information Reports: no information reports in 1992/93
- iii) Other reports:

Navratil, S. 1992. Silvicultural systems for minimizing wind damage in released white spruce understory. Unpublished Technical Report. Canada-Alberta PAIF. For. Can., North For. Cent., Edmonton, Alberta.

Navratil, S. and MacIsaac, D. (in press) 1993. Competition index for juvenile mixed stands of lodgepole pine and aspen in west-central Alberta. Forest Management Note, For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta.

Brace Forest Services, 1992. Protecting white spruce when harvesting aspen. Progress report, Can.-Alb. PAIF, For. Can., North. For. Centre, Edmonton. (Contract report, S. Navratil, scientific authority)

- iv) Lectures, courses, seminars and scientific addresses

Hayward, R.B. and Navratil, S. 1992. Single-tree pre-harvest treatment of aspen. Vegetation Management on Mixedwood Sites for the Practitioner. Regional Reforestation Technical Committee, Forestry Canada, Northern Forestry Centre Techn. Dev. Unit Workshop. Waskesui, Sask., August 24-27, 1992. (Workshop Presentation).

MacIsaac, D. 1992. Biodiversity and implications to resource management. Annual Peace River Region Forestry Lands and Wildlife Meeting, Peace River Alberta. Dec 10-11 1992. (Workshop Presentation with A. Landals and B. Stelfox).

MacIsaac, D. and Navratil, S. 1992. Competition indices in boreal mixedwood. Vegetation Management on Mixedwood Sites for the Practitioner. Regional Reforestation Technical Committee, Forestry Canada, Northern Forestry Centre Techn. Dev. Unit Workshop. Waskesui, Sask., August 24-27, 1992. (Workshop Presentation).

MacIsaac, D. and Navratil, S. 1993. Application of competition indices for lodgepole pine. Why Stand Tend: Options and Applications. Forestry Canada, Northern Forestry Centre Techn. Dev. Unit Workshop. Edmonton, Alb., March 10-11, 1993. (Workshop Presentation).

Navratil, S. 1992. Integrating aspen and balsam poplar autecology and vegetation management objectives. Vegetation Management on Mixedwood Sites for the Practitioner. Regional Reforestation Technical Committee, Forestry Canada, Northern Forestry Centre Techn. Dev. Unit Workshop. Waskesui, Sask., August 24-27, 1992. (Invited paper)

Navratil, S. 1992. Regeneration and vegetation management strategies for aspen on mixedwood sites. The role of vegetation management in sustainable forestry development, Can. Inst. of Forestry, Rocky Mountain Section, October 15-16, 1992, Peace River, Alberta. (Invited paper)

Navratil, S. 1992. Managing aspen regeneration. Farm Woodlot Symposium. Alb. Agriculture and Alb. Forestry, Lands and Wildlife, Dec. 8, 1992, Lac La Biche, Alberta. (Invited paper)

Navratil, S. 1992. Strategies for promoting and controlling aspen and balsam poplar regeneration. Annual Foresters Meeting. Alberta Forest Service, Lac La Biche, Alberta. (Workshop Presentation).

Navratil, S. 1992. Guest lectures on silviculture topics at University of Alberta.

v) Technology transfer:

Navratil, S. Demonstration and field tour documentation for the Chinese Delegation, Hinton.

Navratil, S. and Hayward, R. 1992. Management of aspen density on mixedwood sites. Field Tour Pamphlet. Can. Inst. of Forestry, Rocky Mountain Section, October 15-16, 1992, Peace River, Alberta.

16. Goals 1993-94

1. Transfer the Project Leader responsibilities to I. Edwards.
2. Chair and report on August 1993 RRTC meeting in Alberta; (pending staffing).
3. Continue Vegetation Management studies.
 - a. analyze and interpret data from the 1992 measurements of Major Trial Grande Prairie; Satellite trials A,B,C.; Single-tree treatment trial (vice R. Hayward and S. Sidhu) C/A PAIF:8037; C/A PAIF:8013.
 - b. complete and submit manuscript "Site preparation effects on aspen regeneration" to For. Mgmt Note or Forestry Chronicle (Navratil/Hayward).
 - c. prepare a draft of journal paper : Glyphosate residuals in the wood of treated trees, co-authored with J. Feng NOR 7-04.
 - d. Complete manuscript on Fifth year performance of planted white spruce and lodgepole pine on a vegetation management trial in Grande Prairie, ForCan Information Report (Todd).
 - e. remeasure three (3) mechanical release trials (3 year results) in Edson and Rocky Mountain House (Dendwick).

- f. interpret mechanical release trials in Saskatchewan, jointly with Sask. District Office. (NOR 44)
4. Coordinate and provide input to the Competition and juvenile stands study.
 - a. initiate a new study (MacIsaac).
 - b. publish For. Mgmt. Note, coauthored with MacIsaac.
 - c. complete and submit manuscript "Interactive growth of aspen and lodgepole pine in juvenile stands in Alberta", Scand. J. of For. Res. coauthored with MacIsaac.
 - d. start analysis of aspen-white spruce growth interactions and aspen morphology data.

The following are goals to be transferred to the new study NOR 10-XX (D. MacIsaac):

1. Alberta Aspen-Lodgepole Pine Competition
 - a. Complete and publish a journal paper on aspen lodgepole pine competition, coauthored with Navratil.
2. C/M PAIF:8026 - Competition and Juvenile in Mixed Regeneration
 - a. Complete analysis of relationship between hardwood competition indices and white spruce from western Manitoba.
 - b. Validate competition index for black spruce for Duck Mountain area, against 1991 Pine Falls area data.
 - c. Develop ecological thresholds for black and white spruce for use in the design of Free-to-Grow standards.
 - d. Continue summer data collection (jack pine, or black spruce in Northern Manitoba).
3. C/A PAIF:8028 - Hardwood Competition and Growth of White Spruce in Mixed Regeneration.
 - a. Continue analysis and modelling of competition relationships.
 - b. Continue data collection of white spruce-hardwood competition.
4. Aspen Growth/Morphology
 - a. Assist in analysis of aspen morphology data set, with Navratil
5. Provide input into C/A PAIF: 8032 project: Harvesting options to favor white spruce in Boreal mixedwoods and supervise C/A PAIF:8033 project: Wind risk criteria and remeasurements.

- a. establish wind damage monitoring plots on the new trial of the project C/A PAIF: 8032, Daishowa Canada FMA (Todd/Navratil). (cross-referenced with NOR 10-03, C/A PAIF:8033).
 - b. complete supervision of the 1992-93 FERIC and Brace Forest Services contracts of the project C/A PAIF: 8032 (NOR 10-03).
 - c. complete supervision of Wind measurement, University of Alberta contract, C/A PAIF: 8033.
 - d. upgrade the C/A PAIF: 8033 file report "Silviculture systems for minimizing wind damage in release white spruce understory" for publication in Forestry Chronicle or as a Green Plan Forest Practices Report (NOR 36-88).
6. Continue work on aspen regeneration knowledge base for DSS.
- a. analyze and interpret Saskatchewan Provincial regeneration survey data base (with Todd).
 - b. initiate formulation of the knowledge base and decision trees for aspen regeneration module (tentative, pending the time allocation of three months and funding from the Green Plan DSS, assistance from a knowledge engineer).
7. Aspen regeneration and autecology.
- a. analyze and interpret the 1992 data from Balsam poplar residuals effects on aspen regeneration study (with Dendwick).
 - b. continue Aspen re-growth after release cut study by establishing trials in 10 - 15 year old stands; link to the Foothills Model Forest projects (with Dendwick).
 - c. draft a paper "Juvenile growth of aspen of seed and sucker origin", coauthored with C.Cieszewski (NOR-4-10).
 - d. publish the paper "Aspen ingress of seed origin on lodgepole pine cutovers in Alberta" in Can. J. For. Research.
8. Coordinate the project Silviculture systems for white spruce natural regeneration.
- a. scientific authority of White spruce natural regeneration monograph, C/M PAIF:8031. (in 1993/94 stage 2: manuscript preparation)
 - b. assessments of "old" CFS silviculture trials:
 - in Manitoba, C/M PAIF participate in interpretation of growth and yield and aspen trial; jointly with I. Bella and J. Ball.
 - in C/A PAIF:8043; jointly with I Bella, NOR 04.
 - c. participate in Dynamics and ecology of white spruce understory studies with V. Lieffers, Univ. of Alberta, C/A PAIF:5015, C/A PAIF: 8045 and Green Plan, Forestry Practices.

9. Site sensitivity to harvesting impacts on aspen regeneration.
 - a. analyze and interpret aspen site sensitivity survey in Saskatchewan, jointly with Sidders (TDU-NoFC NOR 37) and soil survey jointly with Edwards (NOR 10-13). C/S PAIF:8026).
 - b. analyze and interpret the 1992 data of "retrospective" study (skid trails and landings) in Edson forest (with Dendwick) and link to soil bulk density studies of Edwards(10-13).
 - c. initiate "active" harvesting impact study with FERIC and Weyerhaeuser Canada, pending the preparation of plans under contract with FERIC, jointly with Edwards (NOR 10-13), C/A PAIF:8040.
10. Continue remeasurements (AFS contract), analysis (contract) and interpretation of Alb. PAIF project coniferous performance and aspen regeneration on site-prepared areas, jointly with Reforestation Branch, Alberta Forest Service, C/A PAIF:8029.
11. Continue committee involvement and continue technology transfer.
 - a. Forestry Canada Mixedwood Silviculture Committee; assist in planning of the 1994 Mixedwood Symposium.
 - b. Co-chairman for North America of IUFRO S1.05-12 Working Party Northern Silviculture; coordinate the 1994 Working Party meeting with the 1994 Mixedwood Symposium and verify memberships in Canada and USA.
 - c. Adjunct Professor and Graduate Studies Committees member, Department of Forest Science, University of Alberta.
 - d. Adjunct Professor, School of Forestry, Lakehead University, Thunder Bay.
 - e. technical and professional presentations as required.
 - f. prepare and present an invited paper Vegetation Management Strategy for aspen in Boreal mixedwoods, Vegetation Management Conference, Vancouver, November 1993
12. Complete training under Development leave Jan. 11 - Apr. 9 / 1993.

17. Major Co-operators:

i) Internal - FC

Region	ID #	Title	Contact name
NWR	NOR-10-03	Silvic. investigations	S. Lux
NWR	NOR-10-13	Forest soils	I. Edwards
NWR	NOR-07-04	Environmental impact of herbicides	S. Sidu
NWR	NOR-04	Stand Productivity	I. Bella C. Cieszewski
NWR	NOR Manitoba PAIF 8008	Remeasurement of "old" CFS silviculture trials	J. Ball
NWR	Alb. PAIF 8043	Remeasurement of "old" CFS silviculture trials	I. Bella

ii) External -

Establishment	ID #	Title	Contact name
Univ. of Alberta	Green Plan For. Pract.	Dynamics of white spruce	V. Lieffers
FERIC	Alb. PAIF 8032	Harvesting options	T. Sauders
Alb. For. Serv.	Alb. PAIF 8029	Coniferous and aspen regeneration	D. Patterson K. Branter
FERIC	Alb. PAIF 8040	Site sensitivity	T. Sauders
Weldwood Canada	Model Forest	Silviculture research	W. Rugg
Daishowa Canada	Alb. PAIF 8032	Harvesting and silviculture systems	S. Luchkow

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 7, 1993

1. **STUDY TITLE:** Forest Soil Research In Boreal Mixedwood Management
2. Responsibility Centre: Northwest Region (8133)
3. Program: Forest Resources
4. Project Title: Mixedwood Silviculture
5. Office Location(s): Edmonton, Alberta
6. Work Location: Grande Prairie, Edson, Hinton, Drayton Valley, Whitecourt, AB;
Hudson Bay, Saskatchewan
7. Study Staff:

	Name
Study Leader	I.K. Edwards
Team Members	J.J. van Dyk
	[Student]

8. Study Key Words: Soils, harvesting, soil disturbance, site degradation, regeneration, juvenile growth, site productivity, stand development, Picea glauca (Moench) Voss, Pinus contorta Dougl., Populus tremuloides Michx., Populus balsamifera L.
9. Study Activity: 2222
10. Study Resources:

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
I.K. Edwards	SE-RES-02 (P)	1.00	1.00	1.00		
J.J. van Dyk	EG-05 (T)	1.00	1.00	1.00		
[Student]						
FTEs		2.00	2.00	2.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	9.04	12.00			
Capital					
G & C					
TOTAL:	9.04	12.00			

STUDY TOTAL		12.00			
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11. Study Background and Problem Analysis

Development of technology for utilization of aspen for pulp and assorted wood products has resulted in a sharp increase in interest in, and importance of, this tree species. The increased utilization of aspen has presented forest managers of boreal mixedwood and aspen ecosystems with new problems, not the least of which relates to stand management. For example, depending on the system used in harvesting boreal mixedwood forests, the result is a range in disturbance of soil and site conditions. The degree of disturbance manifests itself in problems related to regeneration, competition, juvenile growth, and, subsequently, stand development.

Currently, in harvesting the dominant species or overstorey in a mixedwood stand, consideration has to be given to preservation of the sub-dominant species or understorey component of the stand. Frequently, when the stand is opened by selective harvesting, the remaining trees are prone to windthrow and/or blowdown. Soil characteristics are implicated in these phenomena. Therefore, characterization of soils in mixedwood and aspen stands, determination of the relationship between such characteristics and windthrow/blowdown phenomena, and development of a windthrow hazard rating for soils within such stands is a priority.

Investigation and solution of problems encountered in the management of boreal mixedwood and aspen ecosystems will facilitate development of a Decision Support System (DSS) or technical modelling framework, through which forest managers will be assisted in using the land judiciously and with minimal impact on productivity. [Development of operational DSS for integrated management of boreal mixedwood and aspen forests is one of the new program thrusts of the regional Strategic Plan.] Completion of an adequate DSS, including contributions based on studies of soil-plant interaction, will provide relevant prescriptions for enlightened harvesting, site preparation, and stand establishment/management practices in boreal mixedwood and aspen forests.

Completion of an adequate management framework for boreal mixedwood and aspen ecosystems within the Northwest region should include studies of soil-related problems, particularly those concerning the assessment of site disturbance and the effects of forest management activities on vegetational succession. Also, soil compaction, following harvesting, is known to increase bulk density and reduce plant establishment and growth over the long term. Development of a DSS should include measures for the avoidance or mitigation of such disturbances, based on sound forest soil studies, including a review of relevant historic Forestry Canada R & D in the Northwest Region. The maintenance of long term productivity is compatible with the principle of sustainable forest development as stated in the national Strategic Plan.

12. Study Objectives:

i) Objectives

1. Plan and conduct forest soil research and development studies to solve soil-related problems in mixedwood management. [National and Regional Strategic Plans]
2. Provide knowledge, advice, and consultation related to regeneration, competition, juvenile growth, and stand development for a range of disturbed and undisturbed soil and site conditions for major tree species in boreal mixedwood forests, within a DSS framework. [Regional Strategic Plan]
3. Prepare and supervise contracts related to forest soil research and development in the Northwest Region. [National and Regional Strategic Plans]
4. Plan and conduct research to promote and expedite transfer of soil science information relevant to nursery and regeneration problems among forestry clientele. [National and Regional Strategic Plans]

ii) Deliverables

Short Term (1-5 years)

1. Prepare report on the effect of soil disturbance on regeneration and growth of lodgepole pine on 15-year old cutblocks. [National and Regional Strategic Plans] (Objective #1)
2. Prepare preliminary report on the relationship between soil disturbance and regeneration and growth of aspen on 8-year old cutblocks. [National and Regional Strategic Plans, Canada-Alberta PAIF] (Objective #1)

Long Term (5 years and beyond)

1. Prepare report on criteria and guidelines for managing aspen sites that are sensitive to post-harvest impacts on regeneration. [Regional Strategic Plan, Canada-Alberta PAIF] (Objective #1)

2. Publish a site sensitivity rating system for preventing deficiencies in aspen regeneration. [Regional Strategic Plan, Canada-Alberta PAIF] (Objective #1)
3. Provide information on the relationship between soil properties and aspen regeneration, for use within a DSS framework. [Regional Strategic Plan] (Objective # 2)

iii) Significant Linkages:

(Regional): Geographic Information Systems, Forest Inventory and Site (NOR-2); Environmental Stresses on Forest Ecosystems (NOR-7); Model Forests (NOR-26); Canada-Alberta PAIF (NOR-44); Canada-Saskatchewan PAIF (NOR-46); Weldwood of Canada Ltd., Hinton, AB; Alberta Forest Service; Saskatchewan Department of Parks and Renewable Resources.

(National): Green Plan (Forestry Practices); Model Forests.

13. Progress and Achievements

Up to and including 1991-92

The study was initiated in April 1991. A review of the literature on forest soils, particularly regarding aspen regeneration and growth, has been completed. Also, literature on the impact of harvesting on soil physical and chemical characteristics has been reviewed. Soil samples from seven-year old aspen cutblocks were collected within and away from skid trails and analyzed for texture, bulk density, and porosity. These physical characteristics have been correlated with height, diameter, and mean annual increment of aspen suckers that have regenerated following logging. The results indicated an inverse relationship between bulk density and growth of suckers, demonstrating that soil compaction along skid trails is, probably, responsible for the poor growth, compared with that in less disturbed areas. Also, the more clayey soils showed higher negative regression coefficients, indicating that they were more sensitive to disturbance, i.e. small increases in bulk density following harvesting resulted in sharp decreases in growth of aspen suckers.

14. Goals and Accomplishments (1992-93)

[Note: Goals shown in the 1992-93 Study Work Plan have been rewritten more succinctly and, although the revisions were shown on the Performance Appraisal document for 1992-93, the Study Work Plan was, inadvertently, not changed. The goals below reflect the revisions whereas the numbers in brackets refer to the earlier version.]

1. *Review literature and develop list of relevant soil parameters that are required for formulation of concepts and knowledge base in mixedwood and aspen DSS. (# 1)*

Initiated review of literature on DSS, with particular emphasis on soil characteristics that adequately describe boreal mixedwood and hardwood sites. Attended demonstration of a DSS prototype, featuring "windows", and developed by R. Yang.

2. *Initiate soil characterization of experiment areas within the white spruce understorey project at Drayton Valley, Whitecourt, and Hinton. (# 5)*

This goal was not accomplished because of insufficient time.

3. *Analyse soil data collected to determine the relationship between soil disturbance during harvesting and aspen regeneration (in cooperation with NOR 10-12: Navratil). (# 3)*

Over 350 soil samples were collected along transects across skid trails on five 7-year old aspen cutblocks and from neighbouring uncut (Control) stands. The soil samples were analyzed for bulk density, porosity, available water capacity, and texture. Regression equations were developed to express the relationship between soil physical properties and growth of aspen suckers.

4. *Develop protocol for a greenhouse study to determine the effect of soil compaction on suckering of aspen root cuttings. (# 3)*

Reviewed literature on propagation of aspen by root cuttings under greenhouse conditions. The review indicated that the effect of soil moisture on sprouting has been tested but the effect of compaction was yet to be determined.

5. *Conduct an assessment of soil disturbance on growth of lodgepole pine on 15-year old cutblocks in the Grande Prairie Forest. (# 4)*

Six pairs of "disturbed" and "undisturbed" sites were selected in each of three cutblocks (total 175 ha). Growth data (height, root collar diameter, and age of all dominant and codominant trees) were collected and over 230 soil samples were analyzed for bulk density, porosity, available water capacity, and texture. Data analysis and interpretation are in progress.

6. *Review soil data from aspen cutblocks near Hudson Bay, Saskatchewan and contribute to development of site sensitivity rating (in cooperation with NOR 10-12). (# 6)*

Initiated review of soil data from 10-year old aspen cutblocks near Hudson Bay, Saskatchewan. Many sites have become wetter following logging; this was indicated by the juvenile development of gleying within the profile. Further review will include the growth data for aspen suckers.

7. *Prepare progress report on greenhouse study of acidification of soil from Weldwood Canada planting site near Hinton. (#10)*

Progress report prepared. The site is extremely alkaline owing to the presence of free calcium carbonate and neutralization by a single application of sulphuric acid was not permanent. Local provenances of lodgepole pine and white spruce survived only if the soil is kept moist. Cost-effective rehabilitation of the site would require repeated application of an inexpensive acidifying agent such as elemental sulphur.

8. *Initiate planning and prepare soil survey contract for aspen cutblocks used in joint (Navratil, Edwards, FERIC) development of a site sensitivity rating system with respect to aspen regeneration. (Subject to approval of Canada-Alberta PAIF proposal.)*

The goal was accomplished by S. Navratil. Reprofiting of funds followed approval by the PAIF committee and a contract was let in the latter part of the year. The work has been completed. The Agreement proposal was approved (C/A PAIF Project No. 8040).

9. *Initiate planning and review soil disturbance parameters that are relevant to assessment of the impact of forestry practices on hardwood ecosystems (in cooperation with FERIC and University of Alberta). (Subject to approval of Canada-Alberta PAIF proposal.)*

Initiated review of soil disturbance parameters that are used to estimate the impact of practices on hardwood ecosystems. The PAIF proposal was combined with those of Corns (NOR 2) and Maynard (NOR 7); a proposal for funding under the Forestry Practices initiative of the Green Plan is being developed.

15. Information Activities

i) Journal Publications

Nil

ii) Information Reports

Nil

iii) Other reports

Edwards, I.K. 1992. Effect of acidification on soil from a Weldwood Canada planting site: a progress report. For. Can., North. For. Cent. File Report.

Edwards, I.K., compiler. 1992. Proceedings of the 1989 Prairie Federal-Provincial Nurserymen's Meeting. Smoky Lake, AB, September 14-15, 1989. Final Draft.

iv) Lectures, courses, seminars and scientific addresses

Edwards, I.K. 1992. Water quality for growing tree seedlings. Lectures given as part a course, "Introduction to Forest Seedling Production", to 50 contract-growers of tree seedlings, at Olds College, Olds, AB, December 8-10, 1992.

v) Technology transfer:

J. Chernysh, Superintendent, Prince Albert Nursery: interpretation of water quality analysis and recommendations.

B. MacDonald, Greenhouse Manager, Blue Ridge Lumber Co., Whitecourt: options for water treatment at the facility.

S. McDougald, Weyerhaeuser Canada Ltd., Prince Albert: interpretation of soil analysis and recommendations for fertilization of seed orchard.

P. Chapman, Manitoba District Office: recommendations for application of acid solution to seed orchard at Birds Hill, MB.

16. Goals 1993-94

1. Prepare a report on the effect of soil disturbance on growth of lodgepole pine on 15-year old cutblocks in the Grande Prairie Forest. [Forest Management Note]
2. Initiate planning, review FERIC proposal, and develop work plan for a joint (Navratil, Edwards, FERIC) study of the impact of seasonal harvesting methodologies on aspen regeneration in boreal mixedwood ecosystems. [Canada/Alberta PAIF: 8040]
3. Develop protocol for a greenhouse study to determine the effect of soil compaction on suckering of aspen root cuttings.
4. Initiate soil characterization of experiment areas within the white spruce understory project at Drayton Valley, Whitecourt, and Hinton.
5. Review plant growth and soil data from aspen cutblocks near Hudson Bay, SK and prepare preliminary site sensitivity rating (in cooperation with NOR 10-12: Navratil).
6. Develop proposal and initiate work [in cooperation with NOR 2 (Corns) and NOR 7 (Maynard)] to assess the impact of forestry practices on mixedwood and hardwood ecosystems. [Subject to approval under Green Plan: Foothills Model Forest]

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
NWR	NOR 10-12	Aspen Silviculture	S. Navratil
NWR	NOR 2-01 NOR 7-01	Forest Ecology Environmental Impact	I. Corns D. Maynard

ii) External -

Establishment	ID#	Title	Contact name
FERIC	C/A PAIF 8040	Site Sensitivity	Tony Sauder
Weldwood	Model Forests NOR 26	Soil Amelioration	Diane Renaud
AFS	NOR 10-13	Soil Disturbance	David Patterson

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

Study activities are expected to result in soil disturbance, e.g. logging, collection of soil samples, and are subject to environmental review. However, to date, the precise location and extent of the disturbance is unknown, pending approval of a contract proposal from FERIC. When this information is known, formal documentation will be prepared and submitted for environmental impact assessment and review.

ii) FC-NWR EARP Committee Approval Date:

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Forest Insect and Disease Management Systems and Surveys
2. Responsibility Centre: Northwest Region (8135)
3. Activity: 2311, 2232, 2234
4. Program: Forest Protection and Management
5. Status: Continuing
6. Last Evaluation: January 29, 1992
7. Next Evaluation:

B. KEYWORDS:

029 Pest Management
030 Forest entomology
031 Forest pathology
036 FIDS
100 Green Plan
227 Pollution
231 Invertebrates
239 Biomonitoring
308 Biotechnology
312 Molecular genetics
403 Parasitoids/predators
411 Population dynamics
412 Pathology
414 Pheromones
423 Biocontrol
424 Insect pests
426 Epidemiology
435 Abiotic factors
436 Impact on forests
437 B.t.
441 Spruce budworm
442 Root diseases
443 Stem diseases
444 Leaf diseases
445 IPM systems (integrated pest management)
720 ARNEWS

C. RESOURCES:

D. PROJECT DESCRIPTIONS:

A variety of inimical agents, including insects, tree pathogens, vertebrates, pollutants and adverse weather conditions take a varying toll on the forest resource. Estimates of the loss in growth due to defoliators alone range from 0.6 to 4.2 million m³ per annum. This represents a loss of some 87 to 654 million dollars annually because most of this damage is concentrated in the accessible forests close to forestry developments. This project is organized to develop technologies to assess pest caused losses, to understand and predict the nature and causes of this damage and develop techniques to mitigate the effects of the inimical agents on the productive forest resource. Research which contributes to a better understanding of the biology of pests and their interactions with forests is undertaken by this project. This understanding contributes to better techniques to manage pests and improve pest management methodologies such as pest control, monitoring, forecasting and impact assessment. Ultimately, the information is incorporated in decision support systems which assist resource managers in improving management and ensuring sustainable development of the forest resource.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary \$s:

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u>	<u>Upcoming</u>	<u>Planning 1</u>
	\$000s				
Primary	1.87	4.96			
Secondary					
Total					
Green Plan	55.38	58.46			

3. Collaborators:

Primary

Daishowa
Alberta Forest Service

Secondary

University of Alberta

Department of Forest Science
Department of Plant Science
Department of Entomology
Government Northwest Territories - Renewable Resources
Manitoba Natural Resources
Saskatchewan Department of Environment & Resource Management

4. Green Plan:

All studies in the project contribute to improved integrated forest pest management. The results of these investigations have direct application in the development of decision support systems to manage both natural systems such as ecological reserves and intensively managed forests. The biomonitoring which the project has invested in provides a base-line database against which forestry practices can be assessed and the effects of climate change monitored. A network of sites monitored annually contributes to the national data base on the effects of acid rain on forests of the region. The techniques, information and scientific principles developed in this project will find immediate practical application in any model forests established in this region. Information developed by the project can be used in mitigating the effects of pests on trees planted for Tree Plan Canada.

Forestry Practices

Project has historic data-base against which insect and disease conditions can be compared to past conditions.

Decision Support Systems

Information as pest biologies, pest impacts and historic data bases is being used in the development of Decision Support Systems.

Ecological Reserves

Information on Biodiversity and pest conditions can be inferred from reference collections and data bases.

5. Milestones:

1993-94:

1. The major focus for NOR 11-01 in the coming year is to begin automating the process of data acquisition and reporting. Efficient data acquisition routines and collection protocols will be introduced so that field personnel in NOR-11 will have a minimum of time in carrying out the analysis and reporting requirements of the project. This will make field results and conditions reports available shortly after the field work is completed. The design of these procedures will require the cooperation of all field related studies of the projects. Permanent sampling plots established by the inventory divisions of

forestry agencies in the region will be used to obtain impact relationships on forest stands. The aspen resource will be targeted for the initial set of surveys.

2. Emphasis will be placed on the analysis and reporting on bark beetle semi-chemical studies in 1993/94. The initiation of defoliator pheromone studies in collaboration with NOR 11-01 is also contemplated should funds from the Green Plan be available for a pheromone trapping network.
3. The development of an information base for pest management decision support system for aspen pests will be the major new focus of NOR-11-05 staff. Some effort will also be directed to the continuation of ongoing studies on the impacts of the major defoliations of the region.
4. The production of an information guide on frost damage in the region will be the major focus of NOR 11-06. In addition studies on the biological control of western gall rust and the selection of trees resistant to gall rust will continue.
5. For 1993/94, the major focus of NOR 11-09 will be the completion of green house experiments and forest health surveys, related to root disease, in Alberta. A new initiative to look at balsam fir mortality in northeastern Alberta will be co-ordinated with NOR-11-10.
6. Work in NOR-11-10 will concentrate on biosystematic studies of the Genus *Pissodes* including work on isozyme variation, morphometric studies and DNA sequencing, and publication of a bibliography.
7. Microbial and chemical investigations of aspen decaying organisms will continue with funding from NSERC and collaboration with University of Alberta cooperators.

Accomplishments

1. **Pinewood nematode surveys and technology transfer.** Special surveys for the Pinewood Nematode (PWN) were conducted in the Northwest Region as part of a national F.I.D.S. survey. Technology information on the PNW and on the bark and wood infesting insects associated with it has been communicated both in Edmonton and in Ottawa. The technology transfer activities included representatives from Forestry Canada, Agriculture Canada, External Affairs, the lumber exporting industries in Canada and European visitors concerned with lumber imports from Canada.
2. **Spruce beetle semiochemical development and applications.** A chemical compound produced by the spruce beetle, that has potential for commercial use as an attractant bait, was discovered and field tested in collaboration with chemists at the University of Calgary. A patent has been obtained for the compound and its intended use. Other bark beetles are attracted to this chemical as well.

3. **Periodicity in jack pine budworm outbreaks.** Survey revealed that jack pine budworm populations erupt at periods of about 10 years. The size of these outbreaks may be related to climatic effects up to 7 years prior to the network.
 4. **Spruce budworm control strategies.** Spruce budworm control strategies for populations in Saskatchewan have been developed and implemented by Resource Agencies in Saskatchewan. Phenological studies indicate that suppression of the population by targeting the late instars is the most attractive strategy for dealing with northern outbreaks.
 5. **Tree mortality and mountain pine beetle attack** The mechanism by which mountain pine beetle vectored fungi interrupt water flow and cause the death of lodgepole pine trees has been elucidated.
 6. **Identification of rust resistant trees.** Jack pine and lodgepole pine families are being screened for resistance to western gall rust infection.
 7. **Characterization of Armillaria spp in the region.** The identity of the major species of Armillaria in the region and aspects of the genetic relationships among them have been described.
 8. **Jack pine budworm damage and its relationship to infection by Armillaria.** The degree of damage sustained by trees defoliated by the jack pine budworm is strongly associated with the degree of infection by root pathogens. This information can be used to hazard rate stands.
 9. **World collection of Pissodes specimens.** A collection of all major holding of Pissodes worldwide has been assembled. This is the basis for a biosystematic revision of the Genus now in progress.
 10. **Publication of manuals.** The tree diseases and insects affecting trees in the region have been described and manuals illustrating the organisms and the damage they cause have been prepared.
7. Link to Strategic Plan:

National: / Regional/Institute:

In addition to the contributions to the Green Plan initiatives, and the national strategic initiative to improve forest pest management, scientists in this project contribute significantly to the training of forestry personnel and to development of scientists which are significant activities in all studies. New studies seek to adapt biotechnology in controlling forest pests. Regional strategic initiatives addressed by the project include contributions to improved aspen utilization, decision support systems and the commitment to transferring the technologies developed to users.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 14, 1993

1. **STUDY TITLE:** Forest Insect and Disease Surveys
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:**
4. **Project Title:** Forest Insect and Disease Management Systems and Surveys
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Alberta, Saskatchewan, Manitoba, and the Northwest Territories
7. **Study Staff:**

	Name
Study Leaders	H. Cerezke, J. Brandt
Team Members	J. Volney
	Y. Hiratsuka
	D. Langor
	K. Mallett
	H. Gates
	P. Maruyama
	C. Myrholm
	D. Williams
	D. Ip
	M. Grandmaison
	new EG-3

8. **Study Key Words:** Detection, forest entomology, forest pathology, pest depletion losses, survey methods
9. **Study Activity:** 2311

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
J. Volney	SE-RES-3 (P)	0.20	0.20	0.80		
J. Brandt	FO-2 (P)	0.00	0.00	1.00		
H. Cerezke	SE-RES-2 (P)	0.50	0.50	0.10		
Y. Hiratsuka	SE-RES-5 (P)	0.00	0.00	0.10		
D. Langor	SE-RES-2 (P)	0.00	0.00	0.20		
K. Mallett	SE-RES-2 (P)	0.00	0.00	0.10		
H. Gates	EG-5 (T)	0.20	0.200.25	0.40		
P. Maruyama	EG-6 (T)	0.00	0.00	0.10		
C. Myrholm	EG-4 (T)	0.00	0.00	0.40		
D. Williams	EG-4 (T)	0.20	0.20	0.40		
New EG-3	EG-3 (T)					
FTEs		2.30	2.30	4.60		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	31.00	42.00			
Capital	18.84	3.00			
G & C					
TOTAL:	49.84	45.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	11-80	5.66	5.85			
	11-80	1.24	1.95			
	11-81	0.00	16.50			
Capital	11-80	1.30				
G & C						
TOTAL:		8.20	24.30			

STUDY TOTAL	58.04	69.30				
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11. Study Background and Problem Analysis

Forest Insect and Disease Surveys (FIDS) and detection in Canada date back some 50 years. During this period of continuous operation, a wealth of information has been accumulated that provides a historical record and knowledge base of native and introduced insects and diseases inhabiting and attacking forests and trees, their distributions, damage effects on trees, natural control agents, life cycle development, and behaviour within the Northwest Region. The data are gathered by a wide variety of established sampling, collecting, and processing procedures that have been developed over a long period of time. Application of these procedures provides an efficient means of continually updating the knowledge of forest insect and disease infestations and other forest disturbances within the region, and to satisfy nationally directed surveys such as acid rain monitoring, pest outbreak prediction, and plant quarantine concerns. The procedures also provide the basis for generating forest pest caused loss estimates, in pest risk analyses, in assessing pest controls, and in implementing integrated pest management strategies. During the period, 1977 to 1981, FIDS data identified annual tree mortality loss estimates in Canada from insects and diseases to be 107 000 000 m³ per year, and additional losses in growth reduction to be of similar magnitude.

The survey, identification, reporting, and prediction of losses due to insects, diseases, and other damage agents form an integral part of intensive forest pest management strategies and other land use interests, and must be maintained on an annual basis because of the dynamic nature of pest populations, forest growth, and development. Thus there is a need to monitor pest conditions regionally and to maintain strong linkages with other regions and for national and international perspectives, for such diverse problems as pinewood nematode, scleroderris canker, Asian gypsy moth, or introductions of parasitoids/predators for biological control programs.

Prompt and accurate identification of forest insects and diseases is essential to surveys, pest extension services, damage appraisal studies, and pest management. To maintain and improve diagnostic and taxonomic service capabilities, it is necessary to maintain reference collections of forest insects and diseases, as well as a reference literature collection.

The incorporation of sound pest management strategies by regional clientele rely heavily upon efficient and comprehensive FIDS operation. To meet this need the various functions of FIDS require a continual updating to incorporate new technologies such as insect pheromones, GIS applications, improved data gathering, recording and processing, and improved pest sampling/monitoring procedures.

12. Study Objectives:

i) Objectives

1. Obtain and maintain an updated knowledge of forest pests and their natural control agents and other tree damaging agents in the Northwest Region required for developing and administering federal policy, programs, and research in forest protection and for pest management strategies.
2. Provide information and knowledge on forest pests and abiotic agents and their impact on forest growth, productivity, and health through preparation of annual reports, pest leaflets, and other publications, and by transferring technology, advice, and assessment information on forest pests to clientele.
3. Conduct plant quarantine related activities that may assist in preventing the introduction or spread of foreign pests into Canada's forests, or the export of Canadian forest pests via transportation of forest products to foreign countries.
4. Conduct short term research in forest protection, on survey detection, monitoring, and damage impact assessment methodologies and on pest biologies.
5. Provide diagnostic and taxonomic services to clients, NoFC personnel, outside agencies, and scientists.

ii) Deliverables

Short Term (1-5 years)

1. An annual published report of provincial and regional pest conditions, and a component for a national overview of pests.
2. The surveys and records provide a permanent data base that supports a variety of forest research projects, quarantine programs, and the regional and national insect collections and herbaria. The data base also provides information to improve pest outbreak prediction and impact relationships.
3. Annual surveys of ARNEWS plots provide a component of the regional and national perspective on the state of Canada's forest health.

4. Through a variety of problem oriented surveys, data and reports will be generated to address specific forest management concerns.
5. Provide pest diagnostic and advisory services.

Long Term (5 years and beyond)

1. Prepare a regional FIDS survey and sampling methods manual.

iii) Significant Linkages:

A major component of NOR 11-01 involves the identification of insects and diseases and other tree damage agents. For this service, FIDS relies on taxonomic expertise at NoFC (ie. Studies NOR 11-03, 11-06, 11-09, and 11-10), the Biological Research Institute, Ottawa, and other specialists at other FC regional centres. The FIDS data base is maintained at PNFI, accessible through a computer-based (FIDSINFOBASE or the Forest Insect and Disease Survey Information system). Other linkages with PNFI involve updating of host and pest species catalogues, ARNEWS data analyses, map generation and forest inventory data, and GIS and other computer training specialties.

The field operation and conduct of FIDS activities utilize a variety of methodologies for sampling and processing data efficiently. On-going research on important pests (eg, spruce budworm, jack pine budworm, spruce beetle, Armillaria root rot, western gall rust, terminal weevils, and other regeneration pests) provide linkages for new survey and sampling methodologies (re: Studies NOR 11-03, 11-05, 11-06, 11-09, 11-10).

ARNEWS samples of soil and foliage require chemical and nutrient analyses and are therefore linked directly with NOR 7 (Environmental Stresses/Forest Ecosystems).

At a more general level, NOR 11-01 functions interact with other Projects at NoFC, specifically NOR 10 (Mixed Silviculture), NOR 16 (Canadian Forests/Climate Change), NOR 33 (Technology Transfer/ Communications), all four PAIF's, and NOR 53 (Computing/Data Processing Services).

iv) Methodologies

The operational aspect of FIDS uses a variety of established procedures. New techniques for data gathering, recording, and processing are adapted and incorporate as they become available. Each individual survey assignment is assessed for appropriate methodologies and statistical design.

13. Progress and Achievements

Regional FIDS activities have focused on detecting, monitoring, and mapping current infestations of the major pest species (spruce budworm, jack pine budworm, forest tent caterpillar, mountain pine beetle, etc.). This information has been updated annually, summarized in regional and national reports, and reported at annual Forest Pest

Control Forum meetings. The annual summary of data has added to the knowledge base of regional outbreak patterns, pest distribution patterns and conditions, and has provided timely, useful information for major client agencies in developing management strategies.

Special surveys have been undertaken in support of national, regional, and provincial requests, and in response to a variety of client agencies.

All permanently located ARNEWS plots have been and will continue to be maintained for long-term monitoring of the effects of acid rain, as part of a nationally directed program.

FIDS has regularly provided a variety of information to regional client agencies in the form of extension calls, pest leaflets, lectures, field demonstrations, published information on life history, impact and control, pest identification, and recommendations on pest management.

14. Goals and Accomplishments (1992-93)

1. *Survey, map, and report on major forest pests of the region.*

Major pests of the region were surveyed, mapped and reported on, with assistance from federal, provincial, and industrial agencies, and included surveys on the spruce budworm, aspen defoliators, mountain pine beetle, spruce beetle, Douglas-fir beetle, gypsy moth, abiotic factors affecting forests, and Dutch elm disease.

2. *Publish the 1991 FIDS report, prepare an edited version of this report for the national report on pest conditions, and prepare a 1992 pest status report of regional pest conditions.*

The 1991 FIDS annual regional report was published and an edited version sent to HQ on computer disc for inclusion in the annual national report on pest conditions. The 1992 FIDS annual regional report was completed.

3. *Assemble data on regional pest depletion losses compiled for the period 1982-87 and submit to HQ; complete a summary of the regional pest depletion losses. Assemble pest depletion loss estimates for the period 1988-91.*

Work was continued on the report of forest pest depletion estimates for the Northwest Region from 1982 to 1987 initiated by P. Amirault. No estimates on losses were made for the period 1988-91.

4. *Provide forest-related pest diagnostic and identification service, scientific and advisory service on pest management, and technology transfer workshops and information sessions as requested.*

Diagnostic and advisory services and technology transfer highlights are summarized as follows:

- a) lectures provided on forest pests to students at the University of Alberta;

- b) workshops on forest pests and pest management presented to Alberta Forest Service, Daishowa Canada Co. Ltd., Jasper and Banff national parks personnel, and Manitoba Natural Resources;
 - c) field identification of tree and seedling pests given at Pine Ridge Forest Nursery;
 - d) pest identification, diagnostic, and control information was provided to a large number of regional clientele.
5. *Conduct pest surveys in designated genetic and tree improvement plantations, high-value stands and forest nurseries as requested.*

Surveys for pest and damage incidence were completed at Pine Ridge Forest Nursery, Hualien Seed Orchard, Judy Creek Genetic Plantation, and Swan Hills Genetic Plantation.

6. *Represent Forestry Canada on various national, regional, provincial, and other meetings, committees, and advisory groups as requested.*

Representation was provided at the following meetings and on the following committees and advisory groups:

- a) Forest Pest Control Forum, Ottawa, November;
 - b) Alberta Critical Pest Response Plan Task Force meetings;
 - c) FIDS Head annual meeting and field tour, Fredericton, July;
 - d) Several planning meetings with AFS on spruce budworm management planning and impact assessment;
 - e) Pheromone Trapping Working Group;
 - f) report to Western Committee on Crop Pests, November;
 - g) Forest Health Meeting (Alberta/national parks/British Columbia/ Forestry Canada), December;
 - h) Can. Ent. meeting, Saskatoon, October;
 - i) report to Alberta Horticulture Advisory Committee, Olds College, November.
 - j) Aspen PSP assessment surveys meeting with AFS, Edmonton, April;
 - k) Spruce budworm management meeting with AFS, Edmonton, October;
 - l) Mountain pine beetle interagency meeting, Jasper National Park, October;
 - m) Genetic plantations surveys meetings with AFS, Edmonton;
 - n) Alberta Critical Pest Task Force meetings (2);
 - o) Gypsy moth meetings (2);
 - p) Biological Survey of Canada, Ottawa, April, October;
 - q) FC biological control working group, Saskatoon, September.
7. *Organize and conduct the Regional Insect and Disease Technical Advisory Committee meeting.*
- Attendance and reporting of regional pest conditions was provided at annual meeting in Saskatoon.
8. *Re-survey the 12 regionally established ARNEWS plots and the 5 newly established plots, establish a sixth new plot, summarize the 1991 ARNEWS data for contribution to the annual national report on the status of forest health, and submit 1992 ARNEWS data summaries to PNFI for data analysis. Provide input into revising the ARNEWS manual.*

An annual survey of the 12 longest established regional plots was completed. Data from the survey was summarized and submitted to PNFI for analysis. Input was also provided on revising the ARNEWS manual.

9. *Prepare contributions toward a regional FIDS survey and sampling methods manual.*

No contributions were made towards the preparation of a regional FIDS survey and sampling methods manual.

10. *Continue surveys of pest conditions in PSP's registered in Manitoba and prepare an updated status report.*

Surveys of pest conditions were conducted in several PSP's in Manitoba and an updated status report was completed.

11. *Establish up to 20 pest assessment/stand condition and impact plots in each of the prairie provinces, specifically to monitor for Hypoxylon canker, aspen insect fauna, root/but rots, and abiotic agent influences.*

Eleven PSP's were assessed in Alberta, 9 PSP's in Saskatchewan, and 17 PSP's plus one ARNEWS plot in Manitoba to evaluate aspen stand conditions and impact of pests and abiotic agent influences on aspen.

12. *Establish up to 20 plots in young conifer stands in each province/territory for assessment of pests and damage conditions.*

Assessment was made of pests and damage in young conifer stands at 16 sites in Alberta, 20 sites in Saskatchewan, and 17 sites in Manitoba.

13. *Prepare a Forest Management Note on sampling procedure for forest tent caterpillar.*

A Forest Management Note on sampling procedure for forest tent caterpillar was not prepared.

14. *Investigate special concerns and requests of client agencies on forest pests or forest conditions.*

Special concerns and requests of client agencies on forest pests or forest conditions were addressed by various personnel with the study.

- a) Aerial and ground survey of spruce beetle with Alberta Forest Service (AFS), Peace River Forest, November;
- b) Aerial survey and inspection of mountain pine beetle bait sites with AFS, Edson Forest, July;
- c) Aerial survey for Douglas-fir beetle tree mortality with Canada Parks Service, Jasper National Park, April;
- d) Gas plant survey, Whitecourt area, August.

15. Information Activities

i) Journal publications: none

ii) Information Reports:

Cerezke, H.F.; Gates, H.S. 1992. Forest insect and disease conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories in 1991. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-325.

Moody, B.H.; Amirault, P.A. 1992. Impacts of major pests on forest growth and yield in the prairie provinces and the Northwest Territories: a literature review. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-324.

iii) Other Reports:

Brandt, J.P. 1992. Spruce gall midge (*Mayetiola piceae* (Felt)). In Forest Insect and Disease Notes: A022 December 1992.

Brandt, J.P. 1992. Update of major forest pests in the Northwest Region. In Forest Insect and Disease Notes: A022 December 1992.

Cerezke, H.F. 1992. Aerial survey of aspen forest conditions near Grande Prairie, Alberta. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. File Rep.: NOR-1101-9202. 6 pp.

Cerezke, H.F. 1992. Assessment of forest and vegetation conditions adjacent to a gas plant site at Battle Lake, Alberta. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. File Rep.: NOR-1101-9204. 4 pp.

Cerezke, H.F. 1992. Field inspection of tree conditions on Mr. J. Bambers' farm near Sangudo, Alberta. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. File Rep.: NOR-1101-9201. 5 pp.

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Cerezke, H.F. 1992. Predictions of aspen defoliators. In Forest Insect and Disease Notes: No. A020 March 1992.

Cerezke, H.F. 1992. Survey of insect, disease, and damage incidence in a young spruce stand in Manitoba, previously treated by hardwood overstory removal.

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- Cerezke, H.F. 1992. What's wrong with my tree? For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leaflet. 23.
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- Ip. D.W. 1992. Dutch elm disease. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leaflet. 19.
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- Mallett, K.I. 1992. An investigation into tree damage in Whitecourt Forest. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta, File Rep.: NOR-1109-9203.
- Mallett, K.I. 1992. Assessment of Prince Albert tree nursery soils for disease pathogens. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta, File Rep.: NOR-1109-9201.
- Mallett, K.I. 1992. Pathogen analysis of peat moss collected from Pine Ridge Forest Nursery. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta, File Rep.: NOR-1109-9202.
- Mallett, K.I. 1992. Young stand pest survey of eight stands in the Sundre ranger district. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta, File Rep.: NOR-1109-9204.
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- Mallett, K.I.; Langor, D.G. 1992. Balsam fir mortality survey. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta, File Rep.: NOR-1109-9205.

Zalasky, H.; Hiratsuka, Y. 1992. Frost damage of poplar. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leaflet. 20.

iv) Lectures, courses, seminars, and scientific address:

Cerezke, H.F. 1992. Nursery and parks short course. University of Saskatchewan, Feb. 18-19.

Cerezke, H.F. 1992. In-house FIDS field training - Saskatchewan. April.

Cerezke, H.F. 1992. Insect management in boreal spruce. University of Alberta, April 6.

Cerezke, H.F. 1992. Tree hazard assessment workshop. Park Warden Service, Jasper National Park. June 11-12.

Cerezke, H.F. 1992. Aspen pest workshop. Manitoba Natural Resources forestry staff, Riding Mountain National Park. September 2.

Cerezke, H.F.; Mallett, K.I. 1992. Insect and disease workshop, Daishowa Canada Co. Ltd. May 27-28.

Cerezke, H.F.; Mallett, K.I. 1992. Interpretative workshop on insects and diseases. Banff National Park Interpretative Staff, Banff National Park. June 3.

Cerezke, H.F.; Mallett, K.I. 1992. Nursery pests presentation. Pine Ridge Forest Nursery. July 3.

16. Goals 1993-94 (staff member(s) responsible for goal in parentheses)

1. Survey, map, and report on major forest pests of the region. (J. Brandt, FIDS staff)
2. Publish the 1992 FIDS report, prepare an edited version of this report for the national report on pest conditions, and prepare a 1993 pest status report of regional pest conditions. (J. Volney, J. Brandt)
3. Assemble data on regional pest depletion losses compiled for the period 1982-87 and complete a summary report of the regional pest depletion losses. An edited version of this report is to be sent to HQ. Assemble pest depletion loss estimates for the period 1988-93. (J. Brandt)
4. Provide scientific and advisory service on pest management, and technology transfer workshops and information sessions as requested. (J. Brandt, FIDS staff)
5. Provide diagnostic and taxonomic services for determination of forest and shade tree insects and diseases. (Y. Hiratsuka, D. Langor, and J. Brandt and FIDS staff)

6. Maintain, update, reorganize, and improve regional reference collections (insects, mites, and diseases, photographic slides, FIDSINFOBASE, FIDS library). (Y. Hiratsuka, D. Langor)
7. Conduct pest surveys in designated genetic and tree improvement plantations, high-value stands and forest nurseries as requested. (J. Brandt, FIDS staff)
8. Represent Forestry Canada on various national, regional, provincial, and other meetings, committees, and advisory groups as requested. (J. Volney, J. Brandt)
9. Organize and conduct the Regional Insect and Disease Technical Advisory Committee meeting. (J. Volney)
10. Re-survey the 17 regionally established ARNEWS plots and establish 2 new plots, summarize the 1992 ARNEWS data for contribution to the annual national report on the status of forest health, and submit 1993 ARNEWS data summaries to PNFI for data analysis. (J. Brandt, FIDS staff)
11. Prepare contributions toward a regional FIDS survey and sampling methods manual. (J. Brandt, scientific staff)
12. Continue surveys of pest conditions in PSP's registered in Manitoba and prepare an updated status report. (J. Brandt, FIDS staff)
13. Establish an additional 10 assessment/stand condition and impact plots in each of the prairie provinces, specifically to monitor for Hypoxylon canker, aspen insect fauna, root/but rots, and abiotic agent influences affecting aspen. (J. Brandt, FIDS staff)
14. Establish an additional 5 plots in young conifer stands in each province/territory for assessment of pests and damage conditions. (J. Brandt, FIDS staff)
15. Investigate special concerns and requests of client agencies on forest pests or forest conditions. (J. Brandt, FIDS staff)
16. Survey northern Alberta for spruce gall midge to determine the impact of this pest on spruce stands. (J. Brandt, FIDS staff)
17. Continue preparation of a Field Guide to the Forest Pests of the Prairie Provinces: field photography, preparation of colour plates, write text. (D. Langor [NOR-11-10], Y. Hiratsuka [NOR-11-06])
18. Coordinate and lead project NOR-11: Forest Insect and Disease Management Systems and Surveys, and provide advice to clients as required. (J. Volney)
19. Provide functional guidance to studies initiated under the Partnership Agreements in Forestry. (J. Volney)

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Pacific Region		FIDS Head	G. Van Sickle
Ontario Region		FIDS Head	G. Howse

ii) External -

Establishment	ID#	Title	Contact name
Agriculture Canada		Program Officer Program Officer Program Officer	N. Brandt H. Koga B. Wiebe
Alberta Forest Service		Manager, Insect and Disease	H. Ono S. Ransinghe
Daishowa Canada Co. Ltd.		Woodlands Supervisor	M. Witiw
Environment Canada		Climatological Services	P. Kyle
Gulf Canada Ltd.			B. Patterson
Husky Oil Ltd.			D. McCoy
Manitoba Natural Resources		Chief, Forest Protection Section Biologist	R. Westwood K. Knowles
Northwest Territories Renewable Resources		Director, Forest Management	B. Larson C. Carlisle
Parks Canada		Warden Warden Warden	E. Abbot B. Irons I. Pengelly
Saskatchewan Natural Resources		Forester Resource Officer Resource Officer	B. Walter G. Carter G. Frey
Weyerhaeuser Canada Ltd.		Operations Manager	G. Curniski

18. Environmental Implications:

- a) Environmental Impact/Assessment Review Statement: Not applicable
- b) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 14, 1993

1. STUDY TITLE: Pheromone applications and bionomics of important forest insects
2. Responsibility Centre: Northwest Region (8135)
3. Program: Forest Protection and Environment
4. Project Title: Forest Insect and Disease Management Systems and Surveys
5. Office Location(s): Edmonton, Alberta
6. Work Location: Northwest Region
7. Study Staff:

	Name
Study Leader	H.F. Cerezke
Team Members	

8. Study Key Words: Forest habitats, plantations, nurseries, regeneration, pest management, bark beetles, wood borers, root collar weevils, semiochemicals, pheromones
9. Study Activity: 2232

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
H. Cerezke	SE-RES-02 (P)	0.40	0.40	0.90		
H. Gates	EG-5 (T)	0.80	0.80	0.60		
FTEs		1.20	1.20	1.50		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	2.24	1.00			
Capital					
G & C					
TOTAL:	2.24	1.00			

STUDY TOTAL	2.24	1.00			
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11. Study Background and Problem Analysis

This study currently focuses on three important forest insects: mountain pine beetle (*Dendroctonus ponderosae*), spruce beetle (*D. rufipennis*), and Warrens root collar weevil (*Hylobius warreni*).

Mountain Pine Beetle (MPB): An outbreak of the MPB developed in southern Alberta and Saskatchewan about 1976 and, over the next 10 years, caused mortality to an estimated 3.48 million lodgepole and several thousands of limber pine trees. During the outbreak period, large-scale salvage logging and sanitation cuttings were initiated as necessary strategies to help contain the MPB and to reduce timber losses. Various studies were initiated with client agencies to investigate use of aerial photography for outbreak assessment, impact, and potential for spread, hazard rating systems, deployment of semiochemicals for detection, monitoring, and control strategies, and biological studies. During 1982 to 1986, a variety of collaborative field bioassay studies on mountain pine beetle semiochemicals was undertaken with Drs. H. Wieser and E.A. Dixon, University of Calgary, Dr. J.H. Borden, Simon Fraser University, Alberta Recreation and Parks, and Alberta Forest Service. While most of the

information collected during these studies has been summarized in various reports and publications, the current focus is aimed primarily at completing reports of unpublished data.

Spruce Beetle (SB): The spruce beetle, an endemic species throughout the region, caused over 80,000 m³ of mortality to mature white spruce in northern Alberta between 1982 and 1984, and caused additional mortality in 1986, and again in 1990, 1991, and 1992. The continued losses in mature and overmature spruce forests prompted interest in the development of improved methods to detect and monitor population change and to assess stand hazard. Studies of spruce beetle chemical ecology were initiated in 1987 to test and develop improved semiochemical baits for commercial applications in spruce beetle management. Many of these studies were undertaken in collaboration with Drs. H. Wieser, E.A. Dixon, and J.H. Borden, as well as with B.C., U.S., and Alberta forest services, and Crestbrook Forest Industries. Considerable data have been collected in various field trials where semiochemicals were deployed as bait in traps and on trees since 1987, much of which remains unreported. Current and future studies are aimed at completion of the examination of collected insect materials, analyses of data and preparation of reports.

Warrens Root Collar Weevil: On-going surveys in young coniferous stands (conducted mostly under NOR-1101) throughout the three Prairie provinces have revealed that root collar-girdling weevils (*Hylobius* spp.) are among the five most important agents causing tree mortality, and their wounds have been associated with several root decay and staining fungi. Two species mainly have been determined to be economically important in the Northwest Region, namely the pine root collar weevil, *H. radialis* and Warrens root collar weevil, *H. warreni*. The former species is known only from southeastern Manitoba where it has been primarily associated with declining young Scots pine plantations growing on dry sandy soils. *Hylobius warreni*, on the other hand, is of much greater importance because it occurs throughout the region, attacks young to mature lodgepole pine, jack pine, and white spruce trees as well as other hosts, and occurs in a variety of forest habitats. While most tree mortality caused by this weevil occurs in stands less than 25 years old, its feeding wounds continue to accumulate through to stand maturity and thus contribute to reduced tree growth and stand vigor.

A large body of information has been accumulated on the distribution, ecology, behavior, and impact, of *H. warreni* in the Northwest Region as well as in other regions of Canada. There is a need to compile and synthesize this information into a document useful to forest managers and to incorporate management guidelines compatible with present forest management practices. Current and future plans are aimed at preparing such a document.

12. Study Objectives:

i) Objectives

- 1) Develop and test new pheromone techniques and applications for the management of important forest insects.
- 2) Undertake bionomic studies of important forest insect pests that can provide management strategies for reducing their risk and losses.

- 3) Provide technology transfer and new pest information applicable to regional client agencies and to the FIDS program.

ii) Deliverables

Short and Long Term:

- on an on-going basis and as requested, provide technical advice to regional client agencies on insect identifications, risks and impacts, and methodologies for survey and monitoring;
 - provide advisory role on bark beetle surveys and assessments to FIDS staff and in the Model Forests;
 - prepare Forest Leaflets on three (3) or more of the important species;
 - prepare technical and scientific reports for publication and to aid the forest manager.
- iii) Significant Linkages: This study has maintained strong linkages with FIDS surveys (NOR 11-01) for information on areas of infestation and sampling methodology, with provincial forest agencies, industries, and Canadian Parks Service on pest management decisions and surveys, with Universities of Calgary and Simon Fraser for collaborative studies on field bioassay tests of bark beetle semiochemicals, and with Phero Tech Inc., for specific bait preparation specifications

13. Progress and Achievements

Up to and including 1991-92: During the early years of this Study (ie, 1970's to early 1980's), a number of investigations were made on various insect problems including the spruce bud midge, birch leaf miners, seed and cone insects, Warrens root collar weevil, sawyer beetle, jack pine budworm and the spruce budworm. Various reports and publications were prepared that summarize these early investigations.

In 1982, collaborative studies were initiated on semiochemicals of the MPB, and from 1987 to the present, the focus was shifted to studies of the chemical ecology of the spruce beetle. Highlights of these studies since 1982 are as follows:

- the studies focusing on MPB and SB have contributed to the general knowledge and understanding of the chemical ecology of these species in western Canada and the U.S.;
- the studies have helped to promote semiochemical use as a useful survey tool and has been applied in Alberta and Saskatchewan since 1983 in detection and monitoring programs;
- the studies provide a basis for a sampling method for estimating population levels of the SB and to help assess stand risk;
- the studies have helped to develop practical applications for MPB and Sb semiochemical use, identified new attractants and inhibitors, resolved some behavioral questions in

beetle attraction, attack pattern and distribution, and have helped to identify some natural insect predator responses to synthetic and natural attractants;

- the studies of MPB and SB have helped define optimal responses to various release rates, to different release devices and to different compound combinations (several technical reports summarize some of the data and a U.S. patent was obtained for a spruce beetle semiochemical lure);
- the field bioassay experiments of MPB and SB have provided important leads toward identification of attractant semiochemical blends for two other important bark beetle species, the Douglas-fir beetle and the larch beetle;
- fulfilled numerous advisory and consultative services to client agencies for technical information on bark beetles, wood borers and root collar weevils;
- established a field baiting experiment with Parks Canada to monitor for Douglas-fir beetle with semiochemicals;
- established cooperative trials with Alberta Forest Service to test SB attraction in control strategies;
- participated in numerous workshops and field demonstrations that have included the technical transfer of information on bark beetles, woodborers and root collar weevils;
- recently compiled and summarized research literature on root collar weevils (*Hylobius* and *Steremnius* spp.) in Canada in a book chapter; much of this information can be included in the proposed major publication on Warrens root collar weevil.

14. Goals and Accomplishments (1992-93)

Due to increased commitment requirements in 1992 in Study NOR-1101 (FIDS) and reduced technical assistance, only limited progress in completing goals in this Study was possible.

1. *Re-examine data on attack pattern and brood productivity of MPB on three pine hosts and prepare a final report.*

No progress

2. *Re-examine data on MPB attack density pattern on semiochemical baited and unbaited lodgepole pine and prepare a final report.*

No progress

3. *Complete a draft of paper on the field response to semiochemicals by the spruce beetle, eastern larch beetle and a clerid predator with cooperators at the University of Calgary.*

A first draft has been partially prepared.

4. *Complete examinations and analysis of 1991 spruce beetle experimental data and prepare reports.*

Spruce beetle collections in 1991 were examined and summarized, and the results submitted to Dr. J. Borden (Simon Fraser Univ.) to compare with results from similar tests conducted in B.C. and Alaska.

5. *Contribute to the nationally established Pheromone Trapping Working Group network for pheromone applications in insect detection and monitoring.*

Participated in one meeting held in Ottawa, Nov., 1992 and submitted a summary report of 1992 research to Dr. R. West (Chairman of PTWG) for a membership newsletter.

6. *Serve as an Associate Editor for the Canadian Entomologist.*

Reviewed and processed several submitted papers.

7. *Conduct spruce beetle semiochemical trials to correlate trap catch with spruce beetle population indicators.*

Conducted two field experiments with spruce beetle semiochemicals. The first experiment was established to compare two bait formulations at 15 different spruce sites. Insect samples were collected three times and have been identified and counted.

Descriptive plot data have been collected at each site.

In the second experiment, two baits were compared in multi-funnel traps to evaluate increased release rate of one of the semiochemical compounds. The experiment was replicated at five sites. Insect samples have been identified and counted.

8. *Determine Douglas-fir beetle response to semiochemical-baited multi-funnel traps in an infestation in Jasper National Park.*

In cooperation with Parks Canada staff, insect samples were collected from late May to early August in traps baited with a spruce beetle bait formulation. Insect samples have been counted (most are believed to be Douglas-fir beetle) and will be analyzed for seasonal flight pattern, numbers of Douglas-fir and predatory beetles, and for seasonal trend in sex ratio.

9. *Provide consultory role to Alberta Forest Service on spruce beetle surveys and control.*

Advised on tree trap felling and tree baiting with semiochemicals to assist in spruce beetle control and advised on aerial and ground survey procedures for timber management decisions.

15. Information Activities

- i) Journal Publications
- ii) Information Reports

- iii) Other reports
- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer: (described above)

16. Goals 1993-94

1. Prepare a first draft of a proposed publication on the biology and management of Warrens root collar weevil.
2. Complete examination of spruce beetle samples collected in 1992, and re-examine other samples collected between 1987 and 1991 as necessary for summary reports.
3. Re-examine data on attack pattern and brood productivity of MPB on three pine hosts and prepare a final report.
4. Re-examine data on MPB attack density pattern on semiochemical baited and unbaited lodgepole pine and prepare a final report.
5. Prepare a paper on field response to semiochemicals by the spruce beetle, eastern larch beetle and a clerid predator.
6. Compile information and contribute to the following proposed Forest Leaflets:
 - a. Bronze birch borer
 - b. Mountain pine beetle
 - c. Spruce beetle
 - d. Wood borers (*Monochamus*, *Tetropium*, *Saperda*)
 - e. Warrens root collar weevil
7. Serve as an Associate Editor for Canadian Entomologist.
8. Provide consulting and technology transfer to client agencies as requested.

17. Major Co-operators:

- i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name
Alberta Forest Service		Manager, Insect & Disease Program	Mr. H. Ono
Parks Canada		Park Warden	Mr. E. Abbott
Univ. Calgary, Dept. Chemistry		Chemists	Dr. H. Wieser Dr. E.A. Dixon
Simon Fraser Univ.		Professor, Forest Entomology	Dr. J.H. Borden

18. Environmental Implications:

None

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: 14 January 1993

1. **STUDY TITLE:** Damage appraisal of major forest pests
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection and Environment
4. **Project Title:** Forest Insect and Disease Management Systems and Surveys
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Region-wide
7. **Study Staff:**

	Name
Study Leader	W.J.A. Volney
Team Members	A. Yohannes
	R. Brett

8. **Study Key Words:** Damage, appraisal, impact, hosts, forest pests, management, mortality, risk, growth loss, stand dynamics, population dynamics, benefit/cost, pest management.
9. **Study Activity:** 2232
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
W.J.A. Volney	SE-RES-3 (P)	0.70	0.70	0.20		
A. Yohannes	EG-5 (T)	1.00	1.00	1.00		
Term & Stdnt.						
FTEs		1.70	1.70	1.20		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	9.04	6.00			
Capital	17.09	15.50			
G & C					
TOTAL:	26.13	21.50			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>	8002					
Salaries:						
Alta	A8018		13.00			
	A8023		11.00			
O&M:						
Alta.	A8018		13.00			
	A8023		9.00			
Man.	M8013		10.00			
NWT	N8002		6.15			
Sask.	S8074		35.00			
	S8075		25.00			
Capital						
G & C:						
Sask.	S5008		23.80			
	S5009		22.00			
TOTAL:			147.95			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	11-85	.34	21.66			
Capital		4.81				
G & C						
TOTAL:		5.15	21.66			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Other</u>						
Suspence	11-95	0.20	1.96			
AFS Hawk Hills						
TOTAL:		0.20	1.96			

STUDY TOTAL		193.07				
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11. Study Background and Problem Analysis

Sound pest management systems require information on the resource values threatened by pests. This information can only be obtained from an understanding of pest epidemiology and their effects on host stands. Two different time horizons are considered in developing these pest management systems. These are the short-term and the long-term horizons. They are related to the need for treatments under current pest conditions, and forecasting pest impacts on the timber supply in the integrated resource management system respectively. The basic scientific information required to design pest management systems is therefore embodied in a description of the interactions among pest population dynamics, stand dynamics and control strategies. This description permits an evaluation of the socio-economic impact of pests on resource values and the benefit/cost integration required to embed pest management systems in the integrated resource management system.

This study aims to provide the descriptions of the physical pest impacts and the information on pest population dynamics to make long-term and short-term predictions of their effects on stand yield. An attempt is also to be made to identify critical sources of pest generation mortality and natality so as to be able to manipulate populations effectively.

12. Study Objectives:

i) Objectives

1. To develop methods to evaluate the significance of specific forest pests in terms of measured damage to trees and forest stands.
2. To develop or modify appraisal methods for assessment of losses caused by forest pests.
3. Design forest pest management systems which optimize the return from stand management activities.

ii) Deliverables

Short Term (1-5 years)

- Journal publication on sampling jack pine budworm for population assessment.
- Journal publication on the behaviour of jack pine budworm populations in Wisconsin over the past 30 years.
- Journal publication on mortality rates of jack pine in the prairie provinces following the last outbreak.
- Journal publication on sampling spruce budworm on white spruce in northern Alberta.
- Journal publication on the effect of B.t. sprays on the dynamics of spruce budworm populations in northern Alberta.
- Report on the behaviour of tent caterpillar outbreaks in the past 20 years.

Long Term (5 years and beyond)

- A pest management system for the jack pine budworm in the prairie provinces (Technology Transfer materials).
- A pest management system for the spruce budworm affecting white spruce stands in the Northwest Region (Technology Transfer materials).
- A decision support system to manage pests of the mixedwood forest. (Technology Transfer materials and computer based DSS).

iii) Significant Linkages:

Linkages to other studies:

- NOR/11/01: Provision of statistical advice, data capture protocols, sampling regimes, and survey design.
- NOR/11/03: Collaboration on defoliator bionomics.
- NOR/11/06: Collaboration on population biology of insects affecting galls of western gall rust galls.
- NOR/11/09: Collaboration on the effect of root disease in modifying effects of defoliators on forest stands.
- NOR/11/10: Diagnostics of parasitoids of major defoliator pests.
- NOR/2/04: G.I.S. applications to forest pest damage assessment.

- NOR/3/04: Collaboration on econometric analysis of pest impacts.
- NOR/7/01: Collaboration on analysis of impacts of sulphur deposits in lodgepole pine stands.
- NOR/16/01: Evaluation of interaction of climate change with pest populations.
- NOR/36/01: Functional supervision of I & D staff and consulting on pest concerns in Manitoba.
- NOR/36/02: Functional supervision and consulting of pest management program in Alberta.
- NOR/36/03: Consulting and delivery of pest management program in Saskatchewan.
- NOR/36/04: Consultation on pest management program in Northwest Territories.

Linkages to other Forestry Canada Establishments:

- PNFI: Assistance with development of North American Jack Pine Budworm Decision support System.
- FPMI: Diagnostic of pathogen incidence in spruce budworm cadavers. Dr. K. van Frankenhuyzen.
- Green Plan: Impact of the spruce budworm on white spruce stands. Nation wide co-operative of impact scientists.

Linkages to external agencies:

- Alberta Forest Service: Hawk Hills Spruce Budworm Project. With H. Ono, Alberta Forest Service.
- Saskatchewan Department of Natural Resources & Weyerhaeuser Canada Ltd.: Management of spruce budworm populations in the Big River area.
- University of Alberta 1: Role of parasites in endemic populations of the forest tent caterpillar. With J. Spence, Dept Entomology.
- University of Alberta 2: Latitudinal variation in spruce budworm phenology. With Dr. J. Spence, Dept. Entomology.
- U.S. For. Serv. Jack pine budworm population behaviour in Wisconsin, With Dr. D. McCullough, Michigan State University, East Lansing, Michigan United States of America

iv) Methodologies

Damage studies: Information gathered for these studies is derived from multi-stage sampling designs using mensurational plots and measurement procedures. The calculation of volumes uses equations derived from Provincial Forestry Inventories. Plots and effort is allocated using optimal allocation routines developed for provincial forestry inventories.

Population studies: Analysis of variance using general linear model procedures and their analogues used in the analysis of categorical data are applied in evaluating differences in population densities and attributes respectively. Optimization procedures using cost functions and variance components derived from distribution studies are used in developing sampling routines for insect populations.

13. Progress and Achievements

Up to and including 1991-92

- Information report reviewing impact of pests on forests of the Northwest Region.
- Development of long-term predictor of jack pine budworm outbreaks in the Northwest Region (Journal Publication).
- Development of methodology to develop pest management systems to manage defoliators in forest stands of the Northwest Region (three (3) symposium proceedings articles).
- review of population dynamics of North American spruce budworms feeding on conifers (book chapter).
- Journal publication on distribution and estimation of jack pine budworm caused defoliation
- Journal publication on the occurrence of light rings in jack pine.
- Journal publication on the phenology of white spruce and spruce budworm in northern Alberta.

14. Goals and Accomplishments (1992-93)

1. *Prepare journal publication on sampling jack pine budworm for population assessment for internal review.*

Paper in preparation, analysis complete.

2. *Prepare journal publication on the behaviour of jack pine budworm populations in Wisconsin over the past 30 years for internal review.*

Paper prepared, draft with co-author for review.

3. *Prepare for internal review: journal publication on mortality rates of jack pine in the prairie provinces following the last outbreak of the jack pine budworm.*

Data on plots assembled. Analysis in progress.

4. *Complete revisions as necessary: journal publication on distribution and estimation of jack pine budworm caused defoliation.*

Paper published in Canadian Journal of Forest research.

5. *Submit for review: journal publication on the occurrence of light rings in jack pine.*

Paper accepted for publication in Canadian Journal of Forest Research.

6. *Prepare for internal review: journal publication on sampling spruce budworm on white spruce in northern Alberta.*

Paper in preparation, analysis complete.

7. *Publish paper on the phenology of white spruce and spruce budworm in northern Alberta.*

Paper published in Canadian Journal of Forest Research.

8. *Prepare report on the effect of B.t. sprays on the dynamics of spruce budworm populations in northern Alberta.*

Data sets complete, 2 interim client reports prepared.

9. *Maintain and monitor jack pine budworm impact plots in Manitoba and Saskatchewan and assess jack pine budworm populations at extant intensive study sites.*

All plots were monitored.

10. *Continue studies of spruce budworm impacts in northern Alberta.*

Plots were established, measured and assessed for damage, stem analysis was performed on 69 trees and growth loss estimates were obtained for defoliated stands in the footner forest. A report is in preparation.

12. *Continue studies on the impact of sulphur deposits on lodgepole stands in the Rocky/Clearwater Forest.*

Damage assessment plots were established in young stands and mature aspen stands. Stem analyses were completed on trees from young stands. An interim report is in preparation.

13. *Coordinate and lead project NOR-11: Forest Insect and Disease Management Systems Surveys, and provide advice to clients as required.*

NOR 11 was peer reviewed in 1992. Responses to scientific content of project dealt with. Concerns regarding NOR 11-01 (FI D.S.) are being addressed. Weekly project meetings in winter and frequent meetings with program manager provide a vehicle to coordinate project activities. Organized and Chaired annual Regional Forest Insect and Disease Technical Advisory Committee and communicated recommendation to client agencies through reports and/or oral presentations.

14. *Provide functional guidance to studies initiated under the Partnership Agreements in Forestry.*

Provided consultation and study design information to Canada-Manitoba P.A.I.F. Insect and Disease Specialist and monitored progress.

Served as scientific authority on contract to develop decision support system to manage Mixedwood forest pests.

15. *Serve on the dissertation committees of three graduate students at the University of Alberta.*

Served as co-chair on the dissertation committees of Messers Parry and Weber, served on dissertation of Mr. Hall.

Added goals.

16. *Visit Heilonjiang Academy of Forest Science and evaluate biological control research opportunities to manage pests of the northwest region.*

Visited Heilonjiang Academy of Forest Science and prepared report on biological control opportunities.

17. *Serve as NW region representative on Green Plan, Integrated Forest Pest Management Steering Committee.*

Reviewed 22 proposals, participated in committee to evaluate and rate proposals for funding.

18. *Design and implement study to evaluate the efficacy of B.t. sprays used to control spruce budworm in Saskatchewan.*

Developed and served as scientific authority on study to evaluate the efficacy of B.t. sprays in controlling spruce budworm populations.

19. *Conduct assessments of spruce budworm populations along the Mackenzie River in the Northwest Territories.*

Evaluated status of spruce budworm populations along the Makenzie river from Ft. Simpson to "The Grand View" north of the Arctic Circle. Results communicated to NWT Government.

- 20 *Conduct studies to evaluate the impact of aspen defoliators on the productivity of aspen stands.*

Developed and issued contract to acquire long-term PSP inventory data and digitize long-term defoliation histories of outbreaks.

15. Information Activities

i) Journal Publications

Volney, W.J.A. 1992. The distribution and estimation of jack pine budworm defoliation. Can J. For. Res. 22:1079-1088.

Volney, W.J.A., and Mallett, K.I. 1992. Light rings and the age of jack pine trees. Can. J. For. Res. 22:2011-2013.

ii) Information Reports

None

iii) Other reports

Volney, W.J.A., and Langor, D.W. 1992. Report on a Trip to Heilongjiang Province July 7 to 24, 1992. Foreign Trip Report.

Michaelian, M. 1992. Big River Spruce Budworm Spray Program 1992: Budworm Monitoring and Spray Efficacy Report. Report on Saskatchewan P.A.I.F. Contract.

Maynard, D.G., Stadt, J.J., Mallett, K.I. and Volney, W.J.A. 1992. A comparison of sulfur impacted and non-impacted lodgepole pine stands in west central Alberta. Can. J. Soil. Sci. 72:327.

iv) Lectures, courses, seminars and scientific addresses

Course Lectures: 2 for University of Alberta, Forest Entomology Course.

Scientific Lectures:

- a) Heilongjiang Academy of Forestry Science. "Management of forest defoliators in the Northwest Region of Canada." Harbin, China
- b) North Central Forest Pest Work Conference. "The Dynamics of Jack Pine Budworm Populations in Northwestern Wisconsin". Hickory Corners, Michigan, U.S.A.
- c) University of Alberta, Dept. For. Sci. Seminar: "Doing well with less: paradigms for pest management". Edmonton, Alberta.

Workshops Chaired:

- a) Canadian Institute of Forestry, Annual Meeting Forest Pest Management Working Group: Emerging Technologies for Integrated Forest Pest Management. Vancouver, B.C.

- b) Western Forest Insect Work Conference. Climate change and the historical record. Penticton, B.C.

Workshop presentation: Western Forest Insect Work Conference. "Hazard rating jack pine budworm defoliated stands". Penticton, B.C.

v) Technology transfer:

1. Techniques to control the spruce budworm in northwest region. Prescriptions given to Weyerhaeuser Canada Ltd. Big River Project.
2. Denyer, W.B.G. and Volney, W.J.A. 1992. Urban home Garden Composting. Forestry Leaflet.

16. Goals 1993-94

1. Complete journal publication on sampling jack pine budworm for population assessment for internal review.
2. Complete journal publication on the behaviour of jack pine budworm populations in Wisconsin over the past 30 years for internal review.
3. Prepare for internal review: journal publication on mortality rates of jack pine in the prairie provinces following the last outbreak of the jack pine budworm.
4. Prepare for internal review: journal publication on sampling spruce budworm on white spruce in northern Alberta.
5. Complete report on the effect of B.t. sprays on the dynamics of spruce budworm populations in northern Alberta.
6. Maintain and monitor jack pine budworm impact plots in Manitoba and Saskatchewan and assess jack pine budworm populations at extant intensive study sites.
7. Continue studies of spruce budworm impacts in northern Alberta and complete the report on the impacts of the budworm in Footner Forest.
8. Continue studies on the impact of sulphur deposits on lodgepole stands in the Rocky/Clearwater Forest. Prepare progress report.
9. Continue study to evaluate the efficacy of B.t. sprays used to control spruce budworm in Saskatchewan. Focus is to be on the non-target Lepidoptera.
10. Continue studies of the impact of aspen defoliators on aspen stands.
11. Serve on the dissertation committees of four (4) graduate students at the University of Alberta.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Pacific Region			Dr. Rene Alfaro

ii) External -

Establishment	ID#	Title	Contact name
Alberta Forest Service		Manager, Insect and Disease Programs	Mr. H. Ono
Saskatchewan Department of Natural Resources		Forester, Pest Management	Mr. B. Walters
Manitoba Natural Resources		Chief Forest Protection Biologist	Dr. R. Westwood Mr. K. Knowles
NWT Renewable Resources		Director, Forest Management	Mr. R. Larson
Weyerhaeuser Canada Ltd.		Operations Manager	Mr. G. Curniski
Gulf Canada Ltd			Mr. B. Paterson
Husky Oil Ltd			Mr. D. McCoy

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 14 1993

1. **STUDY TITLE:** Research on forest tree rusts and other forest tree diseases
2. Responsibility Centre: Northwest Region (8135)
3. Program: Protection & Environment
4. Project Title: Forest Insect and Disease Management Systems and Survey
5. Office Location(s): Edmonton, Alberta
6. Work Location: Edmonton (laboratory, greenhouse), Alberta, Saskatchewan & Manitoba (field)
7. Study Staff:

	Name
Study Leader	Y. Hiratsuka
Team Members Technician	P.J. Maruyama
Technician	K. Jakubec
PDF	P. Chakravarty
PDF	L. Hutchison
PDF	G. Herger
Graduate Student	P. Crane

8. Study Key Words: Genetics/tree improvement, Forest pathology, Integrated pest management, Reduction of forest losses, forest tree rusts, pine stem rusts, Cronartium, Endocronartium, western gall rust, biocontrol, mountain pine beetle, blue stain fungi, Ceratocystis spp., aspen decay and stain
9. Study Activity: 2232

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
Y. Hiratsuka	SE-RES-5 (P)	0.30	0.30	0.90		
P. Maruyama	EG-6 (T)	0.40	0.40	0.90		
K. Jakubec	EG-5 (T)					
FTEs		0.70	0.70	1.80		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	0.00
O&M:	11.71	8.00			
11-11		2.98			
11-12		1.60			
Capital	14.96	16.20			
G & C					
TOTAL:	31.25	24.20			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries:						
Man.	M8027		12.70			
O&M:						
Alta.	A8041		3.20			
Man.	M8027		4.80			
Sask.	S8044		17.00			
Capital						
G & C:						
Alta.	A5011		40.00			
	A5012		35.00			
Man.	M5010		36.50			
Sask.	S5004		36.20			
	S5005		75.00			
TOTAL:			260.4			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	11-86	15.00	0.00			
Capital						
G & C						
TOTAL:		15.00	0.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Other</u>						
S&T Opps Fund						
O&M:	11-91 11-96	.72 26.34	16.60			
Capital						
G & C						
TOTAL:		27.06	16.60			

STUDY TOTAL			301.20			
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11. Study Background and Problem Analysis

A. Western gall rust

Western gall rust has been identified as the most important disease in artificial regeneration and intensive management situations of lodgepole and jack pines in the region. It is essential to include genetic resistance to western gall rust as an important characteristics to consider in genetic improvement programs of hard pines.

B. Taxonomy, biology, and pathology of forest tree rusts

An estimate of the losses attributable to forest tree rusts in this region has not been obtained, but rusts have caused significant growth loss and mortality of major forest tree species of the region including lodgepole and jack pines, white and black spruces, aspen, balsam poplar, and alpine and balsam firs. In addition, several rust species endemic to the region have been recognized as serious pathogens or potentially dangerous pathogens in other areas where forestry practices are more intensive. It is important to

clarify identity, life history, host range, cytology, damage potential, conditions of infection, and taxonomy of forest tree rusts of the region to cope with the present and future problems with this group of tree diseases.

C. Short-term investigation of selected forest tree diseases

Short-term research activities on selected tree diseases becomes necessary from time to time when diseases are identified as important in certain forest management practices in the region, recognized as important by the public or news media, or identified as suitable topics for joint research activities with outside agencies.

D. Aspen decay and stain

Although aspen together with balsam poplar occupies about 40 % of all growing stock in the prairie provinces, aspen has been considered to be economically undesirable tree species until the middle of 1980s. However, in recent years aspen became an important tree species for industrial utilization especially for production of pulp and particle board (OSB). Decay and stain are the biggest problems of aspen utilization especially for otherwise desirable CTMP processing. In future when intensive management of aspen will be practised, such disease as Armillaria root rot, leaf rusts (*Melampsora* spp.), and Hypoxylon canker as well as several insect pests will become important factors for successful cultivation, and their information will be essential for any aspen genetic improvement programs.

12. Study Objectives

i) Objectives

- A. To study biology, cytology, pathology, host-parasite relationship, inoculation techniques, and resistance screening methods of western gall rust to contribute to the genetic improvement programs and management of lodgepole and jack pines in the prairie provinces.
- B. To study taxonomy, morphology, pathology, and life-cycle of forest tree rusts, especially those of pine stem rusts of Canada and related species elsewhere in the world, with the aim of compiling a definitive manual of forest tree rusts of Canada (or North America), and a monograph of pine stem rusts, and to contribute to the taxonomy, nomenclature, and terminology of rust fungi.
- C. To conduct short-term investigations of selected forest tree diseases of the region such as Dutch elm disease, Armillaria root rot, mortality caused by mountain pine beetle, and decay & stain of aspen.
- D. To develop novel biological control method(s) to reduce loss caused by western gall rust and other pine stem rusts.
- E. To create aspen clones with superior growth characteristics, desirable wood quality, insect repellency, and disease resistance using biotechnological, pathological and entomological methods.

- F. To identify, collect, and maintain aspen clones with superior growth characteristics, superior wood quality, resistance to forest tent caterpillar feeding, and resistance to leaf rusts (Melampsora spp.) which occur naturally within the range of aspen in North America.
- G. To conduct microbiological investigation of aspen decay and stain and develop biological or biorational control strategies of major defect causing organisms.
- H. To determine the cause of "blackish gall" of aspen, discover the relationship of "blackish gall" and decay development, and propose a new strategy of biological protection of decay.

ii) Deliverables

Short term (1-5 years)

Complete and publish "Field Guide for Classification and Measurement of Aspen Decay and Stain" (with AFS personnel) 1994-95

Compile and publish "Western Gall Rust" Information Report 1995-96

Develop a biological control strategy for western gall rust and other pine stem rusts which uses free moving rust feeding insects as vectors of aggressive mycoparasite(s), and demonstrate the applicability with a selected system (Epuraea obliquus - Scytalidium uredinicola). (1993-1994)

Publish "Field Guide for Classification and Measurement of Aspen Decay and Stain" (with AFS personnel) 1994-95

Long term (5-10 years)

Complete and publish "Monograph of pine stem rusts (Cronartium and Endocronartium)" 1997-98

Revise "Illustrated Genera of Rust Fungi" 1997-98

iii) Significant Linkages

Objectives of this study have strong linkages to a regional strategic plan issue, namely Reduction of forest losses. The study is also linked closely to Green Plan initiatives of Integrated Pest Management and Forest Practices.

University of Alberta (Adjunct Professor in Department of Forest Science and Department of Plant Science since 1980).

A part of an international cooperative project on pine stem rusts with staff of University of Tsukuba funded by the government of Japan.

A part of Green Plan BIOCOND Network

iv) Experimental Design, Sampling, Methodologies

Following techniques and methodologies are used regularly in the study:

Compound light microscopy with various specimen handling procedures and staining methods

Scanning Electron Microscopy

Cultural studies of fungi with various media and conditions

Greenhouse inoculation experiments

Data processing with SAS and other statistical programs

13. Progress and Achievements

A. Western gall rust investigation

1. Morphology, life cycle, nuclear cycle, and taxonomy of the pathogen have been investigated and reported. Comparative studies of cytology and morphology resulted in a new explanation and interpretation of the western gall rust life cycle and the establishment of a new genus, Endocronartium.
2. Three aggressive hyperparasites (Monocillium nordinii, Cladosporium gallicola, and Scytalidium uredinicola) were discovered and investigated with A. Tsuneda (NSERC Visiting Fellow, 1982-84). Mode of parasitism and production of bioactive metabolites produced by these fungi were investigated and documented in journal publications. A new strategy of biological control involving a mycoparasite (Scytalidium urdedinicola) and a beetle (Eपुरaea obliquus) has been proposed and under investigation.
3. Active investigations of host-parasite interaction, resistance testing techniques, axenic culture of the pathogen, and epidemiology of the disease are underway with the cooperation of P. Blenis (U of A), A. Hopkin (NSERC Visiting Fellow), E. Allen (Ph.D. student, U of A).
4. A cooperative investigation with the province of Manitoba to test jack pine genetic improvement material (eastern breeding district) has been underway since 1988. Field surveys of genetic family plantations and inoculation experiments with selected families were conducted in 1988-89 and 1989-90. Similar work has been conducted in Saskatchewan since 1989 (western breeding district). Screening of 110 families of lodgepole pine seedlings was conducted in 1992-93 in cooperation with tree improvement programs of Alberta Forest Service (Dr. N. Dhir) and will continue for two more years.

B. Taxonomy, biology, and pathology of forest tree rusts

5. Distribution, taxonomy, life cycle, morphology, cytology, damage, epidemiology, and control of pine stem rusts were compiled and published in a major, fully illustrated, publication entitled "Pine stem rusts of Canada" with J.M. Powell in 1977.
6. Incidence and identity of hyperparasitic fungi, rust-feeding insects, and animal damage to pine stem rusts have been recorded and published by J.M. Powell.
7. Organized and coordinated the 3rd International IUFRO "Rusts of Pine" Working Party conference in 1989 in Banff, Alberta and published a proceedings of the conference as an information report from NoFC (NOR-X-317).
8. Information for the monograph on pine stem rusts is being compiled.
9. An information report entitled "Impact of pine stem rusts of hard pines" with J.M. Powell (NoFC), G.A. Van Sickle (PFC) was published in 1988.

C. Short-term investigation of selected forest tree diseases

10. Together with S. Takai of GLFC, host-parasite interaction of Dutch elm disease was investigated and a specific toxin of the disease (cerato-ulmin) was discovered.
11. Bioactive metabolites of forest fungi such as Gremmeniella abietina, Ceratocystis spp. associated with mountain pine beetle, and Stereum purpureum were investigated with W. Ayer (U of A).
12. Pathological and chemical investigations of fungi associated with mountain pine beetle have been jointly conducted by W. Ayer (U of A), R. Swanson (NoFC), and Y. Yamaoka (NoFC), and a significant discovery was made. A fungus that is both an effective colonizer and an agent that stops water flow in MPB-attacked trees was identified. One journal paper has been published and two are under review..
13. Aspects of distribution, biological species identification, detection method, and pathogenicity tests of Armillaria root rot have been conducted by K. Mallett (NoFC), M. Mugala (University of Alberta), and P. Blenis (University of Alberta). The Armillaria root rot investigations are transferred to the new study with K. Mallett (NOR-11-09) in 1988.

D. Aspen decay and stain

14. Since 1984 investigation of aspen decay and stain in conjunction with aspen utilization especially CTMP pulping process has been conducted with the support from C/A PAIf. Two information reports were published: one a review of previous work (1984) and another one a manual for classification and measurement of decay and stain (1990). Proposals for expanded cooperative investigation with University of Alberta, University of Calgary, Millar Western Pulp C., Alberta Forest Service, and Pulp and Paper Institute of Canada (PAPRICAN) have been approved late 1992 and work has been started.

15. Cooperative investigation of aspen decay and stain with Dr. W. Ayer and Ms. L. Sigler of the University of Alberta has been initiated in 1990 with the three year NSERC Strategic Grant.

14. Goals and accomplishments 1992-93

A. Western Gall Rust study

1. *Continue western gall rust investigation, in conjunction with ongoing jack pine genetics and tree improvement program with J. Klein, and Manitoba Department of Natural Resources.(C/M PAIF:8027)*

- (a) *Examine and analyze results of field and inoculation experiments conducted in 1990.*

Compiled a report summarizing field and inoculation results from 1985 and ready for internal review. A journal paper describing a new inoculation method has been accepted by a journal. Myrholm, C.; Hiratsuka, Y. A new method of inoculation of hard pines with Endocronartium harknessii. Can. J. Pl. Path. (Accepted September 1992).

- (b) *Plan and conduct inoculation experiments based on the results of 1990 inoculation experiment results and field observations.*

About 1000 seedlings representing 25 selected families of jack pine have been inoculated in Pineland Nursery in Manitoba by MDNR staff with significant results.

- (c) *Conduct field evaluation of jack pine family plantations in Saskatchewan-Manitoba border (Central Breeding District, Klein 1982) involving in more than 10,000 seedlings planted in four different sites 18 years ago.*

This field survey was not conducted because of low level of western gall rust infections in the plantations.

2. *Continue to work on an information report on western gall rust with Dr. P.V. Blenis of the University of Alberta.*

Several chapters were drafted.

3. *Continue co-operative work on western gall rust resistance evaluation of lodgepole pine in conjunction with tree genetics and improvement with AFS personnel (Drs. Dhir and L. Barnhardt)(C/A PAIF:8035)*

- (a) *Assist AFS personnel to plant seedlings of resistant and susceptible families from 1990 inoculation experiments in high WGR incidence areas in central Alberta for field testing.*

Gave advice and assisted to plant seedlings in Whitecourt area.

- (b) *Plan and conduct green house inoculation experiments of about 100 lodgepole families provided by AFS.*

About 3600 seedlings of 110 families provided by AFS have been inoculated and results have been analyzed.

- (c) *Identify highly resistant families and provide seedlings to AFS staff to be planted in the field testing site in the spring of 1993.*

Several very resistant families have been identified and they will be prepared to be planted by AFS in the prepared field in Whitecourt area.

4. *Results of ultrastructural investigation of the cytology of western gall rust with Dr. M Neuwirth and Arlene Oatway of Alberta Environmental Centre will be examined and considered for publication.*

A draft manuscript of the paper has been completed and will be ready for review in 1993.

B. Taxonomy, biology, and pathology of forest tree rusts

5. *Plan and conduct pine stem rusts survey in Siberian region of USSR in August 1992 with a Russian mycologist (Dr. Z. Azbukina) and several Japanese collaborators. A short field trip to northern China is also planned.*

A five week field trip to northern China and south eastern Siberia was conducted supported by For Can S & T Development Award. A report has been written and a part of specimens collected during the trip has been examined. A significant amount of information on pine stem rusts and other rust fungi has been obtained.

6. *Examine several interesting rusts collected in Brazil during the study trip in 1990.*

A short journal paper describing a new species of rust fungus from Brazil has been under preparation with Prof. Ferreira and will be ready for review early in 1993.

C. Aspen decay and stain

7. *Investigations of black galls of aspen in conjunction with biocontrol of decay and stain will be stepped-up with the NSERC Strategic Grant support to Y. Hiratuska, W. Ayer (Univ. of Alberta, Chemistry) and L. Sigler (U of A Microfungi Collection).*

Significant progress has been made for the investigation of etiology of black gall, metabolites produced in black gall tissue, and antagonistic fungi isolated from black gall tissue.

8. *Try to obtain funding through FRDA to initiate a multiagency-multidiscipline project on aspen decay and stain. The proposal includes researchers from University of Alberta, University of Calgary, Pulp and Paper Research Institute of Canada, Alberta Forest Service and Forestry Canada. (C/A PAIF Project: 8041, 8044)*

Coordinated and obtained C/A PAIF funding for aspen decay and stain investigation involving researchers from University of Alberta (aspen genetics and DNA fingerprinting), University of Calgary (tissue culture, cell culture and micro propagation of aspen), Millar Western Pulp Co. (material collection), Pulp and Paper institute of Canada (pulping tests), Alberta Forestry Service (field collection of material) and Forestry Canada (microbiological investigation, project coordination). Ten selected logs have been sent to PAPRICAN for pulp testing and various material have been collected for different studies.

9. *Continue participating in Biotechnology Network for Biorational Control of Forest Product (BIOCOND) and co-supervise a graduate student to investigate morphology and histology of black gall of aspen.*

A significant progress has been made for the thesis work of a graduate student, Ms Pat Crane, on field survey, histology and histochemistry of black gall of aspen. (GP BIOCOND Network).

10. *Clones of aspen with unusual field characteristics such as disease resistance, insect resistance etc. will be noted, reported and collected by insect and disease specialists, and propagated and retained for future investigations.(C/A PAIF Project:8041).*

This aspect of the work has not been conducted as planned but propagations of decay free clones, black galled trees etc. have been made by U of Alberta cooperators for further genetic and molecular biological studies.

11. *Complete preparation of the "Field Guide for Aspen decay identification and measurement" with AFS personnel in 1993-94 for review and publication in 1993-94. A joint proposal for the support of this work including the public action cost is proposed to C/A PAIF. (C/A PAIF: 8041)*

Draft edition of the manual has been used in the field during the winter and feedback from AFS field crew will be discussed early spring of 1993 and incorporated for revision and improvements. Separate C/A PAIF funding was not obtained but funded as a part of larger project. See 8. above.

13. *Continue to conduct cooperative investigation of aspen decay and stain with Dr. W. Ayer and Ms. L Sigle of the University of Alberta has been initiated in 1990 with the three year NSERC Strategic Grant.*

Very interesting and significant results have been generated from this cooperative project and five journal papers (including three chemistry papers) are in press and four more have been submitted.

15. Information Activities

i) Journal Publications

Chakravarty, P.; Hiratsuka, Y. Antagonism of two decay fungi Peniophora polygonia and Phellinus tremulae associated with Populus tremuloides. Eur. J. For. Pathol. (In press).

Trifonov, L. S.; Chakaravrtty, P.; Hiratsuka, Y.; Ayer, W. A. Antifungal activities of metabolites of Peniophora polygonia against the aspen decay fungus Phellinus tremulae. Eur. J. For. Path. (In press).

Sato, S.; Katsuya, K.; Hiratsuka, Y. Morphology, taxonomy and nomenclature of Tsuga-Ericaceae rusts. Trans. Jap. Mycol. Soc. (In press)

ii) Information Reports

Nil

iii) Other reports

Hiratsuka, N.; Sato, S.; Katsuya, K.; Kakishima, M.; Hiratsuka, Y.; Kaneko, S.; Ono, Y.; Sato, T.; Harada, Y.; Hiratsuka, T.; Nakayama, K. 1992. The rust flora of Japan. Tsukuba Shuppankai, Japan. 1400 p.

iv) Lectures, courses, seminars and scientific addresses

Hiratsuka, Y. Western gall rust research activities at Northern Forestry Centre. Guest lecture in Dr. M. Hubbes forest pathology class at University of Toronto (7 Feb. 1992)

Hiratsuka, Y. Microbiological investigation of decay and stain of aspen. Invited seminar, Department of Forest Science, University of Alberta (11 March 1992).

Crane, P.; Hiratsuka, Y. Black gall of aspen: etiology, anatomy, and role in decay resistance. BIOCOND Meeting, Pulp and Paper Institute of Canada, Vancouver, B. C. (12 June 1992)

Hutchison, L. J.; Chakravarty, P.; Hiratsuka, Y. 1992. The microbial interactions and ecology of fungi isolated from decayed, stained and healthy aspen found in Alberta and northern British Columbia. Paper presented at Canadian Phytopathological Society Meeting, Truro, Nova Scotia. (June 1992)

Hiratsuka, Y. Research activities on decay and stain of trembling aspen, Populus tremuloides, in western Canada. Invited lecture at Northwestern Forestry College, Yangling, People's Republic of China (6 July 1992).

Hutchison, L. J.; Hiratsuka, Y. Filamentous fungi and yeasts associated with decayed, stained and healthy wood of aspen in western Canada. Paper presented at Mycological Society America/American Phytopathological Society Joint Meeting, Portland, Oregon. (August 1992)

Hiratsuka, Y. Forest tree rusts. Guest lecture in a forest pathology course at the University of Alberta (13 Oct. 1992)

v) Technology Transfer

Invited talk at the Edmonton Mycological Club on forests and mushrooms of northern China and Siberia. (4 Nov. 1992)

Invited banquet talk at the Plant Pathology Society of Alberta meeting on forests and rust diseases in Brazil. (6 Nov. 1992)

16. Goals 1993-94

A. Western Gall Rust study

1. Continue western gall rust investigation, in conjunction with ongoing jack pine genetics and tree improvement program with J. Klein, and Manitoba Department of Natural Resources in Manitoba and Saskatchewan. This is supported by C/M PAIF:8027 and C/S PAIF:8044 funding.
 - a) Examine and analyze results of inoculation experiments conducted in 1992.
 - b) Plan and conduct inoculation experiments based on the results of 1992 inoculation experiment results and field observations. As in 1992, inoculation experiments will be conducted in Pineland Tree Nursery, Hadashville, Manitoba
 - c) Conduct field evaluation of jack pine family plantations in Saskatchewan-Manitoba border (Central Breeding District, Klein 1982) involving in more than 10,000 seedlings planted in four different sites 18 years ago.
 - d) Complete a report containing results of field surveys and inoculation experiments from 1985 to 1992 possibly for an information report.
2. Continue co-operative work on western gall rust resistance evaluation of lodgepole pine in conjunction with tree genetics and improvement with AFS personnel (Drs. Dhir and Barnhardt) supported by a C/A PAIF funding.
 - a) Assist AFS personnel to plant seedlings of resistant and susceptible families from 1992 inoculation experiments in high WGR incidence areas in central Alberta for field testing.
 - b) Analyse 1992 inoculation experiment results and write a report with Alberta Forest Service cooperators.
 - c) Plan and conduct green house inoculation experiments of about 100 lodgepole families provided by AFS in NoFC greenhouse in 1993.
3. Continue to work on western gall rust resistance evaluation in conjunction with jack pine tree improvement program (J. Klein) and early genetic evaluation of jack pine and white spruce (Dr. F. Yeh, University of Alberta).
 - a) Conduct field survey of western gall rust incidence in family field trial plantations in eastern Saskatchewan. (Central Breeding District).
 - b) Compile data of field survey and inoculation experiments for information report.
4. Continue to work on an information report on western gall rust with Dr. P.V. Blenis of the University of Alberta aiming to be published in 1995-96 fiscal year.

5. Results of ultrastructural investigation of the cytology of western gall rust with Dr.M. Neuwirth and Arlene Oatway of Alberta Environmental Centre will be examined and considered for publication.

C. Taxonomy, biology, and pathology of forest tree rusts

6. Plan and conduct pine stem rusts survey in Siberian region of former USSR in 1993 with a Russian mycologist (Dr. Z. Azbukina) and several Japanese collaborators.
7. Complete a journal paper describing a new rust fungus of Clitoria sp. from Brazil for review.
8. Continue investigation of potential biological control of western gall rust using an insect vector and a mycoparasite. (For Can S & T Opportunity Fund project) (Transferred from NOR-11-11 in 1993-94)
 - a) Investigate physiology of Scytalidium uredinicola especially sporulation and spore survival with a contractor.
 - b) Investigate life cycle, feeding habit and ecology of a beetle species Epuraea obliquus with a U of A graduate student.
 - c) Investigate metabolites produced by Scytalidium uredinicola, especially bioactive compounds which possibly are involved in killing western gall rust spores, with Dr.W. Ayer of the University of Alberta.
 - d) Write a report of the work up to the end of 1992-93 fiscal year for S & T Opportunity Fund report.

D. Aspen decay and stain

9. Continue project with U of A cooperators on microbial and chemical studies of aspen decay and stain and compile final report of the three year NSERC Strategic Grant ending in October 1993. Prepare several journal publications resulted from the project.
10. Continue coordinate and participate in cooperative project funded by C/A PAIF with several outside agencies and formulate proposals for extending the work based on the results generated by the end of March 1993.
11. Start cooperating with Drs. J.Saddler and Bruil of the University of British Columbia to screen selected fungi for possible industrial use (for bioprotection of wood chips and biopulping).
12. Initiate cooperative work with Dr. B. Callan of Pacific Region to compile information of Populus fungi of western Canada.

17. Major Co-operators

i) Internal - FC

Region	ID#	Title	Contact name
NW			J. Klein
Pacific			B. Callan

ii) External -

Establishment	ID#	Title	Contact name
University of Alberta			Dr. W. A. Ayer
University of Alberta			L. Sigler
Alberta Forest Service			D. Morgan
Alberta Forest Service			Dr. N. Dhir
Manitoba DNR			K. Knowles I. Pines
University of Alberta			Dr. F. Yeh
University of Alberta			Dr. B. Dancik
University of Calgary			Dr. T. Thorpe
University of Tsukuba			Dr. K. Katsuya

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1992-93**

Project Review Date: January 14,1993

1. **STUDY TITLE:** Operational research studies into important tree diseases.
2. **Responsibility Centre:** Northwest Region
3. **Program:** Forest Protection
4. **Project Title:** Forest Insect and Disease Management Systems and Surveys
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	K.I. Mallett
Team Members	C. Myrholm
	Summer Student

8. **Study Key Words:** Armillaria root rot, pine stem rusts, dwarf mistletoe, poplar diseases and decay, nursery diseases, seed and cone diseases, taxonomy, pathogenicity, control, Forestry Pathology, Root Diseases, Biomonitoring, Acid Rain, Integrated Pest Management, Reduction of forest losses.
9. **Study Activity:** 2234, 2232

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
K.I. Mallett	SE-RES-2 (P)	0.90	0.90	0.90		
C. Myrholm	EG-4 (T)	0.00	0.00	0.60		
FTEs		1.70	1.70	1.50		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	6.28	5.00			
Capital					
G & C					
TOTAL:	6.28	5.00			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries: Alta	A8019		13.00			
O&M: Alta.	A8019		17.00			
Capital						
G & C: Alta.	A5023		4.00			
TOTAL:			34.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries:		0.00	0.00			
O&M	11-89	3.67	3.50			
Capital						
G & C						
TOTAL:		3.67	3.50			

STUDY TOTAL		42.50				
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11. Study Background and Problem Analysis For effective forest management, accurate and reliable methods of disease identification, damage, and loss assessment are necessary. As well, information on the biology of forest pathogens, and control measures must be available to the forest resource manager.

In the Northwest Region, the economically important tree diseases are *Armillaria* root rot, hard pine stem rusts, dwarf mistletoe, nursery diseases, poplar decay and deterioration, and seed and cone diseases.

Armillaria root rot, caused by *Armillaria* species, has been identified as one of the most important disease problems in the region. Most recent work has centred on the identification of the *Armillaria* species in the region, their distribution, and pathogenicity. Little is known about the impact of the disease on plantations or intensively managed conifer stands. Information regarding early detection and survey techniques are limited, and also information regarding the biology of the *Armillaria* in the region and control measures.

Pine stem rusts are thought to impact young conifer stands through mortality, growth and yield loss. Research to date has focused on biology of the hard pine rusts. Information on breeding for resistance, epidemiology, impact, and control measures needs to be developed.

Dwarf Mistletoe of jack and lodgepole pines is a highly destructive disease in the region. Much information has been collected concerning the biology of dwarf mistletoe, but more information is required on impact and control measures.

With the increase in Poplar utilization, there is a greater demand for investigations into poplar diseases, and deterioration. Methodology is required to determine the amount of decay in poplar stands for inventory purposes. As old growth forests are used, and poplar regeneration and stand management become important, other poplar disease problems will arise. It is important that these problems be identified and the appropriate control measures be developed.

The use of planted stock is becoming increasingly important in intensive forest management. There is a need to study the diseases of conifer seedlings in forest nurseries in the region.

Diseases, such as storage moulds of seedlings and damping-off, can cause large losses to nurseries. Little information is available to nursery personnel on the impact of these disease, or their control.

Little is known about the seed and cone diseases of the region. More study is required to provide for nursery and breeding program personnel with accurate and reliable information on these diseases.

This study attempts to address the need to: develop impact information and survey techniques for the major disease causing agents for nurseries, plantations and natural stands; study the biology of the major disease causing agents and develop appropriate control strategies; advise forest managers and forest resource users on the major disease causing agents.

12. Study Objectives:

Objectives:

1. To study the taxonomy, distribution, ecology, and pathogenicity of important disease causing agents in Northwest Region.
2. To study the impact of disease causing agents in nurseries, plantations, and in natural stands.
3. To develop early detection, survey techniques, and control strategies for disease causing agents in nurseries, plantations, and natural stands.

i) Objectives

The objectives of this study are directly related to Integrated Pest Management component of the Green Plan and the reduction of forest losses issue of the regional strategic plan.

ii) Deliverables

Short Term (1-5 years)

1. A journal article on "The fungi associated with terminal weevils in the Northwest region".
2. A journal article on "Armillaria root rot and soil nutrients".
3. A journal article on "Armillaria root rot and soil moisture".
4. A journal article on the "Mating system of Phellinus tremulae".
5. An information report on the "Forest health of lodgepole pine stands around sour gas plants near Rocky Mountain House".

6. Produce 3 issues of "Forest Insect and Disease Notes".

Long Term (5 years and beyond)

1. A journal article on the epidemiology of Phellinus tremulae.
2. A journal paper on the nuclear cycle of Phellinus tremulae.
3. To develop a site hazard rating system for Armillaria root rot.
4. A journal article on the Forest health survey of the forests surrounding the sour gas plants in the Rocky Mountain House area.

iii) Significant Linkages:

NOR 11-09 is linked to the NOR 11-01, NOR 11-05, NOR 07-01, NOR 07-05, NOR 06-1, and C/M PAIF:8035.

iv) Methodologies

Research studies performed in NOR 11-09 use methodology that is currently accepted by the forest pathology research community. All papers undergo peer review to insure that methodology is acceptable. The design of most studies is done to insure statistically valid results. Experiments are designed with adequate replication and with a clear statistical analysis in mind. Most experimental data are analyzed using the Analysis of Variance statistical procedure.

13. Progress and Achievements

Research studies were conducted on the taxonomy and distribution of the Armillaria mellea complex in the region. Specimen collections were made and identified. Three species of Armillaria have been found in the Northwest region, A. ostoyae, A. sinapina, and A. calvescens. A host list for the species and a distribution map has been developed. Identification methods such as the L-DOPA technique for identifying the various species have been developed. Studies into the incompatibility system of some Armillaria species have revealed valuable information regarding intraspecific and interspecific incompatibility. Techniques for identifying Armillaria root rot centers in cutover areas have been initiated.

The A. mellea complex species present in the region have been tested for their ability to kill native conifer species. Results to date suggest that both A. ostoyae and A. sinapina are both pathogenic to native conifers.

Studies into the cause of mortality of jack pine budworm defoliated jack pine in Saskatchewan have shown that there is a relationship between Armillaria root rot and jack pine budworm damaged trees.

A study into the population structure of Phellinus tremulae was initiated. Results suggest that there is a tetrapolar mating system. Experiments to date have shown that heterokaryotic isolates that are genetically identical will grow into one large colony when paired on agar media. Heterokaryotic isolates that are genetically different show vegetative incompatibility. This may provide a tool for studying the epidemiology of P. tremulae in the field.

"Light rings" tree rings that are characterized as having a small number of latewood cells than normal rings were discovered in jack pine trees that had been defoliated by jack pine budworm and Armillaria root rot.

14. Goals and Accomplishments (1992-93)

1. a) *Publish an information report entitled "Armillaria root rot in the prairie provinces".*

An information report was published (see information activities)

- b) *Submit to the Canadian Journal of Forest Research for review an article entitled "Light rings and the age of jack pines" (in conjunction with W.J.A. Volney.)*

A journal article was submitted and accepted for publication (see information activities)

- c) *Submit for internal review a journal article on Soil and foliar nutrients in relation to Armillaria root rot in lodgepole pine. (in conjunction with D.G. Maynard NOR-07-05)*

Thirteen additional sites were sampled in the 1992 field season. A journal paper is currently being prepared.

2. a) *Complete identification of fungi from terminal weevils and their galleries in spruce and pine.*

Identification of fungi was completed.

- b) *Prepare a journal article on fungi associated with terminal weevils. (in conjunction with D. Langor NOR 11-10)*

A journal paper is in preparation.

3. *Complete the greenhouse experiment initiated in 1991 to determine the relationships between Armillaria root rot and foliar nutrients and analyze data. (In conjunction with D.G. Maynard (NOR 07-05).*

The greenhouse experiment was completed and the data analyzed. A poster on the data was prepared and presented at the 1992 American Phytopathological Society meeting (see Information activities).

4. *Complete the greenhouse experiment on the relationship of soil moisture stress and Armillaria root rot and analyze the data.*

The greenhouse experiment was completed and the data analyzed.

5. *The nuclei of monospore isolates and heterokaryotic isolates of P. tremulae will be stained to determine the number and distribution of nuclei in cells.*

Nuclei were stained using Giemsa and DAPI staining techniques. A nuclear cycle for Phellinus tremulae has been tentatively proposed but requires some experimentation to confirm.

6. *Plots established at Hinton in a mixedwood stand will have traplogs assessed for colonization by Armillaria species. Spruce trees within plots will be surveyed for Armillaria root rot. Trap logs will be set in the study at Whitecourt.*

Traplogs from the Hinton plots were collected and Armillaria species were isolated and identified. Spruce trees in the plots were evaluated for disease. Trap bags were placed at the site to evaluate.

7. *A forest health survey will be done on the plots at the 30 sites in the forest surrounding the Husky Ram river and Gulf Strachen sour gas processing plants will be initiated. This information will be compared to the previous year to determine how many of the declining trees have died. Forest health survey plots will be put into six young lodgepole pine stands in the area surrounding the gas plants. Mensurational and forest health survey data will be collected and analyzed. (In conjunction with D.G. Maynard NOR 07-01 and W.J.A. Volney NOR 11-05)*

A forest health survey of six (6) young lodgepole pine stands near the Husky Ram River and Gulf Strachen plants was completed. Trap logs placed in the 30 site around the two plants were removed and examined for Armillaria infestation. Armillaria species isolated were identified.

8. *A survey in north central Alberta will be conducted to determine the cause of Balsam fir mortality. Plots will be established in the Fort McMurray, Lac La Biche, Lesser Slave lake areas and assessed for incidence of Balsam fir mortality and to determine causes.*

A balsam fir mortality survey was conducted and a report written (see information activities).

9. *Provide advice and technology transfer of information regarding forest diseases to NOR-11-01 personnel and client groups.*

Advice was given to Provincial forest managers, nursery personnel, and forest industry personnel. Three workshops on forest disease identification were given.

10. *Produce three (3) issues of "The Forest Insect and Disease Notes". (in cooperation with personnel from NOR 11).*

Three issues of FID Notes were produced.

11. *Conduct an investigation into the cause of the needle casting in young lodgepole pine stands in the Bow/Crow Forest.*

A survey of eight (8) young lodgepole pine stands was conducted in the 1992 field season and a report detailing the findings was written (see information activities).

12. *Investigate the cause of needle loss on lodgepole pine and black spruce in the Whitecourt Forest.*

An investigation into the cause of severe needle loss from lodgepole pine and white spruce was conducted and a report written (see information activities).

13. *Investigate the use of snow mould fungi to biologically control Calamagrostis canadensis (blue joint) (C/A PAIF:8014).*

Blue joint plants and white spruce seedlings were inoculated with a snow mould and incubated in a low temperature growth chamber.

14. *Investigate the growth loss to lodgepole pine and the economic consequence (C/A PAIF 8016) with B. White (NOR 06-01).*

Growth of twenty six trees from a root disease center was examined using tree ring analysis.

15. *Investigate the relationship between Armillaria root rot and soil properties in west central Alberta (C/A PAIF:8017 and Green Plan 11-89) with D.G. Maynard. (NOR 07-05)*

Root rot surveys and soil and plant samples were collected from thirteen sites in west central Alberta.

16. *Investigate the use of stump pulling as a control measure for Armillaria root rot in Manitoba (C/M PAIF 8035) with D. Ip. (NOR 42)*

A root rot control project was established in south eastern Manitoba.

15. Information Activities

i) Journal Publications

Volney, W.J.A.; Mallett, K.I. 1992. Light rings and the age of jack pine trees. Can. J. For. Res. 22:

ii) Information Reports

Mallett, K.I. 1992. Armillaria root rot in the Canadian prairie provinces. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-329.

iii) Other reports

Maynard, D.G.; Stadt, J.J.; Mallett, K.I.; Volney, W.J.A. 1992. A comparison of sulfur impacted and non-impacted lodgepole pine stands in west central Alberta. Can. J. Soil Sci. 72:327.

Mallett, K.I.; Maynard, D.G. 1992. The effect of fertilizer on Armillaria infected lodgepole pine grown in the greenhouse. Phytopathology 82:1151

Stadt, J.J.; Maynard, D.G.; Mallett, K.I.; Volney, W.J.A. 1992. Interim report on biomonitoring and forest health assessments near two sour gas plants.

iv) Technology transfer:

Mallett, K.I. 1992. Assessment of Prince Albert tree nursery soils for disease pathogens. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta, File Report: NOR-1109-9201.

Mallett, K.I. 1992. Pathogen analysis of peat moss collected from Pine Ridge Forest nursery. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta, File Report: NOR-1109-9202.

Mallett, K.I. 1992. An investigation into tree damage in the Whitecourt forest. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta, File Report: NOR-11-09-9203.

Mallett, K.I. 1992. Young stand pest survey of eight stands in the Sundre ranger district, Bow-Crow Forest. For. Can., Northwest Reg., North. For. Cent. Edmonton, Alberta, File Report: NOR-1109-9204.

Mallett, K.I.; Langor, D.G. 1992. Balsam fir mortality survey. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta, File Report: NOR-1109-9205.

Mallett, K.I., (Compiler). 1992. Forest Insect and Disease Notes. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta, A020, March 1992; A021 July 1992; A022 December 1992.

16. Goals 1993-94

1. a) Submit for internal review a journal article on soil and foliar nutrients in relation to Armillaria root rot in lodgepole pine. (in conjunction with D.G. Maynard NOR-07-05). This article will require Editor's service.
 - b) Submit for internal review a journal article on fungi associated with terminal weevils. (in conjunction with D. Langor (NOR 11-10).
 - c) Prepare a final report (information report) on the forest health survey near two sour gas plants in west central Alberta. The report is to be submitted to industry by June, 1993 (in collaboration with D.G. Maynard (NOR 09-05) and W.J.A. Volney (NOR 11-05)).
 - d) Prepare a journal article on the mating system of Phellinus tremulae.
- 2) A field test of the efficacy of a snow mould fungus on the control of blue joint grass, will be conducted (in conjunction with V. Leiffers, U of A and D. Gaudet Agriculture Canada) if funded by the C/A PAIF.

- 3) Analyze tree growth data collected in 1992. Identify and measure stand openings and collect tree discs from trees within and outside the opening. (C/A PAIF:8016 in cooperation with B. White (NOR 06-01)).
 - 4) Armillaria root rot hazard rating (C/A PAIF 8019 in conjunction with D. Maynard (NOR 07-05)).
 - a. A greenhouse experiment on soil moisture and Armillaria root rot will be conducted.
 - b. A greenhouse experiment on the effect of calcium on Armillaria root rot will be conducted.
 - c. Selected young stands of lodgepole pine will be surveyed for root disease and soil samples will be collected and analyzed for soil moisture, pH, organic matter and selected elements. (C/A PAIF:8017 and Green plan 1189).
 - 5) Red and jack pine seedlings will be planted in June of 1993 and evaluated in the fall. (C/M PAIF 8035 in conjunction with D. Ip. (NOR 42))
 - 6) Evaluate spruce budworm impact plots for root disease (Green plan in conjunction with J. Volney and R. Alfaro.)
 - 7) Epidemiology of white rot of aspen.
 - a. As part of an ongoing study into the epidemiology of Phellinus tremulae conks, from within several aspen clones and determine their genetic relatedness.
 - b. The nuclear cycle of Phellinus tremulae will be further investigated by hyphal tipping dikaryotic isolates and determining the resulting colony's nuclear condition and by microscopically studying nuclear movement.
 - 8) Trap bags set in the mixedwood site at Hinton, Alberta will be collected and evaluated for Armillaria colonization. Spruce mortality will be evaluated in the non-harvested stand adjacent to the cutover plots.
 - 9) Produce three (3) issues of "The Forest Insect and Disease Notes". (in cooperation with personnel from NOR-11).
17. Major Co-operators:
- i) Internal - FC

Region	ID#	Title	Contact name
Ontario		Green Plan - Seed Orchard Pests	A. Hopkin
Pacific		Green Plan - Integrated Pest Management	R. Alfaro

ii) External -

Establishment	ID#	Title	Contact name
Husky Oil Ltd.		Environmental Coordinator	David McCoy
Gulf Oil Ltd.		Environmental Coordinator	Bernie Patterson
Agriculture Canada	C/A PAIF 8016	Research Scientist	Denis Gaudet
University of Alberta	C/A PAIF 8016	Associate Professor	Victor Leiffers

18. Environmental Implications:

The NoFC Environmental Committee has evaluated the proposed study activities. On the basis of the information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: 14 January 1993

1. STUDY TITLE: Forest Insect Biosystematics
2. Responsibility Centre: Northwest Region (8135)
3. Program: Forest Protection
4. Project Title: Forest Insect and Disease Management Systems and Surveys
5. Office Location(s): Edmonton, Alberta
6. Work Location: Prairie Provinces and North West Territories
7. Study Staff:

	Name
Study Leader	Dr. D. Langor
Technician	D. Williams
Summer Student	J. Hammond

8. Study Key Words: weevils, taxonomy, management, biodiversity, diagnostics
9. Study Activity: 2232

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
D. Langor	SE-RES-02 (P)	0.90	0.90	0.80		
D. Williams	EG-04 (T)	0.80	0.80	0.60		
W.J.A. Volney	SE-RES-3 (P)	0.10	0.10	0.10		
J. Hammond	Summer student					
FTEs		1.80	1.80	2.40		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	8.07	5.00			
Capital	7.52				
G & C					
TOTAL:	15.59	5.00			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries: Alta.	A8017		14.50			
O&M: Alta.	A8017		18.50			
Capital						
G & C						
TOTAL:			33.00			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	11-88	7.30	0.00			
Capital						
G & C						
TOTAL:		7.30	0.00			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Other</u>						
Suspence - Daishowa						
O&M	11-90	1.68	3.00			
Capital						
G & C						
TOTAL:		1.68	3.00			

STUDY TOTAL						
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11. Study Background and Problem Analysis

Insects constitute one of the most important biotic factors affecting forest ecosystems. Hundreds of insect species attack and damage every part and age class of the native and exotic tree species in this region. Prompt and accurate identification of mature and immature stages of insects is essential to insect surveys, pest extension services, damage appraisal studies, and pest management. Insect diagnostic and taxonomic services are important to many research studies and provide information which leads to a broader understanding of forest ecosystems. It is important to keep abreast of the taxonomy and nomenclature of insect taxa important to forestry so as to provide current scientific names as needed. To maintain and improve diagnostic and taxonomic service capabilities, it is necessary to maintain a reference collection of mature and immature insects as well as a reference literature collection. Also, since the insect larval stage is the most destructive and insect identification is based mainly on the adult stage, a rearing program is a necessity to establish larval-adult association. The rearing program also provides information on phenology, parasites, predators, diseases and host associations as well as supplies material for the reference collection. A major focus of this study is to provide diagnostic and advisory

services to clients, colleagues, and the public and to maintain and improve reference collections.

Some groups of insects of importance to forestry are closely related and resemble each other morphologically. Without adequate ways to discriminate among similar species this may lead to some confusion in biological studies and in the implementation of management plans. Therefore, there is a need to understand the taxonomy of these species in order to determine species boundaries and to find characters to discriminate among similar species. Taxonomic studies are usually based on an examination of morphological characters. Because some species are poorly differentiated morphologically, biochemical and genetic methods (e.g., electrophoresis, DNA sequencing, RFLP, etc.) are required to discriminate among these species. Additionally, life history studies also provide important biological information which assists in separating such species. This study is focused on the taxonomy, ecology, and management of bark and terminal weevils of the genus Pissodes.

The environmental impacts of forestry practices is a major concern in the Northwest Region and across Canada. As a group, insects comprise the most diverse component of forest ecosystems and are vital elements in the ecology of these ecosystems. Clearcutting and fragmentation of forests are known to adversely influence biodiversity (local extinction of species) and abundance (increase in detrimental species) of insects. Since a very large proportion of the commercial forests of the Region are committed for cutting, there is an urgent need to evaluate potential impacts of forestry practices on all aspects of forest ecosystems in order to make recommendations to minimize these impacts. This study will investigate the impacts of clearcutting and forest fragmentation on the arthropod faunas of pine and aspen ecosystems.

12. Study Objectives:

i) Objectives

1. Undertake biosystematic, faunistic, and ecological studies of Pissodes weevils and other selected important forest insect taxa.
2. Assess impacts of forestry practices on the arthropod faunas of major forest ecosystems in the Northwest Region.
3. Provide diagnostic and taxonomic services to clients, NoFC personnel, outside agencies and scientists engaged in biological and taxonomic research on insects.
4. Maintain and improve regional collections of insects and mites, collection of photographic slides, and FIDSINFOBASE.

ii) Deliverables

Short Term (1-5 years):

- journal and TT publications on the taxonomy, ecology, and management of P. strobi and P. terminalis in the prairie provinces.

- taxonomic descriptions of new species of Pissodes in China.
- annotated bibliography of North American Pissodes literature.
- journal papers on the life history of Hylesinus californicus and Pityophthorus pulchellus tuberculatus.
- journal and TT publications on the impacts of clearcutting and forest fragmentation on arthropod diversity in the boreal forest.
- journal and TT publications on the parasitoids of the spruce budworm and forest tent caterpillar.
- journal and TT publications on birch leafminer biology and management
- produce a field guide to the Forest Pests of the Prairie Provinces.

Long Term (5 years and beyond)

- taxonomic revision of North American Pissodes, including keys to discriminate among species, based on morphological, biochemical and genetic studies.
- initiate taxonomic studies on other forest insects.
- establish pest management programs (biocontrol, silvicultural) for terminal weevils in the NWR.
- develop a strong database on the ecology of terminal weevils and their natural enemies in the prairie provinces.
- develop a strong database on the impact of clear cutting and forest fragmentation on biodiversity of boreal forest in Alberta and use this data to contribute to a decision support system to help industry minimize environmental impacts of forestry practices in the major forest ecosystems of the region.
- produce a field guide to the aspen pests of the prairie provinces.

iii) Significant Linkages:

Internal:

NOR 11 01: diagnostic/ advisory services and collections management

NOR 11 05: parasitoids of spruce budworm

NOR 11 06: field guide on forest pests of the prairies

NOR 11 09: balsam fir mortality, fungi associated with Pissodes

External:

Dr. J. Spence (U. of A.): impacts of forestry practices on biodiversity, natural enemies of forest tent caterpillar.

Dr. F. Sperling (U. of Ottawa): molecular systematics of Pissodes.

Mr. R. Zhang (Academia Sinica, Beijing, China) & Mr. S. Yingxian (Southwest Forestry College, Kunming, China): taxonomy of Chinese Pissodes.

Ms. P. Camsell (AFS, Slave Lake): silvicultural control of Pissodes.

iv) Methodologies

Ecological Field Studies (Pissodes and scolytids): Where necessary, temporary plots were established in the field (dimensions varied according to experiment). Infested host material was returned to the lab and processed. Fungi were cultured on 2% malt extract. Insects were extracted from host, head capsules measured to determine instar, mortality was tallied and causes of mortality noted. Flight activity was monitored using baited, cylindrical, sticky traps. Behaviour was observed in the field and lab. Data were analyzed using non-parametric tests and ANOVA.

Taxonomic Studies (Pissodes): Morphological characters were assessed and measured using a microscope and ocular micrometer. Morphometric data will be analyzed using discriminate analyses and cluster analysis. RFLP analysis of mitochondrial DNA was done using the polymerase chain reaction and agarose gel electrophoresis. DNA sequencing was done using PCR and an automatic DNA sequencer.

Geographical variation in litter-dwelling arthropod communities in mature aspen forests was assessed by comparing collections from 21 stands at 6 locations in north central Alberta. The variation in litter arthropod communities in stands of various ages was studied in 18 sites near Lac la Biche. Arthropods were sampled using continuous pitfall trapping during the snow-free season. Traplines consisted of 6 traps ca. 50 m apart. Traps were unbaited, used ethylene glycol as a preservative, and were emptied at ca. 10-day intervals. Number of species and diversity were compared using rarefaction. Community similarity was assessed using cluster analysis.

13. Progress and Achievements

The insect reference collection is undergoing reorganization, expansion, and scientific names of insects are being updated. Diagnostic and advisory services, and insect and mite specimens are provided to scientists, clients, and the public upon request. The FIDSINFOBASE is continuing to be updated by addition of new records and correction of old records. The database is queried and reports generated upon need or request. Organization of the FIDS photographic slide collection (ca. 10,000 slides) was completed. All slides have been sorted, identified as much as possible, re-labelled, and organized using a filing system.

A laboratory to analyze DNA sequences and restriction sites is set up. DNA has been extracted from 110 Pissodes specimens. A ca 1600 bp region of mitochondrial DNA from all specimens has been amplified using PCR and assayed using 8 restriction enzymes. The data provided several good diagnostic for distinguishing among species of P. strobi, P. terminalis, and P. nemorensis. A manuscript is in preparation.

A study of morphological variation in Pissodes, in search of character systems to help discriminate among species, is ongoing. In particular the morphology of P. strobi and P. terminalis is being compared to find characters to discriminate among adults and larvae. 8 abdominal and genitalic characters have been measured on 160 adult Pissodes of both species. Data have been entered into a computer database and are being statistically analyzed.

A survey of the fungi disseminated by P. strobi and P. terminalis in the prairie provinces has been completed. A manuscript is being prepared. A three year study of the life history and life tables of Pissodes terminalis in lodgepole pine has been completed, data have been analyzed, a FMN has been published, another journal manuscript is being prepared. A survey of the predators and parasites of P. strobi and P. terminalis in the Northwest Region has been completed and a reference collection prepared. This information will appear as a part of future publications. About 800 papers on Nearctic Pissodes have been compiled, citations entered into the ProCite database, and most have been abstracted in preparation for an annotated bibliography.

A study to assess the impacts of aspen overstory removal on the growth and yield of and incidence of Pissodes strobi on understory white spruce was commenced near Slave Lake. Three treatments of overstory removal and controls (no removal) were replicated three times. Permanent plots were established for long term monitoring of G&Y, and tree condition and pest incidence was measured. These baseline data have been entered into a computer database.

Three years data has been collected about the effects of clearcutting on the biodiversity of ground-dwelling arthropods (ground beetles, rove beetles, ants, and spiders) of lodgepole pine forests in west central Alberta. Data on the ground beetles has been analyzed. One journal paper and one book chapter are in press and one tech transfer paper has been published. The other three taxa of arthropods are in the process of being identified. A similar study was commenced in aspen forests in Alberta in 1992. Geographical variation in litter-dwelling arthropod communities in mature aspen forests was assessed by comparing collections from 21 stands at 6 locations in north central Alberta. The variation in litter arthropod communities in stands of various ages was studied in 18 sites near Lac la Biche. Samples are currently being sorted, identified, and data analyzed.

A survey of the predators and parasitoids of forest tent caterpillar in Alberta has been completed and construction of identification keys completed. A manuscript is in preparation. A survey of the insects and mites feeding on aspen in the Northwest Region is continuing.

Studies of the life history and life tables of two bark beetle species, the western ash bark beetles (Hylesinus californicus) and Pityophthorus pulchellus tuberculatus have been completed and one journal publication (ash bark beetle) prepared.

14. Goals and Accomplishments (1992-93)

A. Biosystematics and Ecology of Pissodes Weevils

- 1) *Continue a survey of isozyme variation in Pissodes; assess geographic variation of isozymes in P. strobi and P. terminalis.*

I completed a preliminary survey of isozyme variation in these two species in the prairie provinces. These biochemical characters appear to have little reliable diagnostic value. RFLP analysis of mtDNA has much more utility as a diagnostic tool and I plan to invest future time into developing and using this more powerful technology. Hence, I will be discontinuing work with isozymes. The isozyme data may be used in a future publication.

- 2) *Continue a morphological study of Pissodes: (a) search for morphological characters to discriminate among P. strobi and P. terminalis adults and larvae; (b) initiate a cooperative taxonomic study of Chinese Pissodes. [In collaboration with Dr. Situ Yingxian, Southwest Forestry College, China and Mr. Runzhi Zhang, Academia Sinica, Beijing, China]*

About 160 adult male weevils of both species have been examined for variation in genitalic and abdominal characters. Eight characters have been measured and data entered into a SAS database. Analyses are under way. Another 80 specimens of females have been dissected in preparation for measurements. (b) Specimens of two undescribed species of Pissodes from southwestern China were received from Dr. Situ. These specimens are being examined and new species described. A study on the taxonomy of Chinese Pissodes was commenced in collaboration with Mr. Zhang. About 70 specimens have been examined. This material contains at least 5 undescribed species, two of which are conspecifics with the southwestern Chinese material.

- 3) *Obtain training in DNA sequencing and RFLP technology.*

I visited the laboratory of Dr. Donal Hickey (University of Ottawa) on two occasions and received training in these technologies.

- 4) *Complete identification of fungi associated with P. strobi and P. terminalis and prepare first draft of a journal paper. [with K. Mallett, NOR-11-09]*

Dr. Mallett has identified all fungi and a journal paper is under preparation.

- 5) *Complete bibliography of Nearctic Pissodes literature and publish as a computer diskette.*

Abstracting of papers is continuing. Publication will be at a later date.

- 6) *Prepare a journal paper on the life history and life tables of P. terminalis in lodgepole pine in Alberta.*

The data for this paper is analyzed, some figures and tables drafted, and a manuscript is roughly 50% complete.

- 7) *Embark on collecting trips throughout the Northwest Region to collect Pissodes specimens for taxonomic study and search for suitable potential study areas for future field research.*

D. Williams made several collections of Pissodes for taxonomic study and noted several potential study sites.

- 8) *Travel to P. R. China to attend the International Congress of Entomology (Beijing) and meet with colleagues in Heilongjiang Province and Kuming to discuss potential collaborative research on taxonomy and biocontrol of Pissodes. Will present a series of seminars, lectures, and papers on Pissodes research, scolytid pest management, and environmental impact work on insects.*

Travelled to Congress, presented a paper on 'The life history and life tables of Pissodes terminalis', and co-authored a second paper on 'The changing landscape of boreal forestry: effects of logging on carabid assemblages in western Canada'. Afterward, travelled in Heilongjiang Province for two weeks to consult with Chinese colleagues about Forest I&D work in the province and investigate opportunities for collaborative work. Presented a seminar on 'The taxonomy, ecology, and management of Pissodes terminal weevils' at the Heilongjiang Academy of Forest Science in Harbin. Afterward, I visited the Chinese Academy of Forestry and Academia Sinica in Beijing. The trip to Kunming was cancelled.

B. Diagnostic and Advisory Services and Collections Management

- 9) *Provide diagnostic and taxonomic services for determinations of forest and shade tree insects.*

To date, 67 collections (900 specimens) were received for identification. About 60 collections of insects were reared for diagnostic purposes or to obtain specimens for study.

- 10) *Maintain, update, reorganize, and improve regional collections (insects and mites, photographic slides, FIDSINFOBASE, FIDS library).*

To date, about 500 new insect specimens were pinned, labelled, and incorporated into the reference collection. Organization of the FIDS photographic slide collection (ca. 10,000 slides) was completed [contract]. All slides have been sorted, identified as much as possible, re-labelled, and organized using a filing system.

- 11) *Provide advice, information, and specimens to colleagues, clients, and the public.*

To date, advice and information were provided to 61 colleagues, clients, and the public.

C. Other Faunistics and Taxonomic Studies

- 12) *Publish a journal paper on the life history of the western ash bark beetle in Alberta.*

Manuscript prepared and under internal review.

- 13) *Publish a journal paper on the life history of Pityophthorus pulchellus tuberculatus.*

This goal has been deferred to 1993/94 because of other new priorities.

- 14) *Publish a journal paper on the impacts of forestry practices on the ground beetle communities in lodgepole pine forests in Alberta. [In collaboration with Drs. J. Spence and J. Niemela, U. of Alberta]*

Paper titled 'Effects of clear-cut harvesting on boreal ground-beetle assemblages (Coleoptera: Carabidae) in western Canada' is in press in Conservation Biology.

- 15) *Prepare a tech. transfer version of the paper mentioned in point 14.*

Paper prepared and published (see list of publications).

- 16) *Commence study of impacts of clearcutting and forest fragmentation on arthropod biodiversity in aspen stands: set up plots and collect first years' data. [In collaboration with Dr. J. Spence, U. Alberta, C/A PAIF 8020, AFDRT]*

Geographical variation in litter-dwelling arthropod (ground beetle, rove beetles, spiders, ants) communities in mature aspen forests was assessed by comparing collections from 21 stands at six (6) locations in north central Alberta. The variation in litter arthropod communities in stands of various ages was studied in 18 sites near Lac la Biche. All samples are sorted and specimens are being identified. Data for ground beetles has been analyzed.

- 17) *Publish a FMN on 'Host Effects on the Mountain Pine Beetle in Alberta'. [In collaboration with J. Spence]*

Manuscript has been completed and will be submitted for review in February.

- 18) *Publish a FMN on the parasitoids of the spruce budworm in Alberta.*

D. Williams has produced the first draft of a manuscript which is under review.

- 19) *Complete keys to parasitoids and predators of the forest tent caterpillar in Alberta and start to prepare illustrations for publication. [In collaboration with D. Parry and J. Spence, Univ. of Alberta].*

D. Williams has commenced work on keys and illustrations. Keys will be completed by the end of January.

- 20) *Set up plots and gather data to investigate balsam fir mortality in northern Alberta. [In collaboration with NOR 11-01, NOR 11-09, and AFS]*

Set up five permanent plots in Slave Lake and Lac la Biche forests, recorded tree health, and assessed pest incidence. A file report summarizing this data was written (see list of publications).

- 21) *Continue preparation of a Field Guide to the Forest Pests of the Prairie Provinces: field photography, preparation of color plates, write text. [In collaboration with Y. Hiratsuka, (NOR 11-06), C/M PAIF:8038]*

Assembled a preliminary list of insect plates to be included. Wrote sample text for two plates. Scanned photograph and slide collection for poses suitable for plates. Commenced compilation of plates [contract].

Additional Goals and Accomplishments:

- 22) Assess RFLP variation in mtDNA of Pissodes [In collaboration with Dr. F. Sperling, Univ. of Ottawa].

DNA has been extracted from 110 Pissodes specimens. A ca 1600 bp region of mitochondrial DNA from all specimens has been amplified using PCR and assayed using 8 restriction enzymes. The data provided several good diagnostic for distinguishing among species of P. strobi, P. terminalis, and P. nemorensis. A manuscript is in preparation.

- 23) Commence investigation of the effects of removal of aspen overstory on the growth and yield of as well as Pissodes strobi incidence in understory white spruce [In collaboration with P. Camsell, AFS; C/A PAIF 8017]

Three treatments of overstory removal and controls (no removal) were replicated three times. Permanent plots were established for long term monitoring of G&Y, and tree condition and pest incidence was measured. These baseline data have been entered into a computer database.

- 24) Write a book chapter titled 'Logging and Boreal Ground Beetle Assemblages on Two Continents: Implications for Conservation'. [In collaboration with J. Spence (U. of A.) and J. Niemela (U. of Helsinki)].

Chapter completed and in press [see list of publications].

- 25) Write Forestry Leaflet on 'Western Ash Bark Beetle'.

FL completed, internally reviewed, and is being edited.

15. Information Activities

i) Journal Publications

Niemela, J., D.W. Langor, and J.R. Spence. 1993. Effects of clear-cut harvesting on boreal ground beetle assemblages (Coleoptera: Carabidae) in western Canada. *Conserv. Biol.* (in press)

Niemela, J., J.R. Spence, D.W. Langor, and Y. Haila. 1993. Logging and boreal ground-beetle assemblages on two continents: implications for conservation. In Gaston, K.J. et al. (eds.), *Perspectives in Insect Conservation*, Intercept Publishers Ltd., Andover, U.K. (in press).

ii) Information Reports

iii) Other reports

Langor, D.W. 1992. Life history of the lodgepole terminal weevil, Pissodes terminalis Hopping, in lodgepole pine in Alberta. page 430 In Proceedings of the XIX International Congress of Entomology, Beijing, China, 28 June- 4 July, 1992. [Abstract]

Langor, D.W. 1993. Western Ash Bark Beetle. For. Can., Northwest Reg., North. For. Cent., Edmonton, AB, For Leaflet. (in press).

Langor, D.W., J. Niemela, and J.R. Spence. 1992. Clearcutting, biodiversity, and conservation: the Hinton ground beetle study. pp. 3-6, In K.I. Mallett (compiler), Forest Insect and Disease Notes, December, 1992. For. Can., North. For. Cent., Edmonton, AB.

Niemela, J., D.W. Langor and J.R. Spence. 1992. The changing landscape of boreal forestry: effects of logging on carabid assemblages in western Canada. page 685 In Proceedings of the XIX International Congress of Entomology, Beijing, China, 28 June - 4 July, 1992. [Abstract]

Mallett, K.I. and D.W. Langor. 1992. Balsam fir mortality survey. For. Can., Northw. Reg., File Rep. NOR-1109-9205.

Volney, W.J.A. and D.W. Langor. 1992. Report on a trip to Heilongjiang Province, July 7 to 24, 1992. Foreign Trip Report.

iv) Lectures, courses, seminars and scientific addresses

Langor, D.W. 1992. Life history of the lodgepole terminal weevil, Pissodes terminalis Hopping, in lodgepole pine in Alberta. (1) XIX International Congress of Entomology, Beijing, China, 28 June- 4 July, 1992. (2) Entomol. Soc. of Alberta meeting, Waterton, Alberta, 15-17 October 1992. [scientific address]

Langor, D.W. and J.R. Spence. 1993. Effects of clearcutting on arthropod biodiversity in Canadian Boreal Forests. International Conference on Impacts of Forest Practices on Boreal Forest Biodiversity, Lammi, Finland, 29-31 March 1993. [scientific address]

Niemela, J., D.W. Langor and J.R. Spence. 1992. The changing landscape of boreal forestry: effects of logging on carabid assemblages in western Canada. XIX International Congress of Entomology, Beijing, China, 28 June - 4 July, 1992. [scientific address]

Niemela, J., J.R. Spence, D.W. Langor, and Y. Haila. 1992. The effects of logging on boreal ground beetle assemblages on two continents: implications for conservation (Coleoptera: Carabidae).(1) Entomological Society of Alberta meeting, Waterton, Alberta, 15-17 Oct. 1992. (2) Carabidology meeting, Sweden Dec. 1992. [scientific address]

Two lectures ['Bark Beetles' and 'Terminal and Root Collar Weevils'] given to Forest Entomology class at U. of Alberta 15-17 February 1993.

Seminar titled 'Taxonomy, Ecology, and Management of Terminal Weevils' given at (1) Heilongjiang Academy of Forest Science, Harbin, China, 9 July 1992; (2) Dept. of Entomology, University of Alberta, 25 March 1993.

v) Technology transfer:

Gave talk and demonstration on forest insects to (1) 35 students visiting from Lakeland College, Vermillion, Alberta; (2) 50 students from NAIT; (3) XX students from the Grouard Forestry School. [D. Williams]

Gave talk and demonstration on insects to: (1) 10 students from Association for Bright Children, 23 May 1992; (2) ca. 25 kids in a local Beaver group; (3) ca. 30 kids in a local Cub Scout group, Dec. 1992. [Langor]

Co-taught the Forest Entomology section of the Univ. of Alberta Forestry Camp at the Hinton Forestry School, 26 May 1992. [Langor, Spence].

Participated in workshop on Stand Tending sponsored by FC and AFS, 10-11 March 1993. Gave a talk on the responses of insects to stand tending and how impacts may be minimized.

16. Goals 1993-94

- 1) Continue a morphological study of Pissodes: (a) complete a morphological examination of P. strobi and P. terminalis and analyze data; (b) describe new species of Pissodes from China and prepare illustrations for publication [In collaboration with Mr. R. Zhang (Academia Sinica, Beijing) and Mr. S. Yingxian (Southwest Forestry College, Kunming)]; (c) initiate morphometric study of P. nitidus from China and Japan to determine if populations are conspecific.
- 2) Continue a molecular study of Pissodes: (a) Prepare a journal paper on mtDNA restriction site variation as a diagnostic tool in the P. strobi species complex; (2) collect information on RFLP variation in P. strobi and P. nemorensis. [In collaboration with F. Sperling, U. Ottawa]
- 3) Submit for internal review a journal paper on fungi associated with P. strobi and P. terminalis [with K. Mallett, NOR 11-09].
- 4) Continue abstracting papers for a bibliography of North American Pissodes literature.
- 5) Complete preparation of a journal paper on the life history and life tables of P. terminalis in lodgepole pine in Alberta.
- 6) Continue investigation of the effects of removal of aspen overstory on the growth and yield of, as well as P. strobi incidence in, understory white spruce: (a) reassess growth of and pest incidence on trees in treatments set up in 1992; (b) establish three new trials in the Slave Lake Forest. [In collaboration with P. Camsell, AFS, C/A PAIF 8017]
- 7) Publish a journal paper on the life history of the western ash bark beetle.

- 8) Prepare a manuscript on the life history of Pityophthorus pulchellus tuberculatus (deferred from 1992/93).
- 9) Continue study of impacts of clearcutting and forest fragmentation on arthropod biodiversity in aspen stands: (a) collect second years' data on geographic variation in litter arthropod communities; (b) continue to sample litter arthropods in aspen stands near Lac la Biche to assess community variation associated with age structure of stands; (c) evaluate immediate effects of forest harvesting on communities of litter arthropods; (d) initiate survey biodiversity of phytophagous fauna in aspen stands of various ages; (e) initiate study of insects associated with snags (grad. student). [In collaboration with J. Spence, U. Alberta, C/A PAIF:8020, AFDRT]
- 10) Prepare initial draft of Info. Rep. on the parasitoids and predators of the forest tent caterpillar in Alberta. [In collaboration with D. Parry and J. Spence, U. Alberta]
- 11) Co-supervise three (3) graduate students: S. Digweed, J. Hammond, R. McQueen.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
NWR	NOR-11-06		Dr. Y. Hiratsuka
NWR	NOR-11-09		Dr. K. Mallett

ii) External -

Establishment	ID#	Title	Contact name
Univ. of Alberta			Dr. John Spence
Univ. of Ottawa			Dr. F. Sperling
Academia Sinica, Beijing, China			Mr. Runzhi Zhang

18. Environmental Implications:

- i) The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.
- ii) FC-NWR EARP Committee Approval Date: 21 January 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date:

1. STUDY TITLE: Biotechnological and pathological investigation of western gall rust of hard pines in the Prairie Provinces
2. Responsibility Centre: Northwest Region (8135)
3. Program: Forest Protection and Environment
4. Project Title: Forest Insect and Disease Management Systems and Survey
5. Office Location(s): Edmonton, Alberta
6. Work Location: Edmonton
7. Study Staff:

	Name
Study Leader	O.M. Aguilar
Team Members	Y. Hiratsuka
	P.J. Maruyama

8. Study Key Words: Forest pathology, Biotechnology, Molecular genetics, Biocontrol, Genetics/tree improvement, IPM systems, Endocronartium, western gall rust, host-parasite interaction, molecular basis of cell proliferation,
9. Study Activity: N/A

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
O.M. Aguilar	SE-RES-2 (P)	0.80	0.80	0.00		
Y. Hiratsuka	SE-RES-5 (P)	0.40	0.40	0.00		
P.J. Maruyama	EG-6 (T)	0.30	0.30	0.10		
FTEs		2.01	2.01	0.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>	Information transferred to NOR 11-06				
Salaries					
O&M					
Capital					
G & C					
TOTAL:					

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>	Information transferred to NOR 11-06					
Salaries						
O&M						
Capital						
G & C						
TOTAL:						

STUDY TOTAL					
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11. Study Background and Problem Analysis

Jack pine is an important reforestation species in Manitoba and Saskatchewan. A breeding program for jack pine in these provinces has identified genetically superior trees which will

be mass-produced to increase the productivity and economic attractiveness of jack pine plantation forestry. Realization of the potential benefits of planting genetically improved jack pine could be offset by an increase in the prevalence of western gall rust. This disease, which is caused by the fungus Endocronartium harknessii, is not recognized as a major threat to natural jack pine stands, but probably increase in importance as the area occupied by planted jack pine increases. Development of a system for efficient control of western gall rust will allow realization of the potential benefits of genetic improvement.

As a result of ongoing research work at the Northern Forestry Centre (NoFC) for many years, morphology, life cycle, cytology, and distribution of western gall rust are well documented (NOR 11-06). Also a significant amount of knowledge has been accumulated on collection and preservation of spores, technique and timing of artificial inoculation, infection process, and host parasite interaction of the disease. Axenic cultures of the fungus have been established.

During the past decade, significant progress has been achieved in genetic alterations of fungi. Recently, genes can be introduced into fungi with more complex life cycle like Neurospora sp. (N. Giles), Aspergillus sp. (W. E. Timberlake), Cochliobolus sp. (O. Yoder), Ustilago sp. (S. Leong).

Similarly, great advances have been made towards the genetic transformation of trees. Several laboratories reported successful transformations and regeneration of transformed plants of poplar (University of Iowa, University of Wisconsin), walnut and apple (Cornell University Experimental Station).

Genetic transformations and regeneration of conifers are actively pursued in Canada and elsewhere (W. Cheliak, Ottawa; B. Sutton, Vancouver; D. Dunstan, PBI-Saskatchewan), and University of Alberta - Plant Biotechnology Center is actively collaborating with these laboratories. Further, Dr. Thorpe's laboratory reported the recent findings concerning the regeneration of jack pine (personal communication).

Both, fungal and plant genetic advances that are described above provide the scientific justification for immediate initiation of similar research for the pathogenic fungus E. harknessii as well as on the host plant jack pine. Our experiments are aimed to elucidate the mechanism of gall rust formation which undoubtedly will help in designing of novel plant protection approaches for conifers.

12. Study Objectives:

Objectives of this study are strongly linked to one of the regional strategic plan issues, namely Reduction of losses, and one of the research priorities which is on application of biotechnology to improve disease resistance of genetically improved trees.

Long Term Objectives:

1. To create hard pine families immune to western gall rust with superior growth characteristics and wood quality with biotechnological and pathological methods.

2. To develop novel biological control method(s) to reduce loss caused by western gall rust and other pine stem rusts.

Short Term Objectives:

1. Establish and learn technique to enhance growth and sporulation of axenic cultures of western gall rust from various geographical locations and different hosts for in vitro resistance evaluation and molecular biological investigations. (1993-1994)
2. Achieve genetic transformation of lodgepole or jack pine, and western gall rust. (1994-1995)
3. Establish protocols for micropropagation, tissue culture, cell culture, and organ regeneration of lodgepole and jack pines. (1992-1993)
4. Develop a novel concept of biological control strategy for western gall rust and other pine stem rusts which uses free moving rust feeding insects as vectors of aggressive mycoparasite(s), and demonstrate the applicability with a selected system (Epuraea obliquus - Scytalidium uredinicola). (1993-1994)

ii) Deliverables:

iii) Significant Linkages:

iv) Methodologies: Standard molecular biological and forest pathological methods.

13. Progress and Achievements

1. Several methods for the isolation of RNA from gall and uninfected normal stem were assayed. In addition, plant material collected at different stages after the inoculation with western gall rust were tested for yield and quality of RNA. Galls harvested 6 to 8 months after inoculation gave the better yields of RNA although impurities still present in the final preparation even after several steps of purification, affected the initial reaction of the process of cDNA construction. In order to reduce the source of contamination, attempts have been initiated by using xylem tissue of the gall and removing the bark.
2. Investigation of a biocontrol strategy of western gall rust using rust feeding beetle (Epuraea obliquus) and a mycoparasite (Scytalidium uredinicola) has been initiated with the additional financial support from For Can S & T Opportunity Fund. About 40 new cultures of a mycoparasite of western gall rust Scytalidium uredinicola were obtained and cultural tests to enhance growth and sporulation have been conducted. Successfully collected many larvae of rust feeding beetle, Epuraea obliquus, and resulted adults are in cold storage for further study. (Hiratsuka, Volney)
3. This study is terminated in 1992 and some parts of the study were transferred to another study (NOR 11-06) for 1993-94.

14. Goals and Accomplishments (1992-93)

1. *Purify RNA from jack pine tissues, both from galls and normal stem tissues, that can act as template for enzymatic reactions in the process of construction of a cDNA library, or alternatively in DNA-amplification by using the polymerase chain reaction (PCR).*

No accomplishment.

2. *Continue investigation of potential biological control of western gall rust using an insect vector and a mycoparasite. (For Can S & T Opportunity Fund project)*
 - a) *Investigate physiology of Scytalidium uredinicola especially sporulation and spore survival with a contractor.*
 - b) *Investigate life cycle, feeding habit and ecology of a beetle species Epuraea obliquus with a U of A graduate student.*
 - c) *Investigate metabolites produced by Scytalidium uredinicola, especially bioactive compounds which possibly are involved in killing western gall rust spores, with Dr. W. Ayer of the University of Alberta.*

Transferred to NOR-1106.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports
- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer:

16. Goals 1993-94

Study terminated in 1993-94.

17. Major Co-operators:

- i) Internal - FC
- ii) External -

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date:

1. STUDY TITLE: Biotechnological, pathological, and entomological investigations of aspen in the Prairie Provinces (Aspen Bioinnovation Centre)
2. Responsibility Centre: Northwest Region (8135)
3. Program: Forest Protection and Environment
4. Project Title: Forest Insect and Disease Management Systems and Survey
5. Office Location(s): Edmonton, Alberta
6. Work Location: Edmonton
7. Study Staff:

	Name
Study Leader	Y. Hiratsuka
Team Members	O. M. Aguilar

8. Study Key Words: aspen, Populus tremuloides , decay, stain, biotechnology, insects, diseases, biocontrol, ultrastructure, molecular biology, forest tent caterpillar, Armillaria root rot, poplar leaf rusts, Hypoxylon canker
9. Study Activity: N/A

10. Study Resources:

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
Y. Hiratsuka	SE-RES-6 (P)	0.30	0.30	0.00		
O.M. Aguilar	SE-RES-2 (P)	0.20	0.20	0.00		
H.F. Cerezke	SE-RES-2 (P)	0.10	0.10	0.00		
K. Mallett	SE-RES-2 (P)	0.10	0.10	0.00		
P. Maruyama	EG-6 (T)	0.30	0.30	0.00		
FTEs		1.42	1.42	0.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>	Information transferred to NOR 11-06				
Salaries					
O&M					
Capital					
G & C					
TOTAL:					

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>	Information transferred to NOR 11-06					
Salaries						
O&M						
Capital						
G & C						
TOTAL:						

STUDY TOTAL					
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11. Study Background and Problem Analysis

As the mixedwood management become important and regeneration of aspen will be considered as important as conifer reforestation in our region, there will be excellent possibilities of biotechnological work on aspen. Aspen became an important forest tree species in the region and genus Populus is considered to be much easier material to propagate and to make tissue cultures. Successful genetic transformation of Populus with Agrobacterium has been accomplished (Fillatti et al. 1987). At the present time, decay is the biggest concern in relation to the utilization of existing aspen resources. In future when intensive management of aspen will be practised, such diseases as Armillaria root rot, leaf rusts and Hypoxylon canker and insect pest like forest tent caterpillar will become important factors for successful cultivation, and need to be considered in aspen improvement work. However, there are big gaps which exist between our knowledge of conventional biological information of aspen and molecular level work (biotechnological approaches). At this time very little basic biological and pathological information is available on aspen and no ongoing pathological or physiological studies of aspen is underway in NoFC.

12. Study Objectives:

i) Objectives

Long Term Objectives:

1. To create aspen clones with superior growth characteristics, desirable wood quality, insect repellency, and disease resistance using biotechnological, pathological and entomological methods.
2. To find novel biological control method(s) of protecting aspen from decay and stain organisms.

Short Term Objectives:

1. Identify, collect, and maintain aspen clones with superior growth characteristics, superior wood quality, resistance to forest tent caterpillar feeding, and resistance to leaf rusts (Melampsora spp.) which occur naturally within the range of aspen in North America. (1992-93)
2. Achieve transformation of aspen and improve protocols for efficient gene transfer, tissue culture, and regeneration. (1993-94)
3. Investigate the material collected in 1 above and conduct biotechnological investigation of identifying genes, and create and regenerate new clones of aspen having more than one desirable genetic trait. (1994-95)
4. Conduct microbiological investigation of aspen decay and stain and develop biological or biorational control strategies of major defect causing organisms. (1995-96)

5. Determine the cause of "blackish gall" of aspen, discover the relationship of "blackish gall" and decay development, and propose a new strategy of biological protection of decay.(1994-95)

ii) Deliverables

1. Publish "Field Guide for Classification and Measurement of Aspen Decay and Stain" (with AFS personnel) 1993-94

Short Term (1-5 years)

iii) Significant Linkages:

iv) Methodologies

Standard plant pathological and molecular biological methods and techniques.

13. Progress and Achievements

Up to and including 1991-92
This study is terminated in 1992.

14. Goals and Accomplishments (1992-93)

1. *The identification and cloning of aspen DNA sequences which become active in the xylem tissue. (Aguilar)*
 - a) *Continue analysis of the cDNA library in order to isolate further clones.*
 - b) *Complete the construction of a genomic library to be screened with and already available probes. Analyse by restriction and DNA sequence the particular upstream region that determine the tissue specific pattern of expression.*

Study terminated.

2. *Investigations of black galls of aspen in conjunction with biocontrol of decay and stain will be stepped-up with the NSERC Strategic Grant support to Y. Hiratuska, W. Ayer (Univ. of Alberta, Chemistry) and L. Sigler (U of A Microfungi Collection). (Hiratsuka)*
3. *Try to obtain funding through FRDA to initiate a multiagency-multidiscipline project on aspen decay and stain. The proposal includes researchers from University of Alberta, University of Calgary, Pulp and Paper Research Institute of Canada, Alberta Forest Service and Forestry Canada. (Hiratsuka, Aguilar)*
5. *Continue participating in Biotechnology Network for Biorational Control of Forest Product (BIOCOND) and co-supervise a graduate student to investigate morphology and histology of black gall of aspen. (Hiratsuka, Aguilar)*

- 6. *Clones of aspen with unusual field characteristics such as disease resistance, insect resistance etc. will be noted, reported and collected by insect and disease specialists, and propagated and retained for future investigations. (Langor, Mallett, Cerezke, and Hiratsuka)*
- 7. *Complete preparation of the "Field Guide for Aspen decay identification and measurement" with AFS personnel in 1992-93 for the publication in 1993-94. A joint proposal for the support of this work including the publication cost is proposed to CAPAIF. (Hiratsuka)*
- 8. *Continue to conduct cooperative investigation of aspen decay and stain with Dr. W. Ayer and Ms. L Sigle of the University of Alberta has been initiated in 1990 with the three year NSERC Strategic Grant. (Hiratsuka)*

Goals from 2 to 8 are transferred to another study NOR-1106.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports
- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer:

16. Goals 1993-94

Study terminated for 1993-94.

17. Major Co-operators:

- i) Internal - FC

Region	ID#	Title	Contact name

- ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement: N/A
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Canadian Forests and Climate Change
2. Responsibility Centre: Northwest Region (8135)
3. Activity: 2211
4. Program: Forest Protection and Environment
5. Status: Continuing
6. Last Evaluation: January 22, 1993
7. Next Evaluation:

B. KEYWORDS:

017 Climate change
 020 Ecology
 065 Increased prediction/preparation
 100 Green Plan
 120 Working Groups
 224 Meteorology
 226 Microclimate
 330 Models
 331 Productivity
 350 Forest Succession
 505 Biomass
 513 Dendrochronology

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	9.50	7.50	7.20	0.00	0.00
Salaries	\$472.9	\$387.7	\$379.4	\$0.0	\$0.0
O & M	\$173.6	\$18.0	\$281.1	\$0.0	\$0.0
Capital	\$45.8	\$22.5	\$2.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$692.3	\$428.2	\$662.5	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS:

Climate change is increasingly recognized as a potential threat to the sustainable development of the Canadian forest sector. The long life-cycle of forests from seed to maturity dictates that actions must be initiated early to cope with or take advantage of the changing conditions.

The problem is attacked from two directions: 1) the role of forests in storing atmospheric carbon; 2) the effect of climate change on forest biology. The Carbon Budget Model - Canadian Forest Sector (CBM-CFS) is being finalized, to account for carbon stored in the forest biomass and soils, with annual changes due to fires, harvesting, tree mortality, and the fate of forest products. This model is being expanded to accommodate different management actions under different climatic scenarios. The long-term storage of carbon in peat and the effects of climate change on the rate of peat accumulation is the subject of another study.

Another team of researchers is investigating the direct effects of climatic parameters on the basic life functions of trees in different climatic zones. Forest productivity, growth rates and changes in composition are related to climate both at the regional and local levels.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary \$s:

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary		25.2			
Secondary					
Total					
Green Plan	286.40	297.16			

3. Collaborators:

Primary

Laval University
Parks Canada - Jasper National Park

4. Green Plan:

Northwest Region is the leading agency in delivering the Green Plan, Climate Change initiative. Green Plan funding was used to: 1) Coordinate ForCan research into climate change, being conducted at each Forestry Canada establishment; 2) Deliver ForCan's

obligation towards international research under BOREAS, NBIOME; 3) Conduct research in four studies on forest -climate change interactions.

5. Milestones:

1993-94:

1. Provide continued leadership to Forestry Canada climate change program, conducted at various Forestry Canada establishments.
2. Support the major multiagency, interdisciplinary studies related to climate change, such as BOREAS, NBIOME:
 - a) provide technical and tactical support for BOREAS, at both the Prince Albert and Nelson House supersites;
 - b) participate in the development of the NBIOME study.
3. Conduct research into various aspects of climate change impacts:
 - a) expand the Carbon Budget model to accommodate climate change scenarios by incorporating ecophysiological responses and contagious processes in a spatially linked model structure;
 - b) determine the rate of peat development in climatically stressed regions to serve as analogs of climate change impacts on carbon sequestration in peatlands;
 - c) monitor ecophysiological processes in the Aspen Parkland and southern Boreal Forest in order to develop physiological models;
 - d) relate biomass productivity in the boreal forest along a climatic gradient to present and past climatic influences in order to develop productivity-succession models.

6. Accomplishments:

1. Technical advice and supervision was provided for thirteen (13) Climate Change studies, conducted at various Forestry Canada establishments.
2.
 - a) provided tactical and technical support to the BOREAS study;
 - b) participated in the development of the NBIOME Science Plan; ecological and geographical variations within the projected climatic gradients;
3.
 - a) initiated work on expanding the Carbon Budget model to accommodate ecological and geographical variations within the projected climatic gradients;

- b) examined the peat accumulation rate and paleoecology of two peatlands in the Prairie-Boreal transition zone;
- c) physiologically important climatic parameters are being measured at one fully instrumented site in the Aspen Parkland;
- d) analyzed all available major gap dynamics models; established pollen, charcoal and dendrochronology laboratory facilities and procedures to study past forest responses to climate fluctuations.

7. Link to Strategic Plan:

National:

Forest Environmental Quality: Increased capability to predict and prepare for consequences of climate change

Science and Technology: Provide opportunities for cooperative research with universities

Regional/Institute:

Improvement and sustainability of wood supply: Climate change research will result in management strategies that will aid to optimize the changed environmental conditions. New program thrusts: develop research on the effects of climate change on forest and forestry practices.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: 12 January, 1993

1. STUDY TITLE:
2. Responsibility Centre: Northwest Region (8135)
3. Program:
4. Project Title: Scientific leadership and coordination for the Forestry Canada research program on climate change.
5. Office Location(s): Edmonton, Alberta
6. Work Location: Canada, the world
7. Study Staff:

	Name
Study Leader	M. Apps
	S. Zoltai

8. Study Key Words: Boreal forests, climate change, greenhouse effect, carbon cycle, forest productivity, bioenergy, simulation modelling, ecophysiological modelling, BOREAS, N-BIOME, FORET, ZELIG, FORENA, FORCYTE, LINKAGES, JABOWA
9. Study Activity: 2211, 2217
10. Study Resources:

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
M. Apps	SE-RES-3 (P)	0.50	0.50	0.50		
S. Zoltai	SE-RES-4 (P)	0.17	0.17	0.17		
FTEs		0.67	0.67	0.70		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	
O&M	3.34	2.00			
Capital	0.00	0.00			
G & C					
TOTAL:	3.34	2.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	16-81	52.73	59.29			
Capital						
G & C						
TOTAL:		52.73	59.29			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Other</u>						
Suspence - BOREAS	16-91		11.22			
TOTAL:			11.22			

STUDY TOTAL			72.51			
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11. Study Background and Problem Analysis

Climate change is increasingly recognised as a threat to the environmentally sustainable economic development of the Canadian Forest Sector. While the issue of global climate change and our response to it remains controversial, there is now a large measure of consensus amongst the world's scientists that significant changes will take place in the coming decades. Regardless of how the future climate unfolds in detail, there is an urgent need to identify and explore adaptation and mitigation strategies which will allow the

forestry community to take advantage of the opportunities which might arise and to prepare for the potential detrimental impacts of such changes. As Canada enters a new era of forest management under the banner of "sustainable development", it is imperative that we focus existing knowledge, and where necessary develop new understanding, of the potential impacts of these changes: climate change poses what is perhaps the most severe long-term threat to the health and productivity of Canada's forests.

For policy makers, decisions will be required to be made in an aura of great scientific uncertainty. While there is a consensus that "the trees we are planting now will mature and decline in an environment to which they are increasingly poorly adapted", precise estimates of these changes and their impacts are not available, and are not likely to be forthcoming in the near term.

Uncertainties exist both in the timing and magnitude of the climate change and in the response of forest ecosystems to any such change. Nevertheless, basing management strategies on assumptions of unchanging ecological and climatic conditions will obviously lead to significant errors if the climate changes projected with the enhanced greenhouse effect prove to be the future reality.

Forestry activities can affect a number of critical ecosystem characteristics which can enhance (positive feedback) or mitigate (negative feedback) climate change. How do alternative forestry and land-use practises influence the global carbon cycle, surface albedo, surface energy and momentum exchanges, and the small- and large-scale hydrologic cycle?

These are critical questions to address if the Canadian forestry sector is to meet the challenges that the threat of climate change poses for (environmentally) sustainable (economic) development. We need to develop predictive capability by encapsulating existing knowledge in decision-support structures; simulation modelling provides one of the few mechanisms for achieving this goal. In general, the same practices which optimise environmental sustainability, also optimise the long-term economic development and returns from traditional forest industry. Optimising future wood supply is likely to also optimise future carbon sequestration, for example.

The immediate challenge for FC research is to formulate and then communicate the best estimates (or even guesses in the absence of hard data) that science has to offer about 1) the consequences of environmental change on the resource sustainability and 2) the management strategies which best meet economic and environmental needs.

CORE assigned FC-NWR a leadership role for the implementation of a national climate change program. As a first step in this direction a National Climate Change Action Plan (NCCAP) has been developed which draws upon the expertise of the Forestry Canada Climate Change Working Group. The basic tenet of the NCCAP is that: the required national research program must be based on teamwork making use of the talents of scientists at each of the FC establishments.

In keeping with CORE's charge, the NCCAP outlines a scientific leadership role to be filled by the NWR as lead centre in the delivery of the national program. One of the main functions of this leadership role is to foster the establishment of these inter-establishment teams. The responsibilities of the lead centre are spelled out in the NCCAP and will be further refined by CORE and senior FC management. The objective of this study is to

implement this leadership structure and provide scientific leadership and coordination at all levels of Forestry Canada involvement.

This study also provides coordination and leadership for significant national and international research activities on climate change and forests which are underway or planned for the region. The following are of particular, immediate relevance:

BOREAS. (BOReal Ecosystem Atmospheric Study). This Canada-US (NASA) joint project will be started in 1992, culminating with intensive field campaigns in 1994, at two boreal forest sites near the northern (Nelson House, Manitoba) and southern (Prince Albert National Park) ecotones. These two sites form fixed points for a conceptual transect (proposed under several studies in the 1991-92 S&T proposal) which have become a focus for FC climate change process research. One of the key issues to be addressed by BOREAS is that of spatial scaling; how to integrate up from processes at the leaf and micro-site level to response at the stand and whole forest level - an issue of paramount importance to the FC climate change research. (Apps was appointed in 1990 by the Canadian-NASA management committee to serve on the BOREAS Science Steering Committee)

NBIOME. (Northern Biosphere Observation and Modelling Experiment). This ten-year multi-disciplinary, inter-agency project is one of two from Canada which have been accepted in NASA's EOS (Earth Observing System) program. This project attempts to link observational databases (satellite remote sensing, biomass and soils inventories) to process modelling of organic matter dynamics and carbon sequestration in Canada's terrestrial ecosystems, including forests, agricultural, wetlands and tundra systems. Opportunities for leveraging external resources for FC's climate change research program are considerable and one of the cornerstone activities of NBIOME (proposed by Apps and involving University as well as Government researchers) is the study of ecosystem carbon dynamics across a transect through the grassland- boreal forest - sub-arctic woodlands, including the BOREAS sites. Apps is one of the original Co-investigators named in the proposal to NASA, is a member of the NBIOME Science Steering Committee, and has played an active role several inter-agency workshops on NBIOME.

GEWEX. (Global Water and Energy Exchange Experiment). This project, an IGBP project, is in the advanced stages of planning. It is designed to provide a basic understanding of water yield from forested areas, with strong implications for climate change. While field sites have yet to be confirmed, it can be anticipated that both the BOREAS and MBIS sites will be strongly considered.

MBIS. (MacKenzie Basin Impact Study). This study is a group of interagency projects being organized by the Canada Climate Centre (AES, Env. Canada) to study the potential effects of climate change on the biotic and physical environment of this major drainage system and their possible socio-economic impacts. FC-NWR participates in an advisory role as a member of the Working Committee. FC-Pacific have proposed projects for MBIS, which may provide collaborative opportunities. (Zoltai acts as the principal FC-NWR point of contact)

NCCAP. (National Climate Change Action Plan). This implementation plan compliments Forestry Canada's Strategic Plan. It consists of a framework and a set of specific national-scope and establishment-specific research activities and calls for regular

reviews and revisions to adaptively monitor progress. FC-NWR has been designated as lead centre, with significant responsibilities for coordination and scientific leadership of the national research program (as discussed above). (Apps and Zoltai have acted as principal authors of the NCCAP)

IFBRA. (International Boreal Forest Research Association). This international body was formed during 1991 at a meeting in the USSR attended by Government representatives from Canada, the USSR and the United States. Dr. Eldon Ross (USDA Forest Service) will act as its first chairman. Two major working groups were established, one on Forest Inventory and the other on Global Change and Forest Ecosystem function. Dr. Glen MacDonald (MacMaster University) agreed to serve as the International Chair for the latter with Dr. M. Apps as the Deputy Country Coordinator.

CBM. (Carbon Budget Model of the Canadian Forest Sector). This national-scope research project is being conducted jointly with ESSA Ltd. (principal investigator Werner Kurz) funded under the ENFOR program. It has involved a number of scientists from several FC establishments under the leadership of M. Apps. Phase 1, an assessment of the current carbon inventory of all Canadian forest ecosystems and the budget for reference year 1986 was completed in 1990. Phases 2 and 3, 1991-1992, address the impact of climate change and forest resource policy on the Canadian carbon budget. (See also NOR 16-05) (Apps is responsible for the project and coordinates FC involvement in addition to acting as scientific authority for the ESSA contract)

12. Study Objectives:

i) Objectives

1. To provide leadership and program coordination for the regional research program on climate change and forests of the Northwest region.
2. To play a leadership role in the National Climate Change research program.
3. To act as science spokesperson on climate change related issues as required.

ii) Deliverables

Short Term (1-5 years)

Long Term (5 years and beyond)

iii) Significant Linkages:

13. Progress and Achievements

14. Goals and Accomplishments (1992-93)

- 1) *Participate in the activities of the International Boreal Forest Research Association (IFBRA) by:*

- a) *Acting as Deputy Country Coordinator for Canada (Global Change and Ecosystem Function Working Group) (Apps)*

Acting as Deputy Country Coordinator for Canada (Global Change and Ecosystem Function Working Group) (Apps)

- b) *Participating in the IFBRA workshop/meeting in Alaska, September 1992. (Apps)*

Participating in the IFBRA workshop/ meeting in Alaska, September 1992. (Apps)

- 2) *Continue to perform the duties as appointed member of the BOREAS Program Management Committee (successor to the Science Steering Committee) and provide BOREAS field officer logistic support. (Apps, Leckie, BOREAS Field Officer - TBA)*

Continued to perform the duties as appointed member of the BOREAS Executive Committee (successor to the Science Steering Committee) and provide BOREAS field officer logistic support. (Apps)

- 3) *Play leadership role in BOREAS 1992 site visits in June/July by organising the ecological field work and the ground team logistics. (Apps, BOREAS Field Officer -TBA, D.Johnson)*

Played leadership role in BOREAS 1992 site visits in June/July and September by organising the ecological field work and the ground team logistics. (Apps, Niederleitner)

- 4) *Provide logistic field support for BOREAS and Forestry Canada's Boreal Transect Case Study. (BOREAS Field Officer-TBA)*

Provided logistic field support for BOREAS and Forestry Canada's Boreal Transect Case Study. (Niederleitner)

- 5) *Continue to provide scientific coordination and leadership in NBIOME by serving as an active member of its Science Steering Committee. (Apps)*

Continued to provide scientific coordination and leadership in NBIOME by serving as an active member of its Science Steering Committee. (M.Apps)

- 6) *Continue to provide leadership and program coordination for regional research activities on climate change and forests of the Northwest region. (Zoltai, Apps).*

Continued to provide leadership and program coordination for regional research activities on climate change and forests of the Northwest region. (Zoltai, Apps).

- 7) *Continue to play a leadership role in the National Climate Change research program by participating in the Forestry Canada Climate Change and Modelling Working Groups. (Apps)*

Continued to play a leadership role in the National Climate Change research program by participating in the Forestry Canada Climate Change Working Group. (Apps)

- 8) *Continue to act as chairman of Forestry Canada Climate Change Working Group. (Zoltai)*
- Continued to act as chairman of Forestry Canada Climate Change Working Group. (Zoltai)

- 9) *Continue to act as Forestry Canada team leader on the Carbon Budget Model for the Canadian Forest Sector (see also NOR 16-05). (Apps)*

Continued to act as Forestry Canada team leader on the Carbon Budget Model for the Canadian Forest Sector (see also NOR 16-05). (Apps)

- 10) *Act as spokesperson at regional, national and international level on climate change related science issues as required. (Apps, Zoltai)*

Acted as spokesperson at various regional, national and international level on climate change related science issues as required. (Apps, Zoltai)

Added Goals and Accomplishments

- 11) *Assume duties as appointed Team Leader (Apps) and alternate Team Leader (Zoltai) for National Climate Change Green Plan initiative.*

Assumed duties as appointed Team Leader (Apps) and alternate Team Leader (Zoltai) for National Climate Change Green Plan initiative.

- 12) *Organise and conduct Boreal Forest Transect Case Study Science Workshop, Edmonton, December 1992 (Apps. Niederleitner)*

Organised and conducted Boreal Forest Transect Case Study Science Workshop, Edmonton, December 1992 (Apps. Niederleitner)

- 13) *Coauthor preparation of NBIOME Science Plan (Apps)*

Coauthored preparation of NBIOME Science Plan (Apps)

- 14) *Collaborate with University of Quebec at Montreal Scientists in submission to Tricouncil for research program entitled "****" (Apps)*

Collaborated with University of Quebec at Montreal Scientists in submission to Tricouncil for research program entitled "****" (Apps)

- 15) *Serve as appointed member of Royal Society of Canada's LTERM (Long term ecological research and monitoring research) panel. (Apps)*

Served on Royal Society of Canada's LTERM (Long term ecological research and monitoring research) panel. (Apps)

15. Information Activities

NBIOME Science Plan

Additional Publications are listed in separate, related projects (e.g., NOR 16-02 and NOR 16-05)

16. Goals 1993-94

- 1) Continue to act as Team Leader (Apps) and alternate Team Leader (Zoltai) for Green Plan National Climate Change Initiative.
- 2) Continue to participate in the activities of the International Boreal Forest Research Association IBFRA) by a) acting as Deputy Country Coordinator for Canada (Global Change and Ecosystem Function Working Group) (M.Apps) and b) participating in the IBFRA workshop/meeting in Norway, September 1993. (Apps)
- 3) Continue as appointed member of the BOREAS Executive Committee. (Apps)
- 4) Subject to successful funding through PAIF, supervise acquisition of BOREAS and BFTCS biometry data (Apps, Niederleitner)
- 5) Continue to provide scientific coordination and leadership in NBIOME by serving as an active member of its Science Steering Committee. (Apps)
- 6) Continue to provide leadership and program coordination for regional research activities on climate change and forests of the Northwest region. (Zoltai, Apps).
- 7) Continue to participate in the Forestry Canada Climate Change and Modelling Working Group. (Apps, Zoltai)
- 8) Continue to act as chairman of Forestry Canada Climate Change Working Group. (Zoltai)
- 9) Continue to act as Forestry Canada team leader on the Carbon Budget Model for the Canadian Forest Sector (see also NOR16-05). (Apps)
- 10) Act as spokesperson at regional, national and international level on climate change related science issues as required. (Apps, Zoltai)

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

As there is no explicit field component to this study (actual field activities are incorporated in individual studies), no environmental implications were identified.

ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 13, 1993

1. **STUDY TITLE:** Long-term carbon sequestration in Canadian peatlands.
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection and Environment
4. **Project Title:** Canadian Forests and Climate Change
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	S.C. Zoltai
Team Members	R.M. Siltanen

8. **Study Key Words:** Climate change, peat accumulation, peat dynamics
9. **Study Activity:** 2211, 2217
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
S.C. Zoltai	SE-RES-4 (P)	0.41	0.41	0.40		
R.M. Siltanen	EG-5 (T)	0.00	0.00	0.40		
FTEs		0.41	0.41	0.80		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	6.73	2.00			
Capital					
G & C					
TOTAL:	6.73	2.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	16-82	9.82	9.70			
Capital	16-82	0.60				
G & C						
TOTAL:		10.42	9.70			

STUDY TOTAL		17.15	11.70			
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11. Study Background and Problem Analysis

The study of peatland ecology has shown that different kinds of peatlands develop under different climatic conditions. General droughtiness and fluctuating water tables preclude peat formation on the prairies; bog formation requires a certain minimum of precipitation. Permafrost development is directly related to temperature regimes, as is the thawing of permafrost in peat.

Peatlands are a major terrestrial ecosystem where atmospheric carbon is sequestered for long-term storage (thousands of years). About 40% of the Boreal and Subarctic regions of Canada are covered by peatlands, storing vast amounts of carbon each year in the form of peat. Although peat is subject to very slow anaerobic decomposition, with methane as a byproduct, long term accumulation rates show that peatlands are effective reservoirs of carbon. It is estimated that 9 - 30% of the total biomass of peatlands eventually becomes peat; the magnitude of the variation depends on the kind of peatland and climatic regime.

Peat is composed of plant remains in various stages of decomposition that have grown and accumulated in situ in areas of poor drainage. Many of the peat macrofossils are readily

identifiable. By comparing the present environmental limits of the fossil plant communities identified in the peat, the paleoenvironments of the peatlands can be established at any given time in the past. This gives a powerful tool to examine and determine the magnitude climatic changes and their geographical extent within the past 8,000 years. This knowledge can be applied to indicate the effect of anticipated climates on peatland development, and by inference, on the regional water table.

An extension of this technique to the examination of plant pollen or remains of other organisms, such as protozoa or ostracodes, in the peat can provide an indication of past climatic conditions and vegetation development through the past millennia. This would provide important information on vegetation- climate interactions, stability or rate of adjustment to changing conditions by the vegetation. The paleoenvironments therefore serve as analogs of changes to be expected under changing climatic conditions.

12. Study Objectives:

i) Objectives

1. Determine the long-term rate of peat accumulation in different types of peatlands in a north-south transect in west-central Canada, including the BOREAS sites.
2. Using the remains of biota in the peat, create analogs for interpreting climate-vegetation interactions under the expected changing climate scenarios.

ii) Deliverables

Short Term (1-5 years)

1. Determine the long term rate of peat accumulation at or near each Boreal Transect Study sites;
2. Determine the paleoecological evolution of each peatland and its surroundings;
3. Supply evidence of environmental stability or instability at each Boreal Forest Transect Case Study site.

Long Term (5 years and beyond)

1. Determine the long term peat accumulation rates in different peatland types in different climatic zones;
2. Provide analogs for the development of both upland vegetation and peatlands under a warmer and possibly drier climate in boreal and subarctic peatland types.

iii) Significant Linkages:

The study is oriented to provide a wetland component to the Boreal Forest Transect Case Study. The long-term carbon sequestration rate is intended to be used as basic data for the Carbon Budget model (NOR 16-05). Three of the peatland sites will be used for the litter decomposition study to compare the short-term decomposition rates in the

peatlands with corresponding uplands. The pollen analyses will provide an indication of past forest - climate interactions as possible analogs for the forest dynamics study (NOR 16-04).

iv) Methodologies

Field: Peatlands will be selected for study will be within 10 km of the Boreal Forest Transect Case Study sites. The peatland will be cored at one or more plots, as indicated by the complexity of the peatland. Entire cores will be collected in small, manageable sections. Part of the peat material will be used for chemical analysis, the part will be saved for macro- and microfossil analysis. Field measurements (Ph, decomposition) will be made at the time of collection. Additional peat material will be collected by coring for radiocarbon analysis as necessary and from the base of the peat. The Ph and conductivity of the water from the top of the water table will be determined and sampled. The vegetation will be examined in transects and described. Trees will be measured and aged.

Laboratory: The peat material will be dried and ashed, the ash dissolved in HCl (see: Ali, Zoltai and Radford 1988, Can. J. Soil Sci.), and the elements determined by ICAP spectrometer. Peat macrofossils will be determined to the genus level under a dissecting microscope. Efforts will be made to identify *Sphagnum* to the species or group level. Other fossils (ostracodes, gastropods, insects), if present, will be identified. Pollen analysis will be performed by fully qualified palynologists under contract, using standard techniques developed by Faegri and Iverson (1975. Textbook of pollen analysis). The age of the peat will be determined by the radiocarbon method.

13. Progress and Achievements

Long term peat and organic matter accumulation rate was determined for 66 peatland sites in the boreal and subarctic peatland regions. It was found that the dry mass of the peat column can be directly related to age and hence to peat accumulation.

Other studies have shown that peat development did not begin in the southern part of the boreal forest until after 6000 years before present. This was due to warmer-drier climatic conditions during the time period following the disappearance of glaciers. During this period peatlands did not exist as far north as the line between Athabasca, La Ronge and Wabowden. Inferred climatic conditions show 16-29% greater aridity 6000 years ago than at present.

These and additional studies indicate that the rate of peat accumulation and storage varied with major shifts in climatic conditions. A network of peat sampling points would identify the regional pattern of peatland development. A large part of the sampling is already in place across the Boreal forests of Alberta, Saskatchewan, and Manitoba, as well as the Mackenzie valley. Future work should reduce the existing information gaps especially in ecotonal locations.

14. Goals and Accomplishments (1992-93)

1. *Examine and fully document at least one peatland at each of the Boreal Forest Transect Case Study sites and at the BOREAS sites (Zoltai):*

Two peatlands were located and described at Batoche, one at Prince Albert BOREAS site, two at Nelson House BOREAS site. Peatland at Gillam could not be examined due to early season.

2. *Collect peat cores from the above sites and initiate chemical and macrofossil analyses (Zoltai, Siltanen):*

Peat cores were collected from all of the above and two additional sites. Macrofossil analyses completed; microfossil analyses of three cores is in progress.

3. *Lay out strings of litter samples at three peatland sites along the Boreal Forest Transect Case Study sites (Zoltai, Siltanen):*

Strings of litter samples and full site descriptions were completed at three peatland and three upland sites at Batoche-Prince Albert, Nelson House and Gillam.

4. *Conclude study on recent and ancient permafrost degradation in peatlands in Alberta, Saskatchewan, and Manitoba (Zoltai, Vitt):*

Study concluded, manuscript "Present and relict permafrost features in peatlands of west-central Canada" in preparation. (Zoltai, Vitt)

5. *Assemble and publish carbon database for Canadian forest soils. (linked to 16-05). (Siltanen, Zoltai)*

Original contractor's data set has been edited and expanded to include data to a maximum of 100 cm of mineral soil. All previous sources of data were relocated and assembled into a data reference library. New sources added to fill in geographic gaps in data distribution (northern Ontario, coastal and northern B.C., northern Quebec.) Some data entry, screening and analysis still necessary before proceeding to publish.

15. Information Activities

i) Journal Publications: Nil

ii) Information Reports: Nil

iii) Other Reports

Zoltai, S.C. 1993. S&T Progress in the Green Plan - Climate Change Initiative. Memorandum to Cabinet. Submitted to FC Science and Sustainable Development, January 4, 1993

Zoltai, S.C. 1993. Green Plan, Climate Change Initiative. Progress Report, 1992/93. Prepared for Operations Committee, January 12, 1993.

iv) Lectures, courses, seminars, and scientific addresses

Zoltai, S.C. 1992. Climate Change and the North. U of A, Dept. Geography, October 29, 1992.

Zoltai, S.C. 1992. Impact of climate change on Canadian peatlands. 5th Meeting, International Mire Conservation Group, Berne, Switzerland, September 1, 1992.

Zoltai, S.C. 1992. Peat as paleoclimate indicator. 6K Paleoclimate Workshop. Nov. 20-23, 1992. Ottawa. Abstract.

v) Technology Transfer

1. Advisory Committee member of one Ph.D. (Botany) candidate (B. Nicholson).
2. Advisory Committee member of one M.Sc. (Geography) candidate (D. Seburn).
3. Examining Committee member of Ph.D. final examination: "The wetlands of Elk National Park: vegetation, development and chemistry" (B. Nicholson).

16. Goals 1993-94

1. Document peatland site at Gillam, core frozen and unfrozen sections, perform chemical and macrofossil analyses of the peat, obtain C¹⁴ dates of basal and other critical peat sections (Zoltai, Siltanen);
2. Locate, core and analyse permafrost collapse features in peatlands along the BFTCS to determine the time of collapse by dendrochronological or radiocarbon dating methods (Zoltai, Siltanen);
3. Locate, core and analyse peatlands along the boreal-grassland ecotone to determine the climatic parameters, timing of peatland development, and the rate of peat deposition (Zoltai, Siltanen);
4. Complete data work on carbon dataset of Canadian forest soils. Perform summary analyses and provide dataset for use with the CBM-CFS. Initiate publication of report on the dataset and analyses (linked with 16-05) (Siltanen, Zoltai).

17. Major Co-operators:

The work is to be carried out in direct support of BOREAS, BFTCS and NBIOME project; specifically, the background information on peatland dynamics and long term peat accumulation rates.

i) Internal - FC

Region	ID#	Title	Contact name
NW Region	NOR 1605	Carbon Budget	M.J. Apps

ii) External -

Establishment	ID#	Title	Contact name
U. of Alberta		Peatland Dynamics	D.H. Vitt

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

Environmental damage to the cored site will consist of trampling by foot travel, extracting a 5-cm diameter core from the peat by a hand-operated tool. The area affected by trampling during coring is less than 1 m².

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: 13 January 1993

1. **STUDY TITLE:** Vegetation-climate interaction measurement and modelling
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection & Environment
4. **Project Title:** Canadian Forests and Climate Change
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** near Prince Albert, Saskatchewan
7. **Study Staff:**

	Name
Study Leader	E.H. Hogg
Team Members	P.A. Hurdle

8. **Study Key Words:** Climate change, Ecophysiology, Ecology, Aspen, Jack Pine, Modelling
9. **Study Activity:** 2211, 2217
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
E.H. Hogg	SE-RES-2 (P)	1.00	1.00	1.00		
P.A. Hurdle	EG-5 (T)	1.00	1.00	1.00		
FTEs		2.00	2.00	2.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	3.53	2.00			
Capital	15.60	0.00			
G & C					
TOTAL:	19.13	2.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries		0.00	0.00			
O&M: Sask.	S8086		10.00			
Capital						
G & C: Alta.	A5013		70.00			
TOTAL:			80.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	16-83	25.02	24.25			
Capital		2.96				
G & C						
TOTAL:		27.98	24.25			

STUDY TOTAL			106.25			
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11. Study Background and Problem Analysis

General circulation models (GCM's) predict that continued increases in CO₂ levels will lead to warmer air temperatures and a probable decrease in soil moisture in the Canadian boreal forest. The rapid predicted change in climate would be unprecedented since glaciation, and the productivity of existing forest vegetation types in the boreal forest could be drastically affected. Such changes would have profound implications for the conservation, utilization and regeneration of Canadian boreal forest resources.

The interaction between the boreal forest and global climate is complex. Most predictions indicate that there will be significant vegetation change and a reduction in the area occupied by the Canadian boreal forest, particularly near its southern limit, where drought often limits tree growth even under today's climate. In addition to the question of "How could global climate change affect the boreal forest?", the recent literature also points out the importance of this question in reverse, i.e., "How could changes in the boreal forest affect global climate?"

There is increasing evidence that carbon uptake by the boreal forest has significantly slowed the increase in atmospheric levels of carbon dioxide that has occurred since the 1800's. It has been estimated that at present, 30% of the annual variation in atmospheric CO₂ levels measured at Mauna Loa, Hawaii, is produced by seasonal uptake (photosynthesis) and release (respiration and decay) of CO₂ from the world's boreal forests. Thus predictions of future change in the carbon balance of the boreal forest are needed to determine its future role as a feedback on atmospheric CO₂ levels and climate change.

A second example of feedbacks of the forest on climate is through its effects on the global energy balance. A recent modelling study by Bonan points out that because forests absorb more of the incoming solar radiation than snow-covered surfaces, the loss of the boreal forest could lead to significant climatic cooling in some regions.

Forests located near ecotones are likely to be the most sensitive to climate change. On a regional level, two major ecotones form the boundaries of the present-day boreal forest. In the south, the boreal forest forms an ecotone with the aspen parkland, while the northern edge of the boreal forest forms a broad ecotone with subarctic forest-tundra vegetation. The present study will initially focus on the southern ecotone, which has a distribution that appears to be limited climatically by low moisture (Hogg, unpublished).

Realistic predictions require an understanding of which processes are presently controlling or limiting tree productivity and survival in this region. The general hypothesis of this study is that drought (low soil moisture and high vapour pressure deficits) is the primary factor limiting productivity of 50-70 year old aspen and jack pine forests at the southern ecotone of the boreal forest. However, a large number of other interrelated processes need to be considered when predicting future responses of the boreal forest to climate change. In the absence of major disturbances such as fire and pest outbreaks, these include canopy light regimes (including shading and low sun angles), soil resources (including low nitrogen availability), and thermal regimes (including soil temperature).

These factors may vary both diurnally and seasonally, and all are to a greater or lesser degree affected by the forest vegetation itself. Thus the importance of each factor in limiting primary productivity will also tend to be variable, even on a diurnal basis. In extreme cases, the causes of low forest productivity can be established directly by observation (e.g., severe

drought), but often the factors limiting photosynthesis and productivity will not be readily apparent. In these situations, short-term ecophysiological measurements, conducted concurrently with microclimate and nutrient measurements may be the only way to establish which factors, and which interactions among factors, are most strongly limiting productivity at a given point in time.

This study aims to develop process models as a means of understanding climate-ecosystem interactions, and also as a means of providing a framework for future scientific research. At the same time, the complexity of these processes is such that we have formed linkages with larger, interdisciplinary research teams. Thus, we are participating in both BOREAS (Boreal Ecosystem - Atmosphere Study) and BFTCS (The Boreal Forest Transect Case Study). BOREAS is a team of over 200 scientists who will intensively study boreal forest-atmosphere interactions using a variety of ground based, air-borne and remote sensing methods in 1993-94 at two supersites near Prince Albert, Saskatchewan and Thompson, Manitoba. BFTCS is a Forestry Canada initiative headed by Mike Apps that aims to conduct climate change research on ecosystem processes along a 900 km transect across the full width of the boreal forest and including the two BOREAS sites, over a longer (>5 year) time period than that planned for BOREAS.

In the present study we are relying on small-scale ecophysiological measurements, both spatially and temporally, as a means of i) inferring processes that operate on much larger scales and ii) predicting transient changes in these processes under changing climatic conditions. A large proportion of our effort in this study will be to develop methods to "scale up", from ecophysiological measurements to the forest canopy level, and to develop an ecosystem process model of productivity under various climate change scenarios. Physical processes at the canopy level, such fluxes of water vapour and energy, need to be included in the model because of their importance in determining the rates of photosynthesis and respiration via their effects on microclimate and nutrient cycling. We intend to ultimately link this process model to i) a gap model of forest regeneration and succession, (Campbell, Grewal and Varem) and ii) to the Regional Carbon Budget Model (Apps and Price). We anticipate that our proposed collaboration with BOREAS will strongly contribute to the further development of these models after the intensive BOREAS field campaigns in 1994.

12. Study Objectives:

i) Objectives

To concurrently measure ecophysiological and microclimatic processes as a means of identifying and quantifying the most important factors controlling primary production and distribution of major vegetation types along the SW to NE climatic gradient in the boreal forest. Initially, this study will focus on aspen and jack pine near the southern limit of the boreal forest.

To develop a process model to enable prediction of future changes in forest productivity in existing vegetation types in response to various scenarios of climate change.

To develop models that link small-scale physical and ecophysiological processes to canopy level processes and canopy exchange of CO₂, water and energy and to test

these models in field sites that represent near-boundary conditions of boreal forest tree species in terms of regional climate and soil microclimate.

To develop linkages between our ecophysiological process model and other models of boreal forest responses to climate change (e.g., disturbance/succession models and the regional Carbon Budget Model).

ii) Deliverables

Short Term (1-5 years)

A working process simulation model and publications to bring an increased understanding of how different climate change scenarios are likely to affect the productivity, distribution and ecosystem functioning of major existing forest types near the southern limit of the boreal forest.

Contributions of knowledge on ecophysiological, ecological, and microclimate responses to cooperating Forestry Canada Green Plan studies and clients, including quantitative functional linkages to other modelling initiatives.

Long Term (5 years and beyond)

Improved predictions of how the boreal forest will respond to global change, and through our involvement with larger-scale projects such as BOREAS and NBIOME (Northern Biosphere Observation and Modelling Experiment), an improved ability to predict biophysical feedbacks of the boreal forest on global CO₂ levels and climate.

Publications from research and modelling activities to improve our ability to predict global change impacts on the functioning and carbon balance of forests and peatlands near the northern limit of the boreal forest.

iii) Significant Linkages:

Boreal Forest Transect Case Study (Mike Apps, team leader)

This comprises about 14 Forestry Canada studies from across Canada who have a common interest in climate change effects on the western Canadian boreal forest.

Boreal Ecosystem-Atmosphere Study (BOREAS)

This is an intensive, short-term (1993-95) study of the interactions between the boreal forest and the atmosphere, focusing on the role of these interactions in governing global climate change.

NBIOME (linkage to be proposed in 1993-94)

iv) Methodologies: N/A (Peer Review was held January 1992)

13. Progress and Achievements Up to and including 1991-92

N/A (This is a new study. The previous research scientist, R.H. Swanson, retired in 1991 and E.H. Hogg was hired on January 13, 1992.)

14. Goals and Accomplishments (April 1992 - March 93)

1. *Develop linkages with BOREAS, including submission of detailed BOREAS proposal in April and participation in BOREAS site selection in June.*

As Principal Investigator, Hogg coordinated the preparation and writing of a joint BOREAS proposal for four Forestry Canada studies (Hogg, Campbell (NOR 16-04), Lavigne and Penner). Hogg and Hurdle participated in BOREAS site selection and characterization in June and September. The BOREAS proposal was accepted and Hogg attended the BOREAS workshop in Washington, D.C. in December.

2. *Select, describe and instrument BFTCS (Boreal Forest Transect Case Study) sites in cooperation with other collaborative studies.*

Intensive study sites were selected in drought-stressed aspen (Batoche) and jack pine (Nisbet), and also at Gillam. The Nisbet site has been designated as a BOREAS terrestrial ecology site. It was decided to defer intensive studies at Gillam until a) our role within BOREAS is clarified and b) more experience is gained with the methodology at the two southern tower sites.

3. *Test and calibrate ecophysiological and meteorological instrumentation for intensive study sites on the BFTCS.*

A 20-m tower and associated instrumentation was installed (Hurdle) at the study site in the aspen parkland at Batoche, Saskatchewan. The datalogger station is now continuously recording meteorological data, soil temperature and soil moisture. Instrumentation and cuvettes for the IRGAs were developed, assembled, and tested in the laborat. . . (Hurdle).

Leaf area index (LAI) of the tree and shrub layer in several community types at Batoche was measured on four dates using a Li-Cor Canopy analyzer, and the results are presently being calibrated by comparison with leaf fall from litter traps. These results will be used to model the growth and productivity of aspen in response to changes in environmental conditions.

4. *Construct and document a preliminary working process model to be patterned after FOREST-BGC.*

The preliminary model is planned for completion by March 1993. Several key parts of FOREST-BGC (transpiration/photosynthesis modules) have been tested and it is evident that major changes are needed to make this model useful to our modelling efforts.

5. A computer program was written to gain access to a database of Canadian climate normals, and a simple model of evapotranspiration (Jensen and Haise) was used to

develop an climatic moisture index for western Canada. The results strongly suggest that the southern limit of conifers in western Canada is closely linked to climatic moisture stress, either directly or indirectly (e.g. via influences on historic fire frequency). This has helped to develop hypotheses concerning what factors may determine future changes in conifer distribution in the southern boreal forest.

The following computer programs were written to support the research activities: 1) a light attenuation/ photosynthesis model for forests, 2) a model to process results from the Li-Cor canopy analyzer, and 3) a daily temperature simulator model.

15. Information Activities

i) Journal Publications

Hogg, E.H., V.J. Lieffers and R.W. Wein. 1992. Potential carbon losses from peat profiles: Effects of temperature, drought cycles and fire. *Ecological Applications* 2: 298-306.

Hogg, E.H. 1993. Decay potential of Sphagnum peat at different depths in a Swedish raised bog. *Oikos* (in press).

Manuscript accepted for publication:

Lieffers, V.J., S.E. Macdonald and E.H. Hogg. Ecology of and control strategies for Calamagrostis canadensis in boreal forest sites. (*Canadian Journal of Forest Research*).

Manuscript submitted for publication:

Hogg, E.H. An arctic-alpine flora at low elevation in Marble Canyon, Kootenay National Park, British Columbia (submitted to *Canadian Field-Naturalist*)

ii) Information Reports nil

iii) Other reports

Hogg, E.H., with I. Campbell, P.A. Hurdle, T. Varem, H. Grewal, M. Penner and M. Lavigne. 1992. Climate change effects on net primary productivity across a boreal forest transect. Proposal for participation in the Boreal Ecosystem-Atmosphere Study (BOREAS). Unpublished manuscript, Northern Forestry Centre, Edmonton. 43 pp. and appendices.

iv) Lectures, courses, seminars and scientific addresses

Hogg, E.H. and P.A. Hurdle. Factors limiting productivity and distribution of tree species at the southern limit of the boreal forest. Presentation at the BFTCS Team Meeting, NoFC, 30 November - 1 December 1992.

As Principal Investigator on a BOREAS proposal, E.H. Hogg gave a brief presentation on our proposed research to the Terrestrial Ecology Working Group at the BOREAS workshop held in Greenbelt, Maryland, 15-17 December 1992.

v) Technology transfer:

E.H. Hogg is serving as Advisor for one Ph.D. student (Barb Thomas, topic: population genetics of aspen) at the U of A Forest Science Department. He also acted as examiner on the candidacy exam in October 1992.

16. Goals 1993-94

1. Continue to construct and document a working model of forest ecosystem processes in response to climate. The first version will focus on the aspen parkland at Batoche, where several key parameters such as leaf area index/biomass and stand structure have already been measured.
2. Implement ecophysiological instrumentation and leaf-canopy level measurements at the Batoche aspen site. These measurements will be used to validate the preliminary model.
3. Initiate cooperative research with BOREAS and BFTCS at two intensive BOREAS sites near Prince Albert, Saskatchewan.
4. Submit manuscript for publication entitled "Hypotheses on the factors governing the southern limit of conifers in the western Canadian boreal forest".
5. Explore possibilities for new research initiatives to address questions relating to potential climate change effects on the regeneration of conifers in the southern boreal forest.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Northwest	NOR 1604	Climatic change modelling	Ian Campbell
Northwest	NOR 1605	Global carbon cycle	Mike Apps Dave Price
Northwest	NOR 1602	Canadian peatlands	Steve Zoltai
Petawawa		Crown development	Marg Penner
Maritimes		Woody tissue respiration	Mike Lavigne

ii) External -

Establishment	ID#	Title	Contact name
TBA		(BOREAS)	

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

REVIEW OF NEW CLIMATE CHANGE PROPOSAL IN BATOCHÉ NATIONAL HISTORIC PARK

Three members of NoFC's environmental have reviewed the proposal for Batoche National Historic Park. Overall, the environmental effects of this study are not significant and the project may proceed. The following conditions should be addressed before any major disturbance at the site:

1. The appropriate permits have been or will be obtained;
2. A rare plant survey should be conducted near the tower before any major disturbance from construction of the tower begins,
3. Indicate the maximum number of people that may be on site during any research visit.

from Doug Maynard, Chairperson of NoFC Environmental Screening Committee

ii) FC-NWR EARP Committee Approval Date: 30 June 1992

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 13, 1993

1. **STUDY TITLE:** Modelling boreal forest response to climate change
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection Research
4. **Project Title:** Canadian Forests and Climate Change
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Alberta, Saskatchewan, Manitoba
7. **Study Staff:**

	Name
Study Leader	I. Campbell
Team Members	H. Grewal
	T. Varem

8. **Study Key Words:** Boreal Forest, Modelling, Climate Change, Forest Structure, Gap-Phase Dynamics
9. **Study Activity:** 2211, 2217

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
I. Campbell	SE-RES-1 (P)	0.92	0.92	1.00		
H. Grewal	FO-02 (P)	1.00	1.00	1.00		
T. Varem	EG-04 (T)					
FTEs		1.92	1.92	2.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	2.45	2.00			
Capital	3.79	6.50			
G & C					
TOTAL:	6.24	8.50			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	16-84	23.67	22.09			
Capital	16-84	5.86	0.00			
G & C						
TOTAL:		29.53	22.09			

STUDY TOTAL	35.77	30.59			
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11. Study Background and Problem Analysis

Climate models predict that anthropogenic changes in the composition of the Earth's atmosphere will result in climate warming on the order of 1-5°C over the next 50-100 years.

Changes in precipitation and seasonality will vary according to location, but Canada's boreal forest region is expected to experience greater than average warming and in most places reduced precipitation. Palynological and other evidence suggests that such a magnitude and rapidity of climate change could have a strong impact on both the location of range limits and on the structure of the forest. This could in turn have severe repercussions on Canada's forest industries.

The boreal forest is one of the largest biomes in the world, the most economically important forest in Canada, and may also be one of the largest high-flux carbon stores, accounting for as much as 30% of the seasonal variation in atmospheric CO₂ concentration in Hawaii. Understanding the effects climate change may have on this carbon store is important to predicting future atmospheric carbon concentrations, and thus to predicting future climate. While increased temperatures and CO₂ fertilisation may increase the rate at which the boreal forest removes carbon from the atmosphere, decreased precipitation and possibly increased fire frequency and severity may partially or wholly compensate for the increased carbon storage, and may even reduce overall carbon storage in the boreal system.

While some indication of long-term forest responses to climate change can be obtained from the paleoecological record, the predicted future climate change exceeds all known climate changes of the last 2,000,000 years in magnitude and rapidity. While it has recently been demonstrated that past changes in climate on the order of 1-2°C over several hundred years was sufficient to cause a disequilibrium forest response in some regions, the future climate change is predicted to be on the order of 1-2°C over several decades.

Gap-phase dynamics models of forest growth have been shown to be an effective way of simulating past forest responses to past climate changes, including the disequilibrium response mentioned above. Gap-phase dynamics models have also been used to predict future forest responses to climate change. However, the gap-phase models currently available do not explicitly simulate some of the important processes in boreal forest ecology. This project aims to develop an integrated boreal forest gap-phase dynamics model which explicitly includes all of the important processes in boreal forest ecology, and to use it to predict the future structure of the boreal forest. This project will thus be closely linked to several other Forestry Canada projects.

Research Priorities

Existing models of the boreal forest will be investigated and evaluated to determine which routines from each existing model can be adapted to the new model. Processes inadequately represented in the existing models will be studied, and routines developed to simulate them. Initially, it is expected that mortality will be the major focus. Mortality can be classified as catastrophic or gradualistic. Causes of catastrophic mortality include fire, severe insect infestation, blow-down, and severe weather. Gradualistic mortality is caused by competition and other sources of cumulative stress.

The only mortality processes which are well represented in current models are competition and cumulative stress caused by poor climate. Thus fire, of major importance to the boreal forest and generally poorly represented in gap-phase models of the boreal forest, will be one important initial focus. It is expected that most information and data required to model fire occurrence, severity, and impact will be found in available literature. Insects and other pathogens will also be examined.

A second focus will be refining the equations used for tree growth. While much of the required information is available in the literature, some dendrochronological work will be undertaken to develop relationships between leaf area, age, climate, and growth. Data collected by linked projects (see Linkages, below) will also be extensively used.

A third focus will be the development of a paleoecological data-set which can be used for model validation, through high temporal resolution pollen and charcoal analyses of peat (the best material for preserving *Populus* pollen) cores taken from sites along the Boreal Forest Transect.

12. Study Objectives:

i) Objectives

- a) A comprehensive review of processes affecting boreal forest succession
- b) Constructing and operating a computer simulation model of successional processes in the boreal forest, with specific reference to changing climate
- c) Predicting the medium and long-term consequences of climate change for boreal forest ecology in Canada

ii) Deliverables

Short Term (1-5 years)

- a) A paleoecology lab within Forestry Canada
- b) An X-ray densitometry lab within Forestry Canada
- c) An improved understanding of past boreal forest responses to climate change
- d) Improved understanding of successional processes in the boreal forest
- e) A model of boreal forest successional processes
- f) Predictions of the impacts of climate change on the boreal forest

Long Term (5 years and beyond)

- a) Improved forecasting of the carbon budget of the Canadian boreal forest
- b) Improved forecasting of available stocks in the boreal forest

iii) Significant Linkages:

- a) Forestry Canada Green Plan:
 - i) NOR-16-05: Carbon budget model (Apps/Price)
 - ii) NeFC: Woody tissue respiration (Lavigne)
 - iii) PNFI: Crown development (Penner/Lavigne)
 - iv) GLC-26-11: Jack pine responses to elevated CO₂ and nitrogen (Hogan)
 - v) NOR-16-03: Vegetation-climate interactions (Hogg)
 - vi) NOR-16-02: Long-term carbon sequestration in peatlands (Zoltai)
- b) BOREAS (Boreal atmosphere-ecosystem study)
- c) NBIOME (Northern Biosphere Observation and Modelling Experiment)
- d) BFTCS (Boreal Forest Transect Case Study)

iv) Methodologies

The first step will be to analyze and evaluate existing boreal forest models, as well as models of other types which may be applicable. Each sub-model in each model will be evaluated according to how realistically it models the processes intended, how well it does so, and how adaptable it is to the targeted integrated model. Also, existing paleoecological data, ecological information, and PSP data will be collected.

Additional data will be collected in collaboration with Hogg, Penner, and Lavigne, using primarily Hogg's study sites in order to benefit from his data. Data to be collected include litterfall (from litterfall traps), dendrochronology and densitometry (from cores and cookies), climate data (from flux towers), crown and stem maps, and basic soils data. Also, peat cores collected by Zoltai from nearby peatlands will be analyzed for fossil pollen and charcoal abundances, to develop a detailed paleoecology of each site and to complement fire scars found in the tree cores and cookies to develop a chronology of forest fire at each site. A particular effort will be made to obtain cookies from trees recently dead from gradualistic causes, in order to establish relationships between tree vigour and death.

These data will be used in the evaluation of available sub-models to be included in the integrated model, as well as for the development of new sub-models to simulate processes not adequately represented by existing sub-models.

13. Progress and Achievements

As this study was new last year, Progress and Achievements are listed below under Accomplishments for 1992-93.

14. Goals and Accomplishments (1992-93)

1. *Establish a fossil pollen reference collection for the western boreal forest (Varem).*

A collection of 72 taxa has been assembled.

2. *Establish a fossil pollen analysis laboratory (Varem, Campbell).*

A laboratory has been established, and over 200 samples have been processed (of which 30 have been analyzed).

3. *Collect available pollen data from the western boreal region (Varem, Campbell).*

Available stratigraphic pollen data has been collected. A review paper is planned.

4. *Establish an X-ray densitometry tree-ring laboratory (Varem, Campbell).*

An X-ray machine has been obtained and is in use; procedures have been developed for processing samples for X-raying; a scanner has been purchased and is being calibrated.

5. *Obtain all available gap-phase dynamics models (Grewal).*

All but one of the important gap-models have been obtained, the remaining model has been requested from the authors.

6. *Analyze each model for sub-models representing various processes (Grewal, Campbell).*

Several of the models have been examined, and several useful processes have been identified.

7. *Collect PSP data from BOREAS and BFTCS sites (Varem, Campbell).*

Six PSPs were installed in BOREAS and BFTCS sites, and several other potential locations have been identified. As the BOREAS team has not yet confirmed all of the southern sites, some field work has been put on hold.

8. *Obtain PSP data from governments and industries for the western boreal forest (Varem, Campbell)*

Several sources have submitted PSP data, but most other researchers are not collecting the data needed for this study; therefore existing PSP data is not likely to be very useful.

9. *Evaluate existing gap-phase models' representations of processes, and select sub-models for greatest realism and compatibility, to create an integrated model (Campbell, Grewal).*

Few models represent any process with any degree of realism. FIRESUM is being investigated for its treatment of fire, which appears to be adequate in many (though not all) respects.

10. *Using PSP, pollen, and densitometry data, develop new sub-models to represent important processes not well represented in existing models (Campbell, Varem).*

The basic structure of the new model is being planned. This objective will be ongoing through the duration of the study.

11. *Begin study of relationships between growth and climate, by reviewing literature sources, to identify the best climate variable(s) to use in growth modelling (Grewal).*

T. Hogg has identified an aridity index which correlates well with the southern border of the boreal forest. Existing literature on boreal species/climate relations appears to focus more on extremes (ie, northern, alpine, and southern tree-lines) than on the mid-boreal. This suggests increased need for densitometry data from the mid-boreal.

12. *Cooperate with FC and other scientists in the Boreal Forest Transect Case Study, and in BOREAS (Campbell, Grewal, Varem).*

This study participated in two BOREAS site-selection trips, and is actively cooperating with M. Penner in site selection for her study.

13. *Participate in meetings, workshops, and conferences relating to boreal forest and climate change issues (Campbell, Grewal, Varem).*

Campbell participated in a Global Climate Change workshop hosted by the Association of Canadian Universities for Northern Studies.

14. *Prepare reports/journal papers as justified by progress (Campbell, Grewal, Varem).*

Two papers from new work are in progress, and should be submitted by the end of the 1992/93 year. Six other papers (old work) have been or will be submitted before the end of the 1992/93 year.

15. *Finalize biomass paper by responding to reviewer comments (Grewal).*

This has been on hold due to co-author's schedule.

16. *Continue to serve as primary resource person for the FORCYTE model, now in use by more than 30 researchers worldwide (Grewal).*

Grewal has responded to several requests for information/assistance.

Publications in manuscript or in submission as of January 6, 1992:

1. Manuscript with M-A. Geurts (U. of Ottawa) and C. Campbell (U. of Alberta) on the high-resolution long-term record of inorganic pollutants in McKay Lake, Ontario submitted to journal.
2. Manuscript with J.H. McAndrews (Royal Ontario Museum) on transient effects of the Little Ice Age in southern Ontario awaits co-author response to first draft.
3. Manuscript on the ecological significance of the growth parameters b2, b3, and G in the FORET lineage models accepted in Ecological Modelling pending revisions.
4. Manuscript with G.L. Chmura (McGill University) on pollen in the Atchafalaya River, Louisiana awaits co-author response.
5. Manuscript on the Holocene forest dynamics of the Alberta-Saskatchewan-Manitoba region in preparation.
6. Manuscript with C. Campbell (U. of Alberta) on prehistoric land use in southern Ontario submitted to journal.
7. Manuscript with M-A. Geurts (U. of Ottawa) on the palynology of the Kettle Camp site, Yukon Territory awaits co-author response.
8. Manuscript on differential pollen preservation through successive wet-dry cycles in saline and non-saline lakes in internal review preparatory to submission to journal.
9. Manuscript on paleohydrology of Lake Temagami awaits co-authors.
10. Reply to a Letter to the Editor in ArchNotes submitted.
11. Manuscript on Milankovitch forcing of climate in Egypt submitted to journal.

15. Information Activities

- iv) Lectures, courses, seminars and scientific addresses

Two posters presented at Palliser Triangle Global Change conference held in Regina.

16. Goals 1993-94

1. Complete pollen analysis of St. Laurence Fen core, Nelson House peat core, and PA fen core.
2. Begin pollen and charcoal analyses of Amisk Lake core and Jade Lake core.
3. Investigate possibility of distinguishing grass and wood fires in Aspen Parkland sites through sedimentary charcoal.
4. X-ray densitometry of currently held wood samples.
5. Develop interpretative software for x-ray densitometry.
6. Develop computer software for making and analyzing stem maps.
7. Investigate the significance of intra-annual variations in wood density.
8. Develop modular skeleton for new boreal forest gap model.
9. Test auto-scaling of plot size in gap model.
10. Continue to cooperate with BOREAS and other FC scientists in the BFTCS.

17. Major Co-operators:

- i) Internal - FC

Region	ID#	Title	Contact name
See above (12[iii])			

- ii) External -

Establishment	ID#	Title	Contact name
See above (12[iii])			

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

Potential adverse environmental effects are insignificant or mitigable with known technology. Project may proceed.

ii) FC-NWR EARP Committee Approval Date: Jan. 7, 1993.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: 10 January 1994

1. STUDY TITLE:
2. Responsibility Centre: Northwest Region (8135)
3. Program: Forest Protection and Environment
4. Project Title: Modelling the role of northern forests and forestry in the global carbon cycle in a changing climate.
5. Office Location(s): Edmonton, Alberta
6. Work Location: Canada
7. Study Staff:

	Name
Project Leader	M. Apps
Team Members	D. Price
	R. Mair
	J. Niederleitner

8. Study Key Words:

Carbon cycle, carbon budget, carbon sequestering, greenhouse effect, boreal forests, climate change, forest productivity, bioenergy, simulation modelling, ecophysiological modelling, BOREAS, NBIOME, FORET, ZELIG, FORENA, FORCYTE, LINKAGES, JABOWA

9. Study Activity: 2211, 2217

10. Study Resources:Personnel Information

		1992-93	Fiscal Year 1993-94			1994-95
Employee Name	Category	Previous	Budget	Revised	Forecast	Upcoming
M. Apps	SE-RES-3 (P)	0.50	0.50	0.50		
R. Mair	SI-2 (P)	1.00	1.00	1.00		
D. Price	SE-RES-2 (T)	0.00	0.00	0.00		
M. Siltanen	EG-5 (T)	0.00	0.00	0.20		
J. Niederleitner	SI-2 (P)	1.50	1.50	1.70		
Total PY						

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00		
O&M	1.32	2.00			
Capital	5.31	0.00			
G & C					
TOTAL:	6.63	2.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00			
O&M	16-85	40.61	31.35			
Capital	16-85	12.12	0.00			
G & C						
TOTAL:		52.73	31.35			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Other</u>						
Suspence						
Parks Canada-JP	16-95		14.00			
TOTAL:			14.00			
STUDY TOTAL		59.36	47.35			

11. Study Background and Problem Analysis

The Carbon cycle and climate change:

The principal factor driving global warming concerns is man's influence on the natural greenhouse effect through changes in the atmospheric loading of radiatively active gases. Carbon dioxide is still the main anthropogenetic greenhouse gas and global forest ecosystems account for approximately 50% (100 gigatonnes of carbon) of the annual exchange of this gas with the atmosphere. In addition to their significant and dynamic role in the annual carbon cycle, global forest ecosystems represent huge carbon pools in their soils (1500 gigatonnes C) and standing biomass (650 gigatonnes C).

Human activities are upsetting the world's carbon balance by burning fossil fuels and by removing active biological sinks for carbon dioxide through deforestation and other land use changes. An increasingly important question to Canadians is the extent to which our forests are part of the problem or can be part of the solution. This question has three parts: how much carbon is currently stored in Canadian forests, how much do they currently contribute to the atmospheric budget, and how will these carbon storage pools and exchanges change in the future as a consequence of climate change and forest management?

CBM-CFS: the Carbon Budget Model of the Canadian Forest Sector

The Carbon Budget Model of the Canadian Forest Sector addresses these questions in a three phase study: 1) assessment of the current carbon budget using best available data; 2) evaluation of the likely/possible consequences of alternative forest resource management strategies on future carbon budgets; and 3) evaluation of the likely/possible consequences of alternative climate change assumptions on future carbon budgets. This work was initiated with funding under the ENFOR program and culminated in an integrated modelling framework and completion of the first phase of the work.

This study work plan outlines the Forestry Canada component of the carbon budget and carbon cycling research. During the ENFOR supported contract work (under ENFOR) it became clear that a significant research effort would be required to adequately capture the existing state-of-the-art science understanding in order to address aspects of phase 2 and 3. This requires development of new science skills not presently extant in Forestry Canada, or indeed within the country at all. The Forestry Canada research will focus on developing

process-driven algorithms for forest response to climate change scenarios for incorporation in the CBM-CFS framework. Continued ENFOR support will be directed (*via* contracts) towards application of the CBM-CFS modelling framework to specific problems.

It is expected that after completion of the phase 2 and phase 3 framework and prototype model, there will be a period of science and policy recommendation output resulting from gaming analysis with the prototype model. This will be followed by an ongoing use of the model framework to test, refine and formulate projections of future carbon budget questions which incorporate the improvement in our knowledge, understanding and data. The carbon budget model is expected to be a major integrating tool for the overall Forestry Canada National Climate Change research program.

Relationship of study to BOREAS:

It is expected that the carbon budget model for the Canadian Forest Sector will be tested and used as part of an NWR project proposal for the international BOREAS study by adapting, and applying, it to a transect from the grasslands through the BOREAS boreal forest sites and into the tundra. This transect is expected to become an integrating thread for a number of Forestry Canada's climate change research projects (see NOR 16-01) and the carbon budget is a central component of this activity.

Relationship of study to NBIOME:

The carbon budget model framework has been an important component of the development of the science plan for the inter-agency NBIOME (Northern Biosphere Observation and Modelling Experiment). One of the cornerstone activities of NBIOME (proposed by Apps and involving University as well as Government researchers) is to model the carbon dynamics across a transect through the grassland- boreal forest - tundra, including the BOREAS sites as mentioned above.

The ten-year multi-disciplinary, inter-agency NBIOME project is one of two from Canada which have been accepted in NASA's EOS (Earth Observing System) program. Apps is one of the original Co-investigators named in the proposal to NASA, is a key member of the NBIOME Science Steering Committee and has played an active role in several inter-agency workshops on NBIOME. The NBIOME project attempts to link observational databases (satellite remote sensing, biomass and soils inventories) to process modelling of organic matter dynamics and carbon sequestration in forests and agricultural systems at the national scale.

12. Study Objectives:

i) Objectives

To provide the best available estimates of northern forests contributions to the global carbon budget in a changing environment by:

1. developing a quantitative modelling framework within which to capture the changing state-of-the-art science knowledge and data;

2. developing modelling approaches supported by field studies and data synthesis to evaluate the effects of resource management strategies on the carbon sequestration potential of northern forests for incorporation in the modelling framework;
3. adapting existing gap-phase dynamics succession models and ecophysiological response models for incorporation in the modelling framework to assess the changes in carbon sequestration potential of northern forests to possible changes in the global environment (such as global warming).
4. interfacing these models to large scale data accumulation programs (such as remotely sensed data) to assist in the detection and interpretation of global changes.

ii) Deliverables

Short Term (1-5 years)

Long Term (5 years and beyond)

iii) Significant Linkages:

13. Progress and Achievements

14. Goals and Accomplishments (1992-93)

1. Prepare *invited* manuscript on "Implications of Climate Change for Temperate Forests" for 14TH Commonwealth Forestry Conference in Kuala Lumpur, 13-18 September, 1993. Abstract and extended outline due 31 June 1992, completed manuscript by 15 December 1992. (Apps)

In view of the extra commitments as Team Leader, the manuscript for the Commonwealth Forestry Conference was withdrawn. See, however, added manuscript goals 8 and 12.

2. If expected *invitation* materialises, prepare and present keynote theme paper on 'The State-of-Art of Carbon Storage and Carbon Balance: Boreal and Tundra Ecosystems' for the IPCC Workshop on 'Carbon balance of World's Forested Ecosystems: towards a Global Assessment', Joensuu, Finland, 11-15 May 1992. (Apps)

A paper was presented at the IPCC Workshop "Carbon balance of world's forested ecosystems: towards a global assessment" in Joensuu, Finland. In addition Apps chaired one of the two workshop working groups (on carbon budget modelling) and wrote the proceedings summary for this group.

3. Publish the carbon database for Canadian Forest soils. (Apps, Zoltai)

The Canadian Soil carbon database now has data for more than 1200 soil profiles. Its publication has been postponed to the new year in order that the database may be expanded to include all data to a minimum of 100 cm depth and certain geographical

data gaps (western Ontario) to be filled. Preliminary runs of the CBM-CFS using these data have been performed and future analyses with the complete data base should lead to a significant science manuscript when completed.

4. *Coauthor manuscript on "The Impacts of Global Climate Change on the Carbon Budget of Canadian Forests" for the International Conference on Global Climate Change - Impact on Terrestrial Ecosystems to be held in Bad Dürkheim, Germany, 14-18 June (coauthor Kurz to present). (Apps)*

A paper was presented at the International Conference "Global Climate Change - Impacts on Terrestrial Ecosystems", Bad Dürkheim, Germany.

5. *Collaborate in scenario applications of the CBM-CFS to assess the historic (past 40 years) and future (10 years) annual net carbon exchange between the Canadian forest sector and the atmosphere. (Apps, Mair)*

Work has proceeded on collection of historical Canadian fire and insect disturbance data and CBM-CFS simulations are underway to evaluate the historical contribution of Canadian forests to the global carbon cycle. Simulation experiments have also been performed to examine potential future carbon budgets. (See also added publication goals 10 and 12a).

6. *Collaborate on the forest ecosystem modelling activities of NBIOME and BOREAS, including development of process-oriented sub-model for the CBM-P framework (carbon cycle and carbon budgets), and the collaboration with Holling (shared PDF Chao Li) on spatial-temporal scaling issues. (Apps, Hogg, Campbell).*

Significant contributions were made to the development of forest ecosystem modelling activities of NBIOME and BOREAS. These are reflected in publication goals 6, 10, 12a, 12b. In addition the NBIOME Science Plan (Apps is a coauthor) has been submitted for publication by the Royal Society of Canada in its Canadian Global Change Program Report series. NSERC fellow C. Li will assist in the development of mathematical models of contagious processes and the dynamics of spatial structures of forests at various scales (a collaborative NBIOME application of CBM-CFS with Prof. C.S. Holling and Dr. D. Tait).

A two stage meta-model structure has been developed to facilitate scaling up ecophysiological processes to the patch and stand level and from the stand to the landscape level for use in the CBM-CFS. A working collaboration has been established with Dr. C.E. Prentice (Sweden) to refine the FORSKA model for application to the BFTCS area. The modified model has been implemented on the U of A MYRIAS supercomputer and on our Sun Sparc 2 Work Station. Particular attention is being paid to the representation of contagious spatial processes such as regeneration (seed sources) and disturbances (fire, insects, harvest).

7. *Complete the publication of the Information Report NOR-X-325.*

Information Report NOR-X-325 "The Carbon Budget of the Canadian Forest Sector: phase 1" was published.

8. *Prepare presentations for IBFRA workshop, Alaska:*

- a. "NBIOME: a biome-level study of biospheric response and feedback in potential climate change"
- b. "Integration of boreal ecosystem-process models within a prognostic carbon budget model for Canada" (coauthor Dave Price)

Two science presentations were prepared for the IBFRA workshop, Alaska (see goal 11 for titles)

9. *Prepare manuscripts for based on IBFRA presentations for international journal World Resource Review.*

Two manuscripts based on IBFRA presentations (goal 10) were prepared, reviewed and for international journal World Resource Review:

- a. "NBIOME: a biome-level study of biospheric response and feedback in potential climate change" (Author M.J. Apps)
- b. "Integration of boreal ecosystem-process models within a prognostic carbon budget model for Canada" (Authors: D.T. Price and M.J. Apps)

10. *Prepare manuscript on CBM-CFS Phase 1 results for submission to journal Science.*

A manuscript "Canada's forests: a net carbon sink in 1986" has been prepared, and is in review for submission to the journal Science (Authors W.A. Kurz and M.J. Apps).

11. *Prepare invited presentation for Intergovernmental Panel on Climate Change Workshop on biospheric feedbacks, Wood's Hole Mass. October 1992.*

An invited presentation was made and well-received at the IPCC workshop "Biospheric Feedbacks", Wood's Hole Mass. October 1992.

12. *Prepare manuscript for publication in peer-reviewed proceedings of IPCC workshop on Biospheric Feedbacks (Journal Ecology, Climate Change, or Book Chapter).*

A manuscript "Global climate change: Disturbance regimes and biospheric feedbacks of temperate and boreal forests" was prepared, reviewed and submitted for Proc. of IPCC Workshop 'Biotic feedbacks in the global climate system', Wood's Hole, Mass. USA, October 25-29, 1992. To be published in Ecology or Clim. Change (Authors: Kurz, W.A., M.J. Apps, J.A. Volney, and B.J. Stocks).

13. *Prepare journal manuscript on the simulation of the role of roots in the CBM-CFS.*

A journal manuscript on the simulation of the role of roots in the CBM-CFS has been prepared, is in review and will be submitted to Can J. For Res by March 1003. (Authors W.A. Kurz and M.J. Apps)

14. *Complete final drafts of manuscripts for proceedings of International Conference "Carbon Cycling in the Boreal Forest and Sub-arctic Ecosystems: Biosphere Responses and Feedbacks to Global Climate Change", held in Coarvallis, 1991.*

Final manuscripts were prepared, reviewed and submitted for publication in peer reviewed proceedings of international workshop on "Carbon Cycling in the Boreal Forest and Sub-arctic Ecosystems: Biospheric Responses and Feedbacks to Global Climate Change", September 9-12, 1991.:

- a. Application of a Carbon Budget Model to Strategic Planning for the Effects of Climate Change on the Canadian Forest Sector (Apps, Kurz and Price)
- b. Carbon budget and succession dynamics of Canadian vegetation.(Cihlar and Apps)

15. *Prepare journal manuscript on sensitivity analysis with the CBM-CFS.*

A journal manuscript "The carbon budget of Canadian forests: a sensitivity analysis of changes in disturbance regimes, growth rates and decomposition rates" has been prepared, reviewed submitted, and accepted (November 1992) for publication in journal Environ. Pollut.. (Authors: W.A. Kurz and M.J. Apps)

16. *Prepare and submit BOREAS project proposal.*

A BOREAS project proposal "Annual carbon budget and climate induced changes in boreal forest ecosystems at the landscape level" was prepared, submitted and accepted for inclusion in the BOREAS project (Apps, Price and Kurz).

15. Information Activities

i) Journal Publications

Kurz, W.A. and M.J. Apps. 1993. Estimation of root biomass and dynamics for the carbon budget model of the Canadian forest sector. (In review for submission to Can. J. For. Res.)

Kurz, W.A. and M.J. Apps. 1993. Canada's forests: a net carbon sink in 1986. (In review for submission to Science.)

Apps, M.J., 1992. NBIOME: a biome-level study of biospheric response and feedback in potential climate change. World Resource Review. Submitted, October 1992.

Price, D.T. and M.J. Apps, 1992. Integration of boreal ecosystem-process models within a prognostic carbon budget model for Canada. World Resource Review. Submitted, October 1992.

Apps, M.J. W.A. Kurz, and D.T. Price. 1992. Application of a Carbon Budget Model to Strategic Planning for the Effects of Climate Change on the Canadian Forest Sector. In: "Carbon Cycling in the Boreal Forest and Sub-arctic Ecosystems: Biospheric Responses and Feedbacks to Global Climate Change", proceedings of International Conference, US EPA and Oregon State University, September 9-12, 1991. In press.

Cihlar, J. and M.J. Apps, 1992. Carbon budget and succession dynamics of Canadian vegetation. In: "Carbon Cycling in the Boreal Forest and Sub-arctic Ecosystems: Biospheric Responses and Feedbacks to Global Climate Change", proceedings of

International Conference, US EPA and Oregon State University, September 9-12, 1991. In press.

Kurz, W.A., M.J. Apps, J.A. Volney, and B.J. Stocks, 1992. Global climate change: Disturbance regimes and biospheric feedbacks of temperate and boreal forests. Proc. of IPCC Workshop 'Biotic feedbacks in the global climate system', Wood's Hole, Mass. USA, October 25-29, 1992. To be published in *Ecology, Clim. Change*, or as a book Chapter.

Apps M.J. and W.A. Kurz, 1992. The role of Canadian forests in the global carbon balance. In: "Carbon balance on world's forested ecosystems", Proc. Intergov. Panel on Clim. Change Workshop, Joensuu, Finland, 11-15 May, 1992. In press.

Kurz W.A. and M.J. Apps, 1992. The carbon budget of Canadian forests: a sensitivity analysis of changes in disturbance regimes, growth rates and decomposition rates. *Environ. Pollut. Ser. A Ecol. Biol.* Accepted, November 1992.

Kurz W.A., M.J. Apps, T. Webb, P. MacNamee. 1992. The Carbon Budget of the Canadian Forest Sector: Phase 1. ENFOR Information Report, NOR-X-326. Forestry Canada Northwest Region. 93 p.

Kurz, W.A., M.J. Apps, T.M. Webb, and P.J. McNamee. 1991. The contribution of biomass burning to the carbon budget of the Canadian forest sector: a conceptual model. In: J.S. Levine (ed.). *Global Biomass Burning. Proceedings of Chapman Conference*, March 19-29, Williamsburg, Virginia, MIT Press, 339-344.

Apps, M.J. and W.A. Kurz. 1991. Assessing the role of Canadian forests and forest sector activities in the global carbon balance. *World Resource Review* 3(4) 333-343.

iii) Other reports

Forestry Canada. 1992. *The State of Forestry in Canada, 1991 Report to Parliament*, Corporate and Public Affairs, Ottawa, Ontario (uses summary results of C budget model).

Kurz, W.A. and M.J. Apps. 1992. Atmospheric Carbon and Pacific Northwest Forests, Paper presented at the United States/Canada Symposium on the Implications of Climate Change for Pacific Northwest Forest Management, Seattle, Washington Oct 23-25, 1991. In: Wall, G. (ed.) *Department of Geography Publication Series, Occasional Paper*, University of Waterloo, 69-80.

Apps M.J. and W.A. Kurz, W.A. 1991. The carbon budget of Canadian forests in a changing climate: can forestry be part of the solution? In: *Extended Abstracts for 'ISCORD '91', 3rd International Symposium on Cold Region Development*, Edmonton, June 16-20, 1991, Alberta Res. Council, p. 48.

Apps M.J. 1991. Carbon Transfers: Forest and Wetland Ecosystems. In: *report of Technical Meeting on "Natural Sources and Sinks of Greenhouse Gases"*, Toronto, 5 - 7 Feb, 1991, Atmospheric Environment Service, 44-49.

Apps M.J. and D. MacIver D. 1991. Working Group Report on Forestry. In: Proceedings of Canada/US Symposium on Impacts of Climatic Change and Variability on the Great Plains, 11-13 Sept 1990, Calgary, Alta., Univ. of Waterloo Dep. of Geog. Publication Series Occasional Paper No. 12., 205 - 219.

iv) Lectures, courses, seminars and scientific addresses

Kurz, W.A., M.J. Apps, J.A. Volney, and B.J. Stocks, 1992. Global climate change: Disturbance regimes and biospheric feedbacks of temperate and boreal forests. Invited presentation at IPCC Workshop 'Biotic feedbacks in the global climate system', Wood's Hole, Mass. USA, October 25-29, 1992.

Apps M.J. and W.A. Kurz, 1992. The role of Canadian forests in the global carbon balance. Invited presentation at *Carbon balance on world's forested ecosystems*, Intergov. Panel on Clim. Change Workshop, Joensuu, Finland, 11-15 May, 1992.

Kurz W.A. and M.J. Apps, 1992. The impacts of global climate change on the C-budget of Canadian forests: a sensitivity analysis. Presentation at International conference 'Impacts on Terrestrial Ecosystems', Bad Durkheim, Germany, 14 -18 June 1992.

Apps, M.J. 1992. Climate Change, the Carbon Cycle, and Canadian Forests. Invited Special Seminar, University of Calgary, March 1992.

Apps, M.J. W.A. Kurz, and D.T. Price. 1991. Application of a Carbon Budget Model to Strategic Planning for the Effects of Climate Change on the Canadian Forest Sector. Presentation at International Conference "Carbon Cycling in the Boreal Forest and Sub-arctic Ecosystems: Biosphere Responses and Feedbacks to Global Climate Change" Oregon State University, September 9-12, 1991.

Apps, M.J., 1992. NBIOME: a biome-level study of biospheric response and feedback in potential climate change. Presented at International Boreal Forest Research Association Meeting, Anchorage and Fairbanks, Alaska, 11-19 September 1992.

Price, D.T. and M.J. Apps, 1992. Integration of boreal ecosystem-process models within a prognostic carbon budget model for Canada. Presented at International Boreal Forest Research Association Meeting, Anchorage and Fairbanks, Alaska, 11-19 September 1992.

16. Goals 1993-94

1. Complete journal manuscript "The carbon budget of the Canadian Forest Sector: Phase 2: implications of resource management strategies" and submit to Can. J. For. Res. (or equivalent).
2. Develop algorithms for representation of contagious meso-scale processes (such as seed-dispersal and disturbances) and their influence on structure and function at the landscape level. These algorithms will be developed for testing on the BFTCS.

3. Complete manuscript on "Simulation of disturbance contagion in a forest gap model" and submit to Ecological Applications or comparable journal.
4. Refine the current representation of site-specific and ecophysiological processes in ecosystem-level models (first level of meta-model development) to explicitly simulate vegetation response to changes in climate variables such as temperature, precipitation and CO₂ levels.
5. Continue development of large scale model of landscape ecosystem processes and second level of meta-model development (stand to landscape scales incorporating algorithms for contagious processes and spatial scaling (Goal 2). Include representation of processes related to NPP, disturbances, decomposition, wetland dynamics, and vegetation pattern development and their dependence on changes in global climate factors.
6. Perform preliminary simulations of the carbon budget of the present and future boreal forest incorporating the meta-model structure developed for the BFTCS to scale up to the biome-level within the CBM-CFS.
7. Design and initiate validation/verification experiments using data from BOREAS and BFTCS.
8. Complete manuscript on "Simulation of ecosystem processes within an integrated carbon budget framework" and submit to Ecological Applications, Landscape Ecology or comparable journal.
9. Prepare invited overview presentation on the role of forests in global carbon budget, and participate in National Symposium in Ottawa, April 1993.
10. Publish Carbon database for forest soils.
11. Prepare series of journal manuscripts on the CBM-CFS phase 2/3 research: tentative topics:
 - a. the contribution of the Canadian forest sector to the carbon budget of the past 4 decades
 - b. projections of the contribution of the Canadian forest sector to the carbon budget for the next decade, with an emphasis on the potential role of bioenergy
 - c. description of the phase 2 CBM-CFS model (methods paper)
12. Prepare a journal manuscript "Disturbance regimes and biospheric feedbacks in boreal forests" for publication in Science, Can J For Res or equivalent.
13. Prepare presentation(s) on modelling of boreal forest response to climate change along the BFTCS for IBFRA symposium, Norway, September 1993.
14. Investigate the interactions of different disturbance factors (harvesting, insects, fire), forest sector decisions (bioenergy, protection measures, product lifetimes) and internal forest ecosystem feedbacks (age-class structure, productivity) on the national forest sector carbon budget using the CBM-CFS2.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental screening committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

ii) FC-NWR EARP Committee Approval Date:

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Wetlands and Hydrology
2. Responsibility Centre: Northwest Region (8135)
3. Activity: 2211
4. Program: Forest Protection and Environment
5. Status: Continuing
6. Last Evaluation: January 15, 1993
7. Next Evaluation:

B. KEYWORDS

223 Peatland
 020 Ecology/ecosystems
 344 Drainage
 311 Productivity
 714 Herbarium

C. RESOURCES

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	0.00	0.00	2.00	0.00	0.00
Salaries	\$0.0	\$0.0	\$116.0	\$0.0	\$0.0
O & M	\$0.0	\$0.0	\$5.0	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$0.0	\$0.0	\$121.0	\$0.0	\$0.0

D. PROJECT DESCRIPTION

Almost one half of the forest lands in the boreal forest region within the Northwest Region consists of waterlogged, peaty soils where high water table impedes tree growth. Information on the soils and hydrology of these peaty sites is inadequate to formulate management

decisions. A study within this project examines the effect of water quantity and quality on the development of peatlands within different climatic regions. This information is the basis for understanding the ecology and dynamics of wetlands, leading to the development of guidelines for peatland management for improved tree growth or to the use of peat resources. Initial indications are that appropriate drainage techniques applied to selected suitable peatlands and other waterlogged soils result in improvement of tree growth; expectations of 5-times volume growth increase are not unrealistic.

The drainage improvement project is designed to (1) develop optimal silvicultural regimes for drained peatlands; (2) to assess the effects of drainage on peat/soil properties, ground vegetation, local hydrology, and tree growth; (3) determine the economic feasibility of operational forest drainage in the NW region. Three experimental areas were selected in poor fen, swamp and rich fen peatlands, and ditching was performed on the basis of mathematical models. Parts of the ditched areas were subjected to additional treatments, such as fertilizing and mounding. The tree growth and changes in vegetation composition are closely monitored. The water quality in the ditches is monitored to detect any changes that may have an adverse impact on the environment.

1. Environmental Impact Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators Resource Summary:

N/A

3. Collaborators:

N/A

4. Green Plan:

N/A

5. Milestones:

1. Investigate trends of peatland dynamics and rate of peat accumulation in various climatic regions; and supervise the classification and mapping of wetlands in Manitoba.
2. Monitor the response of tree growth and ground vegetation at experimentally ditched peatlands.

6. Accomplishments:

1. Initiated a study of classification and mapping of wetlands in Manitoba. Prepared and published papers on wetland classification, and on permafrost development in peatlands.
2. Prepared and published papers on the hydrological effects of peatland ditching.

7. Link to Strategic Plan:

National:

Project objectives relate to the Forest Sector Development section: to increase the productivity and yield of currently growing forests. Other objectives relate to the Forest Environmental Quality section: to provide increased capability to predict and prepare for the consequences of human disturbance on forest ecosystems.

Regional:

Objectives relate to (1) increase the supply of economically useable wood (Issue II), and (2) to develop decision-making tools and guidelines for resource management in environmentally benign ways. The objectives are part of the new program thrusts (#5) to integrate valuation and management of timber and non-timber forest resources.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: Jan. 15, 1993

1. **STUDY TITLE:** Peatland Development and Ecology
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection and Environment
4. **Project Title:** Wetlands and Hydrology
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	S.C. Zoltai
Team Members	J.D. Johnson
	R.M. Siltanen

8. **Study Key Words:** Peatland, soils, dynamics, chemistry, peat, vegetation, succession
9. **Study Activity:** 2211

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
S.C. Zoltai	SE-RES-4 (P)	0.42	0.42	0.40		
J.D. Johnson	BI-2 (P)	0.16	0.16	0.20		
R.M. Siltanen	EG-5 (T)	1.00	1.00	0.40		
FTEs		1.58	1.58	1.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00		
O&M	0.78	4.00	4.00		
Capital					
G & C					
TOTAL:	0.78	4.00	4.00		

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
O&M: Man.	M8036		7.00			
G & C: Man.	M8036		66.00			
TOTAL:			73.00			

STUDY TOTAL		77.00			
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11. Study Background and Problem Analysis

Peat is constituted by the largely undecomposed remains of vegetation growing in wet places. It usually occurs in depressions and other poorly drained areas, and supports a

variety of vegetation from stunted trees to shrubs and sedges. In its natural state, the high water table prohibits fast tree growth, but when sufficiently drained it can produce as well or better than the best upland sites. As a raw material, it has many uses depending on its quality, from peat moss as a soil conditioner to liquification as gas fuel.

The Prairie Provinces have enormous areas of peat, all north of the prairie zone. The most recent estimates show that about 28% of Alberta, 12% of Saskatchewan and 42% of Manitoba are covered with peat. This translates into approximately 180,000 km² in Alberta, 68,000 km² in Saskatchewan and 230,000 km² in Manitoba.

The amount of peat involved is equally impressive. Conservatively calculating on a basis of 1.5 m average thickness in Alberta and Saskatchewan, and 2 m in Manitoba, the peat resources are 270×10^9 m³ in Alberta, 102×10^9 m³ in Saskatchewan, and 460×10^9 m³ in Manitoba. Estimating the total dry peat content on the basis of 100 kg/m³, this would amount to 27.0×10^9 tonnes in Alberta, 10.2×10^9 tonnes in Saskatchewan, and 46.0×10^9 tonnes in Manitoba; a total of 83,200,000,000 tonnes of dry peat.

The resources involved are considerable, whether viewed as a growth medium for forestry, range, agricultural or horticultural resources, or as raw material. Any development plans for the use of these resources must be based on the understanding of peatland ecology to determine the suitability of various kinds of peatlands for different uses and the possibilities of rehabilitation of exploited areas. The present state of knowledge of peatland development in the western region is very incomplete, and all available information is confined to a few local areas.

Peatlands are unique as the ecosystem (plants, water, soil, climate) creates its own environment. Accumulation of peat, upon reaching a critical thickness, can bring about a drastic change in the chemistry and nutrient levels of the peat. This in turn allows the invasion of different peat-forming vegetation, changing the complexion of the peatland. Conversely, interference with the natural ecosystem by partial drainage or excavation will interrupt this cycle in the short term and initiates the regeneration of peatland in the long term. The understanding of peatland dynamics is essential in predicting the response of a peatland to manipulation (as for example the drainage studies undertaken in NOR-28-03), in order to avoid disappointment, failure, or the creation of wastelands.

A study of peatland dynamics is in progress within the Boreal Wetland Regions of Alberta, Saskatchewan and Manitoba. This study characterizes the various peatland types in terms of vegetation, past and present, chemistry of surface and peat deposits, quantifying and characterizing the peat occurring in various peatland forms. The rate of peat deposition is measured by studying the layering and secondary root development of trees, and by obtaining radiocarbon dates of suitable peat sequences. The information gathered will be used to characterize the dynamics of various peatland forms in the Boreal Wetland Regions.

Based on this background knowledge, guidelines can be established to recognize the value of wetlands for various uses. The suitability of wetlands for forestry can be predicted with reasonable certainty, and management techniques can be recommended for the improvement of drainage and tending of the forest.

12. Study Objectives:

i) Objectives

1. Determine the ecology of wetland development within the region.
2. Develop a system of ecologically sound wetland classification that can be applied at the regional and national level.
3. Develop interpretive applications of the wetland classification system, including guidelines for peatland management, rehabilitation and conservation.

These goals relate directly to FC Strategic Plan by enabling us to predict and prevent environmentally harmful effects of human activities on or near wetlands. Direct benefit will be derived from the use of the information generated by this study when evaluating wetland ecological reserves.

The regional issue of multiple-use forest management is supported by the results of this study. Rational and environmentally sound use of peatlands for forest production is possible if the peatlands are carefully selected. Some peatlands can be transformed into productive forest lands with the appropriate site manipulation techniques.

ii) Deliverables

Short Term (1-5 years)

1. Revised version of the Canadian Wetland Classification System, stressing process-oriented definitions.
2. Reports on peatlands in ecotonal positions in i) boreal forest - subarctic forest ecotone; ii) boreal forest - grassland ecotone.
3. Report on wetland classification and distribution in Manitoba.
4. Initiate study of wetland classification and distribution in Saskatchewan.
5. Summary report on wetland use: generic land use, conservation values of wetlands.

Long Term (5 years and beyond)

See short term deliverables.

iii) Significant Linkages:

National Wetlands Working Group (Classification), NBIOME (Western Canadian wetland dynamics)

3. Progress and Achievements

This study was initiated in 1982, with support from Peat Forum (PERD). Since then 330 peatlands were described, cored and analyzed. This formed the basis of a number of scientific journal reports and book chapters, as well as the further development of the Canadian Wetland Classification System, in collaboration with the National Wetlands Working Group. Wetland Regions, based on wetland dynamics, were defined, and broad peatland distribution maps were produced for the first time. In general, a basic understanding of peatland dynamics in the Boreal, Subarctic and Arctic regions was achieved.

In the past few years, however, there was a great surge of interest in peatlands, as the scientific community "discovered" that peatlands store atmospheric carbon for long periods of time, and, therefore, have an important role to play in the global carbon balance. This resulted in expectations of greater accuracy about existing peat resources and rates of peat development under different climatic and hydrologic conditions. Thus the old estimates need to be replaced by more accurate and detailed surveys and studies of peatland dynamics and processes.

In 1992/93, the mapping and classification of the wetlands of Manitoba has begun. This 3-year study would identify all wetlands by major wetland classes in Manitoba, and would serve as a firm basis for evaluating the wetland/peatland base in the province. A similar study has been completed by the University of Alberta for the Province of Alberta.

14. Goals and Accomplishments (1992-93)

1. *Continue to act as project leader, developing and coordinating research at the study and project level. (Zoltai)*

Acted as Project Leader, Wetlands and Hydrology.

2. *Initiate study of wetland drainability classification, in cooperation with Alberta Research Council. (Zoltai, Johnson)*

Project proposal was developed, but did not receive funding from Canada-Alberta PAIF. Study cancelled.

3. *Initiate a contract for the inventory of wetland types in Manitoba, in cooperation with University of Alberta. Act as Scientific Authority. (Zoltai, Johnson)*

Project is funded by Canada-Manitoba PAIF: M8036, cooperative agreement with U of A is in place; work is in progress.

4. *Continue to serve on the National Wetlands Working Group by providing classification standards and technical advice on wetland conservation policy, and by updating the Canadian Wetland Classification System. (Zoltai)*

Participated in one meeting of NWWG. Began work in revising the classification of fens.

5. *Represent Canada in a symposium at the IV International Wetlands Conference in Columbus, Ohio, and present a paper on wetland classification in Canada, as invited speaker. (Zoltai)*

Participated in the Conference, and presented a paper.

6. *Assist colleagues in the identification of vegetation. (Johnson)*

Numerous vascular, bryophyte and lichen specimens were identified.

7. *Attend the International Mire Conservation Group field symposium in Switzerland, and present paper on the impact of climate change on Canadian wetlands. (Zoltai)*

Took part in the field symposium, and presented paper (see NOR 1602)

8. *Complete the conversion of data on physical and chemical characteristics of peatlands in Northwest Territories, Alberta, Saskatchewan and Manitoba to electronic form, suitable for distribution. (Siltanen, Zoltai)*

Data conversion to electronic form completed for Alberta, Saskatchewan and Manitoba, and 3/4 completed for N.W.T.

- a. *Undertake to cross-reference vegetation information to the above analytical information. (Siltanen, Johnson)*

Vegetation data is now formatted to be compatible to the physical and chemical data; further analyses for classification to be done.

9. *Represent ForCan on various regional, national, and international technical committees, working groups and workshops relating to wetlands. (Zoltai)*

Participated at Peatland Workshop, Devon, Alberta, December 4-6, 1992 - Participated in developing a peatland proposal to NBIOME

10. *Publish report on the natural resources of Melville Hills (N.W.T.) area in cooperation with Canadian Wildlife Service and Canadian Parks Service. (Zoltai)*

Report published.

11. *Design and implement Forestry Canada EG Technician Skills Inventory: coordinate inventory at all FORCAN establishments and compile national inventory of skills. (Siltanen, E. Leduc (HQ Personnel))*

Design completed and approved by CORE; initial prototype completed by CFL; implementation survey complete at NoFC, PFC, PNFI, NeFC, CFL; other regions in various stages of completion. Compilation underway.

15. Information Activities

i) Journal Publications

Timoney, K.P., G.H. La Roi, S.C. Zoltai, and A.L. Robinson. 1992. The High Subarctic forest-tundra of northwestern Canada: Position, width, and vegetation gradient in relation to climate. *Arctic* 45: 1-9.

iii) Other Reports

Zoltai, S.C., J. Sirois, and G.W. Scotter. 1992. A natural resource survey of the Melville Hills region, Northwest Territories. Technical Report Series No. 135, Canadian Wildlife Service, Northern and Western Region, 121 p.

iv) Lectures, courses, seminars and scientific addresses

Zoltai, S.C. and D.H. Vitt. 1992. Canadian wetlands: their classification and responses to environmental gradients. IV International Wetlands Conference, Columbus, Ohio.

Zoltai, S.C. 1992. The Canadian Wetland Classification System. Peatland Workshop, Devon, Alberta, December 4-6, 1992

16. Goals 1993-94

1. Continue to act as project leader, developing and coordinating research at the study and project level. (Zoltai)
2. Continue as scientific authority of a cooperative study for the classification and mapping of peatlands of Manitoba. (Zoltai)
3. Continue to serve on the National Wetlands Working Group by providing classification standards, updating the Canadian Wetlands Classification System, and advising on wetland conservation policy. (Zoltai)
4. Contribute data and data analyses to the NBIOME project on peatland distribution in western Canada (dependent on success of application to NBIOME). (Zoltai)
5. Assist colleagues in the identification of vegetation. (Johnson)
6. Initiate analysis for publication of summary information of wetland data base. (Siltanen, Zoltai)
7. Represent ForCan on various regional, national and international technical committees, working groups and workshops relating to wetlands. (Zoltai)
8. Participate in the joint conference American Society of Limnology and Oceanography/Society of Wetland Scientists in Edmonton, by organizing and chairing a session on "Ecology and Management of Wetlands on Permafrost".

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Northwest	NOR-1605	Global Carbon Cycle	M. Apps

ii) External -

Establishment	ID#	Title	Contact name
University of Alberta		Manitoba Mapping Project	D. Vitt
NBIOME		Carbon storage in peatlands of western Canada	

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concludes that these activities are not potentially detrimental to the environment.

No additional field component is planned for this study, hence no environmental impact is expected.

ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 15, 1993

1. **STUDY TITLE:** Increasing wood production through forest land drainage
2. **Responsibility Centre:** Northwest Region (8135)
3. **Program:** Forest Protection and Environment
4. **Project Title:** Wetlands and Hydrology
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Boreal forest, Alberta
7. **Study Staff:**

	Name
Study Leader	G.R. Hillman
Team Members	J.D. Johnson
	E.B. Robson

8. **Study Key Words:** Wetlands, peatlands, regeneration, forest growth, Larix laricina, Picea mariana, ditches, groundwater, soil water, hydrology, hydrodynamics, site preparation
9. **Study Activity:** 2211
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
G.R. Hillman	SE-RES-2 (P)	0.50	0.50	0.50		
J.D. Johnson	BI-2 (P)	0.42	0.42			
E.B. Robson	EG-5 (T)	0.50	0.50	0.50		
FTEs		1.42	1.42	1.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	0.00
O&M	2.55	1.00			
Capital	17.70	0.00			
G & C					
TOTAL:	20.25	1.00			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries: Alta.	A8012		5.9			
O&M: Alta.	A8012		18.94			
Capital: Alta	A8012		10.17			
G & C						
TOTAL:			35.01			

STUDY TOTAL		36.01			
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11. Study Background and Problem Analysis

In Alberta, concern about the decreasing productive forest land base as more forest land was withdrawn for other uses led foresters to consider increasing the wood-growing capability of forested wetlands. About 4 million ha in Alberta are considered suitable for drainage and conversion to productive forest. There is, however, very little information available on the long-term effects of forest drainage on tree growth and the environment.

It was decided that the best way to approach the problem was to select 3 experimental areas, then drain and instrument them so that the effects of different ditch spacings on groundwater table levels could be evaluated and any changes in ground temperatures recorded. Control areas would be established and pre- and post-treatment measurements would be made on both the drained and control (undrained) sites. Changes in stream water quality were to be determined by setting up monitoring stations upstream and downstream from the points where the main ditches discharged into the streams. Permanent sample

plots would provide information on the effects of drainage on tree growth and on changes in ground vegetation composition.

12. Study Objectives:

i) Objectives

1. Evaluate the growth potential of commercial tree species on treed wetland (peat or mineral soil) sites where water tables have been lowered.
2. Measure the effects of drainage on hydrological parameters such as water table depths, and on critical soil characteristics such as moisture content, temperature, fertility, hydraulic conductivity and subsidence.
3. Monitor the effects of drainage on the composition of ground vegetation.

The first objective relates to Forest Sector Development in the national strategic plan, the aim of which is to increase the productivity and yield of currently growing forests. The second and third objectives relate to the Forest Environmental Quality section of the national strategic plan which states the need for increased capability to predict and prepare for the consequences of human disturbance (drainage in this case) on forest ecosystems.

The three objectives are part of regional strategic initiatives to increase the supply of economically useable wood (Issue II) and to develop decision-making tools and guidelines for resource management in environmentally benign ways (Issue V). They are also part of new program thrusts (#5) to integrate valuation and management of timber and non timber forest resources.

ii) Deliverables

Short Term (1-5 years)

Reports describing effects of forest drainage on water table levels, soil moisture, ground temperature, stream water quality and peat subsidence; and, in particular, the drainage efficiency of different ditch spacings.

Long Term (5 years and beyond)

1. Reports indicating the effects of peatland drainage on tree growth and ground vegetation composition, 5 to 20 years after drainage.
2. Reports on the effectiveness of the ditch mounding treatment at Goose River on tree seedling survival, and reports on the effects of the fertilizer/thinning treatment, also at Goose River, on black spruce growth.
3. Reports containing economic feasibility evaluations of the forest drainage, ditch mounding and the fertilizer/thinning treatments.

4. A set of recommendations and environmental guidelines for operational forest drainage.
5. Other published scientific and technical reports.

iii) Significant Linkages:

Land Use Br., Forest Measurements Br. and Reforestation Br., Alberta Forest Service, Edmonton.

Department of Forest Science and Department of Soil Science, University of Alberta

13. Progress and Achievements

In 1985, under the Canadian-Alberta Forest Resource Development Agreement, three forested wetland areas were selected as experimental sites: Goose River (treed swamp, 320 ha), McLennan (treed fen, 259 ha), and Wolf Creek (treed fen, 132 ha). Ditching was completed on the Goose River site (135 ha ditched) in September, 1986; on McLennan (90 ha) in July, 1987; and on Wolf Creek (60 ha) in October, 1987. Instrumentation was established on test areas for each site where ditches were spaced 30, 40, 50 and 60 m apart (60 m at McLennan only).

A minimum of one summer's and a maximum of two summers' pre-treatment data were collected from the sites. Collection of post-treatment groundwater table, ground temperature, and stream water quality data was terminated in the fall of 1991. Wolf Creek has both the longest pre-treatment and post-treatment recording periods - for 2 and 4 years, respectively. Analyses on the effects of drainage on groundwater table levels and stream water quality (Objective 2) were completed and the results presented at symposia in Edmonton, Joensuu (Finland), Regina and Quebec City, and in a FRDA report. Other papers are being prepared.

136 tree growth and 150 ground vegetation permanent sample plots were established on the three drainage sites. The first remeasurement of tree growth plots, at Goose River, was completed in the fall of 1991. An estimate of the change in tree growth rates that can be expected as a result of lowering water tables (Objective 1) was obtained by analyzing data from an Alberta Forest Service drainage trial initiated in 1975 near Fort McMurray. The results were published in a Forest Management Note.

Forestry Canada and the Alberta Forest Service (AFS) cooperated closely on all aspects of the study. On the Goose River site, the AFS established fertilizer-thinning studies and implemented ditch mounding trials to enhance tree growth and planted tree seedling survival, respectively. The fertilizer/thinning plots were remeasured for the first time in the fall, 1992 (6 years after drainage). By the fall of 1992, the tree seedlings on the ditch-mounded area had been measured 3 times (in 1989, 1990 and 1992) since establishment in 1988.

Wolf Creek and Goose River have also served as study areas for students and faculty of the University of Alberta. A number of journal articles related to this work (drainage, fertility, peat water content, and tree growth) have been published or are being prepared.

A report on the economic feasibility of forest drainage in Alberta was completed.

Future work on this study will be concentrated in two main areas: (1) remeasuring permanent sample plots to determine how drainage has affected tree growth and ground vegetation composition; (2) technology transfer (reports, posters, workshops and seminars).

14. Goals and Accomplishments (1992-93)

1. *Select, instrument and monitor three forested peatland basins to determine the effects of drainage on streamflows and stream water quality (Hillman, Johnson and Robson; dependent on funding under Canada-Alberta PAIF).*
2. *Select and plan drainage or other treatments for highly productive but wet mineral sites that have been cutover and consequently are difficult to reforest (Hillman, Robson; dependent on funding under Canada-Alberta PAIF).*

Because the Canada-Alberta PAIF will operate for a three-year period only, and this is insufficient time to set up the two studies (Goals 1 and 2) and produce some useful results, these studies (goals) were deleted from the proposal submitted for Alberta PAIF funding. Consequently, no attempt was made to meet these goals.

3. *To publish in Can. J. For. Res. a paper entitled Some hydrological effects of peatland drainage in Alberta's boreal forest (Hillman).*

The paper was published in the November, 1992 issue of the Can. J. For. Res.

4. *To co-author a paper entitled Foliar response of tamarack and black spruce to drainage and fertilization on minerotrophic sites for publication in the Can. J. For. Res. (Hillman, in cooperation with A.G. Mugasha and D.J. Pluth, Soil Science Dept., Univ. Alberta)*

The paper will be published in the February, 1993 issue of the Can. J. For. Res.

5. *To co-author a paper entitled Peat moisture content on drained and undrained peatlands in central and northern Alberta (Hillman, in cooperation with U. Silins and R.L. Rothwell, Forest Science Dept., Univ. Alberta).*

A first draft of the manuscript has been completed and is being subjected to peer review.

6. *To complete report on the Wolf Creek forest drainage study (Hillman).*

The report is about 50% complete.

7. *To make a poster presentation on the hydrological effects of peatland drainage in Alberta, to the 9th International Peat Congress in Uppsala, Sweden, June 22-27, 1992 (Hillman).*

Approval to attend the Congress was not granted, therefore no presentation was made.

8. *Continue economic feasibility analysis of forest drainage in Alberta by determining the minimum increase in forest growth that must be realized to offset the costs of forest drainage (White, Hillman).*

Work towards this goal culminated in a paper by M. Pattison and W.A. White entitled Economic evaluation of peatland drainage, and proposed for publication in the Western Journal of Applied Forestry.

9. *Provide scientific and technical advice on forest drainage projects and problems (Hillman).*

Scientific and technical advice was provided when requested.

10. *To complete stem analyses on the 87 trees cut at Goose River (Robson, Hillman).*

The stem analyses were completed.

11. *For Wolf Creek, remeasure tree growth permanent sample plots and carry out stem analyses on destructively sampled trees (Johnson, Robson, Hillman).*

In discussions with the Alberta Forest Service, it was suggested that the remeasurement of Wolf Creek tree growth permanent sample plots be postponed and remeasurement of the fertilizer/thinning plots and ditch-mounded plots at Goose River be undertaken instead (see added goal #13). Therefore goal #11 was not attempted. (C/A PAIF Project 8012).

12. *Remeasure ground vegetation composition permanent sample plots at Wolf Creek (Johnson, Robson).*

The 48 ground vegetation composition psp's at Wolf Creek were remeasured in July, 1992. (C/A PAIF Project 8012).

13. *On the fertilizer/thinning and ditch-mounded permanent sample plots at Goose River, remeasure trees and tree seedlings, respectively. (Hillman, Robson) (C/A PAIF Project 8012).*

At Goose River, 64 fertilizer/thinning plots and 48 ditched-mounded plots were remeasured.

15. Information Activities

i) Journal Publications

Hillman, G.R. 1992. Some hydrological effects of peatland drainage in Alberta's boreal forest. *Can. J. For. Res.* 22:1588-1596.

Mugasha, A.G., Pluth D.J. and Hillman, G.R. 1993. Foliar response of tamarack and black spruce to drainage and fertilization on minerotrophic sites. *Can. J. For. Res.* 23:166-180.

iv) Lectures, courses, seminars and scientific addresses

Invited to present a seminar as part of the Department of Soil Science Seminar Series, Univ. Alberta. Presented a seminar entitled Some hydrological effects of peatland drainage in Alberta's boreal forest to soil scientists and students at Univ. Alberta, October 8, 1992.

16. Goals 1993-94

1. To co-author a paper entitled Peat moisture content on drained and undrained peatlands in central and northern Alberta (Hillman, in cooperation with U. Silins and R.L. Rothwell, Forest Science Dept., Univ. Alberta).
2. To complete report on the Wolf Creek forest drainage study (Hillman).
3. For Wolf Creek, remeasure tree growth permanent sample plots and carry out stem analyses on destructively sampled trees (Johnson, Robson, Hillman)
4. Remeasure ground vegetation composition permanent sample plots at McLennan (Johnson, Robson).
5. To complete data entry and analysis of variance for the tree measurements obtained from the fertilizer/ thinning study at Goose River (Hillman, Robson).
6. To complete data entry and analysis of variance for the tree seedling measurements obtained from the ditch-mounding study at Goose River (Hillman, Robson).

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name
Alberta Forest Service		Program Manager Section head Forester	Sam Takyi Dave Morgan Dave Pattison

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

The NoFC Environmental Screening Committee has evaluated the proposed study activities. On the basis of information provided by the study leader, the committee concluded that the potential adverse environmental effects that may be caused by the project are mitigable with known technology. The project is proceeding with mitigation. The three experimental areas are located at Goose River (treed swamp, 320 ha; Sec 14, Twp 68, Rge 19, W5M), McLennan (treed fen, 259 ha; Sec 28, Twp 79, Rge 19, W5M), and Wolf Creek (treed fen, 132 ha; Sec 19, Twp 51, Rge 14, W5M). Ditching was completed on the Goose River site (135 ha ditched) in September, 1986; on McLennan (90 ha) in July, 1987; and on Wolf Creek (60 ha) in October, 1987.

ii) FC-NWR EARP Committee Approval Date:

**PROJECT SUMMARY
1992-93**

A. GENERAL INFORMATION:

1. Title: Tree Plan Canada
2. Responsibility Centre: Northwest Region (8151)
3. Activity: 3314, 3121
4. Program: Regional Development
5. Status: Continuing
6. Last Evaluation: January 31, 1992
7. Next Evaluation:

B. KEYWORDS:

021 Sustainable Development
 024 Reforestation
 062 Aboriginal lands
 100 Green Plan
 237 Urban Forestry
 313 Plantation
 314 Shelter belts
 318 Planting
 709 Technology Transfer

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	0.00	0.00	0.00	0.00	0.00
Salaries	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
O & M	\$0.0	\$0.0	\$352.3	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$0.0	\$0.0	\$352.3	\$0.0	\$0.0

D. PROJECT DESCRIPTION:

Tree Plan Canada is a community tree planting program initiative under the Green Plan to have Canadians become involved in urban and rural community tree planting projects to improve the environment and beautify communities and rural landscapes.

1. Environmental Assessment Review Process

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan. A national EARP document is being prepared by Headquarters.

2. Collaborators/Green Plan Resource Summary

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary					
Secondary					
Total					
Green Plan		401.12			

3. Collaborators

Secondary

- Alberta Department of Lands, Forestry and Wildlife
- Saskatchewan Department of Parks and Renewable Resources
- Manitoba Department of Natural Resources
- Northwest Territories Department of Renewable Resources
- Municipalities
- Indian Reserves
- Non-government organizations - (including environmental groups, service clubs, community organizations, schools, etc.)
- Forestry Industry

4. Green Plan

Tree Plan Canada is an initiative under the global warming component of the Green Plan.

5. Milestones

1993-94:

1. Manage and co-ordinate the development and implementation of Tree Plan Canada in the Northwest Region.

6. Accomplishments

1. Preliminary work to develop a program framework for the regional Tree Plan Canada activities was done. Arrangements were made for a modest initiation of the program for the 1992 planting season. Subsequent activities resulted in significant development of partnerships during 1992-93 about 100 projects totalling 2.5 million trees for planting during the 1993 season were developed.

7. Link to Strategic Plan

1. National:

Direct linkages in providing leadership to the forest sector and the general public.

2. Regional:

NOR-22 is linked to resolving regional issues in economic forest use and regional development, federal and private lands and research, development and innovation.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 8, 1993

1. **STUDY TITLE:** Tree Plan Canada, Northwest Region
2. **Responsibility Centre:** Northwest Region (8151)
3. **Program:** Regional Development
4. **Project Title:** Tree Plan Canada
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	J. De Franceschi
Team Members	M. Depper
	R. Holehouse
	L. Worster
	D. Pronger
	H. Stewart
	A. Nanka

8. **Study Key Words:** Green Plan, tree planting, urban forestry, NGO's
9. **Study Activity:** 3314, 3121

10. Study Resources:Personnel Information

	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
Employee Name						
J. De Franceschi	CO-02 (P)					
M. Depper	FO-02 (P)					
R. Holehouse	IS-03					
L. Worster	IS-03					
D. Pronger	IS-03					
H. Stewart	GT-04 (T)					
A. Nanka	EG-06 (T)					
FTEs						

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	
O&M					
Capital	0.00	12.80			
G & C					
TOTAL:		12.80			

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>					
Salaries	0.00	0.00	0.00	0.00	
O&M					
Capital					
G & C: Man.	M5020	29.90			
TOTAL:		29.90			

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>					
Salaries	0.00	0.00	0.00	0.00	
O&M: 36-87 22-81	348.06	322.14			
Capital: 36-87	39.57				
G & C					
TOTAL:					
STUDY TOTAL		364.84			

11. Study Background and Problem Analysis

The Government of Canada has embarked on a major environmental initiative with its announcement of the Green Plan. Within the global warming component of the Green Plan, the Government has established Tree Plan Canada, a community tree planting program. This program is aimed at encouraging Canadians to become involved with their communities, both urban and rural in tree planting projects. The intent of the program is to contribute to reductions in atmospheric carbon dioxide, and beautify rural and urban communities and landscapes by planting trees. The program is not intended to reforest areas which fall within existing programs, nor is it the intent to plant trees for fibre production or for profit.

Numerous government and non-government groups are already active in tree planting programs. Some of these groups are well established and have been involved with tree planting projects for many years. Other groups, however, are relatively new at tree planting and are unorganized or lack technical expertise to plant and maintain tree seedlings or saplings. In addition, the growing awareness and general interest in environmental issues has generated considerable interest by the general public in activities related to tree planting. Consequently, many new groups with limited technical abilities but with tree planting objectives are being formed.

Forestry Canada can not only be the catalyst for increasing tree planting activities in the Northwest region, but can also assist to facilitate and coordinate the wide range of planting programs in existence or being developed across the region. Tree Plan Canada, therefore, can significantly contribute towards the Government of Canada's goal of improving the environment through increased tree planting.

12. Study Objectives:

i) Objectives

To manage and coordinate the development and implementation of the Tree Plan Canada program in the Northwest region. The objectives of the program are:

- (a) to provide leadership and action in building the conservation ethic in Canada through cooperative public and private partnerships and volunteer approaches to tree planting and forest conservation;
- (b) to produce environmental and economic benefits;
- (c) to improve the awareness of Canadians about forests and forest management;
- (d) to offset CO₂ emission increases;
- (e) to demonstrate Canada's commitment to world wide sustainable forest management and reduction of atmospheric carbon dioxide; and
- (f) to contribute to the beautification of Canada.

ii) Deliverables

Short Term (1-5 years)

Tree Plan Canada is a new program for Forestry Canada and for the Northwest region. During 1991-92, the first year, the program was established in the region and promoted among numerous groups and agencies, some of which were already established in tree planting programs. A particular challenge is to develop partnerships with agencies currently involved with tree planting programs.

One of the intents of the program is to educate the public on the benefits of trees as well as on tree planting and tree maintenance techniques, and to promote the volunteer aspects of the program. This will be accomplished in part by delivering a series of workshops aimed at volunteers and/or partners in the program. The workshops will focus on Tree Plan Canada objectives, and the technical aspects of tree planting and maintenance. At least one workshop will be delivered annually in each province in the region. This will also be accomplished through development of public information materials.

The development of partnerships is a key item to be delivered. Partnerships will be established with government as well as non-government organizations. A wide range of partners will, therefore, be pursued including urban and rural municipalities, provincial, territorial, and federal government departments, industry, conservation groups, community organizations, schools and even individuals.

These deliverables will be pursued on an annual basis throughout the duration of the program.

Long Term (5 years and beyond)

Contribute to the Northwest Region's share of the 325 million trees to be planted nationally as a result of the program. A cost-effective monitoring system will be developed to determine seedling/tree survival rates.

iii) Significant Linkages:

The successful delivery of this program is highly dependent on the development of strong linkages with a number of agencies as well as within Forestry Canada's existing programs. Linkages are or will be developed with Provincial governments as a supplier of planting stock as well as a partner, TREEmendous Saskatchewan (Saskatchewan's non-commercial tree planting program), numerous national non-government organizations (e.g., National Ukrainian Group, National Mennonites Organization, Boy Scouts, and others), other federal departments (Agriculture Canada, PFRA, Corrections Canada, Parks Canada, and others), Aboriginal groups, and others. Within Forestry Canada, linkages exist with the communications program both regionally and nationally, the Northwest Region's Technology Development Unit, and the Partnership Agreements in Forestry including the Canada-Manitoba, Canada-Saskatchewan and Canada-Alberta Partnership Agreements. Since Tree Plan Canada is a national program, strong linkages have been developed with other regions as well as with headquarters and the departmentally created non-profit National Community Tree Foundation.

13. Progress and Achievements

The program was announced in the spring of 1992. Program development started in the fall of 1991. Activities for 1991-92, therefore, focused on developing a framework for program delivery as well as develop some projects for the spring of 1992. During this time, a data base on private nurseries was developed to assist with procurement of planting stock for coming years.

14. Goals and Accomplishments (1992-93)

1. *Manage and coordinate the development and implementation of the Tree Plan Canada Program for the Northwest Region.*

The program was developed and successfully established in the region.

2. *Promote the program to perspective program participants. Develop partnerships with various agencies interested in tree planting programs and assist them with their program developments under TPC.*

Partnerships were established with municipal, provincial and territorial governments, industry, and a wide range on non-government organizations. Numerous groups/associations/organizations were canvassed for their participation in the program. Assistance was provided to several partners to establish their projects (e.g., planting stock was provided or arranged for, help was given with public announcements

and/or event development). Booths at various exhibitions or fairs were attended to promote the program. TREEmendous, Saskatchewan's provincial tree planting organization was hired to act as the program's agent in that province. In Manitoba, Alberta and the NWT, private consultants were retained to assist with project development. A technical workshop was held in Brandon, Manitoba to provide both program partners as well as technical volunteers with details on the program and on planting and maintaining seedlings and saplings. Approximately 100 people attended. Additional workshops are in the planning stages and will be delivered before March 31, 1993.

3. *Implement community tree planting projects across the region including the development of official launches in accordance with departmental strategies.*

More than 100 partnerships were developed in the region. These partnerships have resulted in more than 2 million trees either planted in the current year or approved for funding for spring planting (1993). A regional program launch was held in Winnipeg and provincial launches were held in Prince Albert, Saskatchewan, Slave Lake, Alberta, and Yellowknife in the NWT. Launches were conducted in cooperation with communications staff at the regional and district offices. The attached tables provide an indication of the types of projects which have been developed.

4. *Develop public information materials to promote the objectives of TPC in conjunction with NOR 33 - Communications.*

A tree poster illustrating trees of the region and their growing requirements was developed for distribution to program partners and at special events. A booklet on how to plant trees, and a brochure promoting the program was also completed. Biodegradable plastic bags were produced for seedlings given away at public events. Numerous advertisements were placed to both promote the program or a specific event, as well as encourage participation in the volunteer technical network. These advertisements appeared in various newsletters and rural newspapers. An article on the benefits of trees was prepared and distributed to weekly newspapers across the region. Three portable table top displays were produced for use by Forestry Canada staff and program contractors at various events.

5. *Coordinate regional liaison with headquarters and the Northwest region's District offices on TPC related activities.*

All communications with HQ and with the National Community Tree Foundation were funnelled through the Regional office in Edmonton. Periodic visits were made to District offices to both update District staff as well as keep provincial officials current on the program's progress. Consultants working on behalf of the program are required in their contract to maintain close liaison with both the Regional Coordinator in Edmonton as well as the appropriate District Manager. All enquiries from HQ were addressed from the Edmonton office. The program's first annual report for the region has been requested by HQ and is in preparation.

6. *Solicit partners and sponsors and procure planting stock supplies for ongoing activities of the program.*

As indicated in Goal/Accomplishment 3, more than 100 projects were developed. Partnerships are in various stages of development with such agencies as the Prairie Farm Rehabilitation Administration (PFRA) in Saskatchewan and Manitoba, and provincial forestry and agriculture departments in Alberta. Relationships have been developed with government and private nurseries to ensure adequate supplies of planting stock. Greenhouse #1 at NoFC has been renovated to permit rearing of additional supplies of seedlings. The nursery areas at NoFC are being developed to grow larger trees for the program as well as provide a demonstration of trees native to the region (a mini arboretum) to the general public. The TDU has provided, and will continue to provide, technical advice and assistance with management of the greenhouse and nursery area.

15. Information Activities

Not applicable

16. Goals 1993-94

1. Manage and coordinate the development and implementation of the program for the Northwest Region and coordinate regional liaison with HQ or the National Community Tree Foundation.
2. Approvals have been received this year (1992-93) for planting projects for spring 1993 for more than 2 million trees. These projects (60-70) will be monitored for adherence to program criteria and funding agreements.
3. Promote the program throughout the region by attending and displaying information materials at public events, addressing interested groups/organizations on participation in the program, publish a regional newsletter and maintaining contacts with program participants.
4. Develop projects for fall (1993) and spring (1994) planting. These projects are expected to total more than 2 million trees with about \$1 million in contributions from the National Community Tree Foundation.
5. Develop a database and maintain a management information and a geographic information system capable of quickly responding to information requests from management.
6. Develop and deliver a communications plan for the region in cooperation with communications staff at the regional and district offices. The plan will reflect the needs of each district in the region.
7. Coordinate involvement in the planning and development of major events related to National Forest Week for 1993 and 1994.

17. Major Co-operators:

- i) Internal - FC

Not applicable

- ii) External -

Establishment	ID#	Title	Contact name
Parks Canada			
TREEmendous Saskatchewan			
National Community Tree Foundation			
Agriculture Canada (PFRA)			

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan. A national EARP document is being prepared by Headquarters.

- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Model Forests
2. Responsibility Centre: Northwest Region (8111)
3. Activity: 2313, 2315
4. Program: Forest Resources
5. Status: New
6. Last Evaluation: N/A
7. Next Evaluation: 1996

B. KEYWORDS:

009 - Communications
 020 - Ecology/ecosystems
 021 - Sustainable development
 025 - Forest Productivity
 028 - Forest fire
 029 - Pest management
 032 - Harvesting/engineering
 100 - Green Plan
 330 - Models
 341 - Management Services

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	0.00	0.00	0.00	0.00	0.00
Salaries	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
O & M	\$0.0	\$0.0	\$64.0	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$2,390.3	\$0.0	\$0.0
Total	\$0.0	\$0.0	\$2,454.3	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS:

On June 25, 1992, Forestry Canada announced the selection of 10 Model Forests across Canada, representative of 6 of the country's major forest regions. This network of forests comprises the core of the federal government's \$100 million sustainable forestry initiative Partners in Sustainable Development of Forests, part of the government's environmental action plan, the Green Plan.

There are three such Model Forests in Northwest Region; Foothills Forest in west-central Alberta, Prince Albert Model Forest in north-central Saskatchewan and Manitou Abi Model Forest in eastern Manitoba. Although management and administration of these three non-profit Model Forest corporations will be the responsibility of the individual Forests, through formal agreements with Forestry Canada, Northwest Region will be responsible for overall coordination activities. This will involve program assessment and approval, project monitoring, communications activities, coordination of research and development activities, environmental assessment, and financial and administration responsibilities as defined in the formal agreements.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan. Each activity planned in accordance with specific Model Forest annual work plans will be assessed independently for potential environmental implications.

2. Collaborators/Green Plan Resource Summary (\$s & PYs):

Incremental and in-kind funding attributed to each Model Forest by sponsors and partners is reported one year in arrears with submission of an annual report due by the end of June for the previous fiscal year.

3. Collaborators:

Primary

Regional Model Forest sponsors and partners that comprise Foothills Prince Albert, and Manitou Abi Model Forests across Northwest Region.

Secondary

A range of human and financial resources from Northwest Region A-base and PAIF programs will mesh closely with the Model Forests Project and individual Model Forests activities as well as research and development initiatives.

4. Green Plan:

This is a Green Plan initiative under the Partners in Sustainable Development of Forests Program.

5. Milestones:

Short Term (1-5 years)

The terms and conditions of the formal agreements between Forestry Canada and the three Model Forests will be implemented by both parties.

Integration, where appropriate, of regional research and development activities into Model Forest initiatives will be promoted, monitored, and accounted for by tracking in-kind and incremental funding provided by Forestry Canada.

Communications and promotional activities in support of enhanced recognition of Forestry Canada's role in the Model Forest program and achievements will be undertaken.

Information sharing among regional Model Forests will be encouraged and linkages to the national Model Forest Network will be maintained and enhanced. International linkages will be established as appropriate.

Long Term (5 years and beyond)

In-kind contributions to Model Forest initiatives and the continuing commitment of sponsors and partners to the program will be monitored and encouraged. Extensions of the Model Forest concept and achievements beyond the original 5-year life of the program will be promoted.

6. Accomplishments:

Since this study was initiated in the fall of 1992, achievements to date have been limited. During the fall and winter months of 1992/93, three formal agreements were negotiated and signed with the Foothills, Prince Albert and Manitou Abi Model Forests. Formal announcement of all three Model Forests has been accomplished. Financial and administrative procedures have been implemented to provide contribution funding to the Model Forest organizations. An informational slide presentation on the Northwest Region Model Forest program has been developed under contract. Organizational meetings have been attended at each Model Forest site. Science and technology linkages for the 1993/94 program year have been established between Forestry Canada and the Model Forests 1993-94, work plans and environmental reviews have been completed for the three (3) regional Model Forests.

7. Link to Strategic Plan:

National:

This Project is part of a national Forestry Canada Green Plan program.

Regional/Institute:

There will be strong linkages established, through this Project, among the three (3) Model Forests in Northwest Region, primarily through enhanced science and technology,

technology transfer, and communications efforts. Linkages between these three (3) Model Forests and the national Model Forest Network will be monitored. Linkages between the Model Forest program and other Green Plan (intra and inter-departmental) programs as well as federal-provincial Partnership Agreements will be established and tracked. International opportunities to link up with Model Forest activities will be evaluated and implemented wherever possible.

8. Establishment/Institute Specific Information:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 19, 1993

1. **STUDY TITLE:** Coordination and Administration of Regional Model Forest Program
2. **Responsibility Centre:** Northwest Region (8111)
3. **Program:** Forest Resources
4. **Project Title:** Model Forests
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Project Leader	R. Newstead
Team Members	R. Holehouse
Dist. Manager-Sask.	
Dist. Manager-Man.	
Prog. Dir.-Resources	
Total	

8. **Study Key Words:** Sustainable development, integrated resource management, sponsors, partners, cooperators
9. **Study Activity:** 2315, 2313

10. Study Resources:

Personnel Information

		1992-93	Fiscal Year 1993-94			1994-95
Employee Name	Category	Previous	Budget	Revised	Forecast	Upcoming
R. Newstead						
R. Holehouse						
FTEs						

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries					
O&M					
Capital					
G & C					
TOTAL:					

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries		0.00	0.00	0.00		
O&M	26-81 26-82 26-83		54.91			
Capital						
G & C	26-81 26-82 26-83		2253.30			
TOTAL:			2308.21			

STUDY TOTAL			2308.21			
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11. Study Background and Problem Analysis

On June 25, 1992, Forestry Canada announced the selection of 10 Model Forests across Canada, representative of 6 of the country's major forest regions. This network of forests comprises the core of the federal government's \$100 million sustainable forestry initiative Partners in Sustainable Development of Forests, part of the government's environmental action plan, the Green Plan.

There are three such Model Forests in Northwest Region; Foothills Forest in west-central Alberta, Prince Albert Model Forest in north-central Saskatchewan and Manitou Abi Model Forest in eastern Manitoba. Although management and administration of these three non-profit Model Forest corporations will be the responsibility of the individual Forests through formal agreements with Forestry Canada, Northwest Region will be responsible for overall coordination activities. This will involve program assessment and approval, project monitoring, communications activities, coordination of research and development activities, environmental assessment, and financial and administration responsibilities as defined in the formal agreements.

12. Study Objectives:

i) Objectives

The objectives of this study will be (a) to effectively coordinate the implementation of the formal agreements between Forestry Canada and each of 3 Model Forests within Northwest Region; (b) to build on the strengths and accomplishments of these forests in the promotion of the program and Forestry Canada's role in it, regionally, nationally, and internationally; and (c) coordinate and monitor Forestry Canada regional research and development opportunities and activities in regional Model Forest programs.

ii) Deliverables

Short Term (1-5 years)

The terms and conditions of the formal agreements between Forestry Canada and the three Model Forests will be implemented by both parties.

Integration, where appropriate, of regional research and development activities into Model Forest initiatives will be promoted, monitored, and accounted for.

Communications and promotional activities in support of enhanced recognition of Forestry Canada's role in the Model Forest program and achievements will be undertaken.

Information sharing among regional Model Forests will be encouraged and linkages to the national Model Forest Network will be maintained and enhanced. International linkages will be established as appropriate.

Long Term (5 years and beyond)

In-kind contributions to Model Forest initiatives and the continuing commitment of sponsors and partners to the program will be monitored and encouraged. Extensions of the Model Forest concept and achievements beyond the original 5-year life of the program will be promoted.

iii) **Significant Linkages:**

There will be strong linkages established, through this study, among the three Model Forests in Northwest Region, primarily through enhanced science and technology, technology transfer, and communications efforts. Linkages between these 3 Model Forests and the national Model Forest Network will be monitored. Linkages between the Model Forest program and other Green Plan (intra and inter-departmental) programs as well as federal-provincial Partnership Agreements will be established and tracked. International opportunities to link up with Model Forest activities will be evaluated and implemented wherever possible.

13. Progress and Achievements

Since this study was only initiated in the fall of 1992 achievements to date have been limited. During the fall and winter months of 1992/93, three formal agreements were negotiated and signed with the Foothills, Prince Albert and Manitoba Abi Model Forests. Formal announcement ceremonies were organized in each instance but not convened owing to an array of constraints. Financial and administrative procedures have been implemented to provide contribution funding to the Model Forest organizations. An informational slide presentation on the Northwest Region Model Forest program has been developed under contract. Organizational meetings have been attended at each Model Forest site. Science and technology linkages for the 93/94 program year have been established between Forestry Canada and the Model Forests.

14. Goals and Accomplishments (1992-93)

1. *Finalize formal agreements with all three regional Model Forests and sign same.*

Formal agreements were negotiated with each of the regional and signed at intervals during December 1992 and January 1993. Announcement ceremonies are pending.

2. *Develop a Model Forest presentation package including text and slides/overheads.*

Under contract, a comprehensive regional Model Forest presentation has been developed for distribution to District Offices and the three Model Forests in Northwest Region.

3. *Coordinate announcement, review, and submission of regional Forestry Canada research and development proposals to Foothills Forest; and, as appropriate, work with District Managers in a similar manner to generate R&D opportunities for Forestry Canada research personnel at Prince Albert and Manitou Abi Model Forests.*

Encouraged and coordinated input from regional science and technology personnel to all three Model Forests in Northwest Region with emphasis on Foothills Forest and through District Office cooperation, Prince Albert and Manitou Abi Model Forests.

15. Information Activities

i) Journal Publications: N/A

ii) Information Reports: N/A

iii) Other reports:

Formal agreements have been negotiated and signed with 3 Model Forests in Northwest Region.

iv) Lectures, courses, seminars and scientific addresses

Produced 20-30 minute slide presentation on Model forest program and initiatives in Northwest Regions.

v) Technology transfer: N/A

16. Goals 1993-94

1. Implement computer assisted tracking and reporting procedures to monitor Forestry Canada research and development activities underway in the three regional Model Forests.
2. Review and approve or solicit modifications to the 1993-94 Annual Work Plan for each regional Model Forest.
3. In conjunction with all three Model Forests develop an agreed-upon Evaluation Framework. These will be completed by July 31, 1993.
4. Monitor implementation of Model Forest activities throughout Northwest Region to identify and promote technology transfer and/or communications opportunities of benefit to Forestry Canada.
5. Attend and participate, as appropriate, in scheduled Project Steering Committee, Partner's Advisory, and Board of Directors meetings of all three regional Model Forests. Attend national Model Forest Network committee meetings as scheduled.
6. Develop and implement, as appropriate, financial and administrative control procedures as they apply to management of the Model Forest program in Northwest Region.
7. In conjunction with the Regional Communications Manager, Green Plan Communications Officer, and the individual Model Forest communications personnel, develop and implement communications activities that will result in due credit to Forestry Canada's role in the Model Forest initiatives.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
HQ, S&S.D.		M.F. Coordinator	J. Hall

ii) External -

Establishment	ID#	Title	Contact name
Foothills Forest			
Prince Albert Model Forest			
Manitou Abi Model Forest			
Saskatchewan and Manitoba District Offices			
Model Forest Network Committee			
Technology Development Unit			
Communications Project			
Regional Research and Development Programs			
Federal-Provincial Partnership Agreements, Northwest Region			

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

Each activity planned in accordance with specific Model Forest annual work plans will be assessed independently for potential environmental implications.

ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Publications & Distribution
2. Responsibility Centre: Northwest Region (8111)
3. Activity: 2251
4. Program: Regional Director General - Northwest
5. Status: Continuing
6. Last Evaluation: January 19, 1993
7. Next Evaluation:

B. KEYWORDS:

009 Communications
 039 Scientific & technical
 054 Public Information/Awareness
 100 Green Plan
 108 Project Leader
 601 Scientific & technical editing
 605 Publications
 709 Technology Transfer

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	0.00	0.00	3.00	0.00	0.00
Salaries	\$0.0	\$0.0	\$114.2	\$0.0	\$0.0
O & M	\$0.0	\$0.0	\$88.7	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$0.0	\$0.0	\$202.9	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS:

To ensure that regional clients (government and industry forest resource managers, other federal departments and the scientific and academic communities) are adequately informed of the results of scientific and technical achievements, it is necessary to continue to provide graphics, editorial, publishing, and distribution services to regional research and development personnel.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary (\$s & PYs):

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary					
Secondary					
Total					
Green Plan					

3. Collaborators:

Primary

University of Alberta	Dr. J. Spence
University of Alberta	Dr. B.P. Dancik
Northern Alberta Institute of Technology	A. J. Pollock
Alberta Forest Lands and Wildlife	H. Archibald
Weldwood	D.W. Laishley
Forest Technology School	H. Anderson
Provincial Parks Service	B.M. Duffin
Alberta Environment Center	Dr. D. McNabb
Blue Ridge Lumber	M. Summers
Weyerhaeuser	B. Macmillan
Procter & Gamble	P. Wearmouth
British Columbia Ministry of Forest	R. Kabzems
Zeidler Forest Products	T. Kristoff

Secondary

Headquarters	J. Tomlinson
Laurentian Forestry Centre	B. Arsenault

4. Green Plan:

N/A

5. Milestones:

1993-94:

1. Assist the research staff through the provision of editing and publishing services, in the preparation and publication of approximately:

- a) 7 Information Reports
- b) 5 Forest Management Notes
- c) 10 Forestry Leaflets
- d) 20 Journal articles and miscellaneous publications
- e) 20 Conference proceedings
- f) 1 Fact Sheet on regional issue. (English and French)
- g) 1 Fire poster (French and English)

Provide editorial, typographic, and printing assistance for public information activities.

Oversee production and printing or reprinting of locally published scientific and technical information.

2. Continue responsibility for the distribution of scientific and technical publications by maintaining a mailing list, responding to requests for scientific and technical information, and carrying out the necessary correspondence.
3. Maintain previously organized and catalogued inventory of all of NoFC publication stored materials (i.e., negatives for all Information Reports, Forest Management Notes, and miscellaneous publications, etc.).
4. Supervise indeterminate and term employees. Provide leadership, coordination, work assignment, priority assessment, and training.
5. Present in-house workshops for scientific staff on common problems with word usage and references.
6. Assess the potential and feasibility of alternate publication and information dissemination mechanisms, including priced publications options re: alternative printed hard copies, electronic transmission, field guides, etc. in the Northwest Region.

6. Accomplishments:

1. Assisted the research staff, through the provision of editing and publishing services, in the preparation and publication of:

- a) 6 Information Reports - plus: 1 Inf. Rep. (In press)
2 Information Reports with author for revision and approval
1 Information Report with translation services
1 Information Report with editor

Due to financial constraints, these manuscripts will be published 1 April, 1993.

- b) 1 Forest Management Note
plus:
1 Forest Management Note with author for revision and approval
2 Forest Management Notes have been edited and are with author for revision and approval; they will be published pending acceptance of journal articles on the same topic.
1 Forest Management Note has not changed status since last year.
- c) 9 Forestry Leaflets (English and French)
- d) 16 Journal articles and miscellaneous publications
- e) 1 Special Report
- f) 6 Conference proceedings

Provided editorial, typographical, and printing assistance for public information. Oversaw production and printing or reprinting of locally published scientific and technical information.

This project has been environmentally responsible by selecting Canadian recycled paper, monitoring audience demand and ordering appropriate print runs, etc.

Corrected and reprinted: NOR-X-314 and "Field guide to forest ecosystems of west-central Alberta" (in press).

- 2. Continued to distribute scientific and technical publications, respond to requests for scientific and technical information, maintain a mailing list, and carry out the necessary correspondence. D. Leroy will take the WordPerfect course when it is offered.
 - 3. Compiled an updated bibliography for 1991-92 and 1992-93 as a supplement to NOR-X-321. (will be printed 1 April, 1993)
 - 4. Supervised indeterminate and term employees. Provided leadership, coordination, work assignment, and training.
 - 5. Completed inventory, organized and catalogued all publications and related stored materials.
7. Link to Strategic Plan:

National:

Scientific and Technical Publications and Distribution are fundamental to the achievement of Forestry Canada's strategic plan. The publications staff aids in the

identification of appropriate avenues for publication of materials, assists the research staff, through the provision of editing and publications as well as assistance with manuscript submissions to journals.

Regional/Institute:

Provided regional district staff with editorial assistance, publications related contract details and occasionally assisted with public information activities.

8. Establishment/Institute Specific Information:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 19, 1993

1. **STUDY TITLE:** Publications
2. Responsibility Centre: Northwest Region (8111)
3. Program: Regional Director-General
4. Project Title: Scientific and Technical Editing and Publishing
5. Office Location(s): Edmonton, Alberta
6. Work Location: Northwest Region
7. Study Staff:

	Name
Study Leader	B. Laishley
Team Members	M. Mason
	E. Schiewe
	D. Leroy
	D. Lee

8. Study Key Words: Scientific and technical editing, publishing, printing, information reports, journal articles, communications, technology transfer, distribution.
9. Study Activity: 2251

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
B. Laishley	IS-4 (A)	0.00	0.00	1.00		
M. Mason	IS-3 (A)	0.00	0.00	1.00		
E. Schiewe	ST-OCE-3 (S)	0.00	0.00	1.00		
D. Leroy	CR-03 (S)	0.00	0.00	0.00		
FTEs		0.00	0.00	3.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M		88.70			
Capital					
G & C					
TOTAL:		88.70			

STUDY TOTAL		88.70			
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11. Study Background and Problem Analysis

There is a need for the Northern Forestry Centre to ensure that regional clients (forest resource and industrial managers, scientific community and educational community) are adequately informed of the results of research and development programs in a relevant and timely manner and at a reasonable cost.

12. Study Objectives:

i) Objectives:

Edit, publish, and distribute scientific, technical, and other publications of the Northern Forestry Centre and its two district offices. Serve the editing and publishing needs stemming from the scientific and technical initiatives emanating from the Green Plan, and including agreement-funded publications.

ii) Deliverables:

Information Reports, Forest Management Notes, Journal Reprints, Bibliographies, Offerings, Assistance with Proceedings, etc.

Short Term (1-5 years)

Responsible for publishing Information Reports, Forest Management Notes, miscellaneous publications, assisting with journal article submissions, galley proofs, and reprints, client and language surveys, mailing list updates, responding to clients requests, etc.

- review distribution activities, and continue to improve service to clients.
- increase production of monographs, field guides, and manuals as well as maintaining active publishing of Information Reports, Forest Management Notes, etc.
- develop a policy for ethics in scientific and technical publishing
- review and update manuscript review procedure and publications policy
- present in-house workshops for scientific staff on at least two of the following topics: tables & figures, abstracts, parts of the manuscript, common problems to watch for in scientific writing, references.

Long Term (5 years and beyond)

- Assess the potential and feasibility of alternate publication and information dissemination mechanisms, including priced publications options re: alternatives to printed hard copies, electronic transmission, field guides, etc.

iii) Significant Linkages:

Society for Technical Communication
 Council of Biology Editors
 Society for Scholarly Publishing
 Canada Communications Group
 Forestry Canada: Laurentian (translation services)
 Forestry Canada: NCR (translation coordination)

13. Progress and Achievements

Since 1970, 329 Information Reports, 54 Forest Management Notes, 33 Forestry Reports, and 852 journal/symposium articles and miscellaneous publications have been edited and published.

Significant Publications:

Malhotra, S.S.; Blauel, R.A. 1980. Diagnosis of air pollutant and natural stress symptoms on forest vegetation in western Canada. Environ. Can., Can. For. Serv., North For. Res. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-228. (and NOR-X-228F)

- Carlson, L.W. 1983. Guidelines for rearing containerized seedlings in the prairie provinces. Revised. Environ. Can., Can. For. Serv., North. For. Res. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-214E. (and NOR-X-214F)
- Corns, I.G.W.; Annas, R.M. 1986. Field guide to forest ecosystems of west-central Alberta. Can. For. Serv., North. For. Cent., Edmonton, Alberta.
- Hiratsuka, Y. 1987. Forest tree diseases of the prairie provinces. Can. For. Serv., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-286.
- Ives, W.G.H.; Wong, H.R. 1988. Tree and shrub insects of the prairie provinces. Can. For. Serv., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-292.
- Samoil, J.K.; Turtle, G.B. 1988. Northern Forestry Centre publications, 1980-86. Can. For. Serv., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-297.
- Hiratsuka, Y.; Gibbard, D.A.; Bakowsky, O.; Maier, G.B. 1990. Classification and measurement of aspen decay and stain in Alberta. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-314.
- Kalra, Y.P.; Maynard, D.G. 1991. Methods manual for forest soil and plant analysis. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-319. (and NOR-X-319F)
- Leroy, D.A. 1991. Northern Forestry Centre publications, 1987-90. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. NOR-X-321. (and NOR-X-321F)
- Peterson, E.B.; Peterson, N.M. 1992. Ecology, management, and use of aspen and balsam poplar in the prairies provinces, Canada. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Spec. Rep. 1.

Awards:

- Certificate of Excellence at the 1981 Technical Publications and Graphic Arts Competition from the Society for Technical Communication for *Diagnosis of air pollutants and natural stress on forest vegetation in Western Canada*.
- Certificate of Excellence at the 1982 Technical Publications and Graphic Arts Competition from the Society for Technical Communications for *Effects of spacing 7-year-old lodgepole pine in west-central Alberta*.
- Certificate of Excellence at the 1983 Technical Publications and Graphic Arts Competition from the Society for Technical Communications for *Manitoba forestry facts: Forestry Report 87*.
- Distinguished Publication Certificate at the 1984 Technical Publications and Graphic Arts Competition from the Society for Technical Communications for *Fire: Forestry Report 28*.
- Certificate of Excellence at the 1986 Technical Publications and Graphic Arts Competition from the Society for Technical Communications for *Decay of aspen and balsam poplar in Alberta*.

- Certificate of Excellence at the 1986 Technical Publications and Graphic Arts Competition from the Society for Technical Communications for *Northern Forest Research Centre: promotional material*.
- Certificate of Merit at the 1987 National Technical Publications and Competition from the Society for Technical Communications for *Field guide to forest ecosystems of west-central Alberta*.
- Distinguished Publication Certificate at the 1988 National Technical Publications Competition from the Society for Technical Communications for *Forest tree diseases of the prairie provinces*.
- Award of Excellence and Merit at the 1989 Technical Publications and Art Competition from the Society for Technical Communication for *Tree and shrub insects of the prairie provinces*.

14. Goals and Accomplishments (1992-93)

1. *Assist the research staff, through the provision of editing and publishing services, in the preparation and publication of approximately:*

- a) 11 Information Reports
- b) 4 Forest Management Notes
- c) 6 Forestry Leaflets
- d) 20 Journal articles and miscellaneous publications
- e) 1 Special Report
- f) 20 Conference proceedings

Provide editorial, typographical, and printing assistance for public information activities.

Oversee production and printing or reprinting of locally published scientific and technical information.

Assisted the research staff, through the provision of editing and publishing services, in the preparation and publication of:

- a) 6 Information Reports - plus: 1 Inf. Rep. (In press)
2 Inf. Rep. with author for revision and approval
1 Inf. Rep. with translation services
1 Inf. Rep. with editor

Due to financial constraints, these manuscripts will be published 1 April, 1993.

- b) 1 Forest Management Note
plus:
1 For. Manage. Note with author for revision and approval
2 For. Manage. Notes have been edited and are with author for revision and approval; they will be published pending acceptance of journal articles on the same topic.
1 For. Manage. Note has not changed status since last year.
- c) 9 Forestry Leaflets (English and French)

- d) 16 Journal articles and miscellaneous publications
- e) 1 Special Report
- f) 6 Conference proceedings

Provided editorial, typographical, and printing assistance for public information. Oversaw production and printing or reprinting of locally published scientific and technical information.

This project has been environmentally responsible by selecting Canadian recycled paper, monitoring audience demand and ordering appropriate print runs, etc.

Corrected and reprinted: NOR-X-314 and "Field guide to forest ecosystems of west-central Alberta" (in press).

2. *Continue responsibility for the distribution of scientific and technical publications by maintaining a mailing list, responding to requests for scientific and technical information, and carrying out the necessary correspondence. Enroll D. Leroy (Distribution Clerk) in advanced WordPerfect training.*

Continued to distribute scientific and technical publications, respond to requests for scientific and technical information, maintain a mailing list, and carry out the necessary correspondence. D. Leroy will take the WordPerfect course when it is offered.

3. *Maintain an up-to-date list of NoFC publications.*

Compiled an updated bibliography for 1991-92 and 1992-93 as a supplement to NOR-X-321. (will be printed 1 April, 1993)

4. *Supervise indeterminate and term employees. Provide leadership, coordination, work assignment, priority assessment, and training.*

Supervised indeterminate and term employees. Provided leadership, coordination, work assignment, and training.

5. *Complete inventory, organize and catalogue remaining publications and weed collection to alleviate storage space problem.*

Completed inventory, organized and catalogued all publications and related stored materials.

15. Information Activities

- i) Journal Publications

Campbell, I.D. 1992. Formula and nomogram for estimating the number of regularly patterned elements on the surface of a spheroidal microfossil. *Rev. Palaeobot. Palynol.* 72:165-167.

- Campbell, I.D.; McAndrews, J.H. 1992. CANPLOT: a FORTRAN-77 program for plotting stratigraphic data on a postscript device. *Comput. Geosci.* 18(2/3):309-335.
- Catchpole, E.A.; Alexander, M.E.; Gill, A.M. 1992. Elliptical-fire perimeter- and area-intensity distributions. *Can. J. For. Res.* 22(7):968-972.
- Corns, I.G.W. 1992. Forest site classification in Alberta: its evolution and present status. *For. Chron.* 68(1):85-93.
- Feng, J.C. 1992. A microcolumn method for hexazinone and metabolite residues in soil and vegetation. *Can. J. Chem.* 70(4):1087-1092.
- Feng, J.C.; Sidhu, S.S.; Feng, C.C. 1992. Spatial distribution of hexazinone and metabolites in a luvisolic soil. *J. Environ. Sci. Health B27(6):639-653.*
- Hall, R.J.; Aldred, A.H. 1992. Forest regeneration appraisal with large-scale aerial photographs. *For. Chron.* 68(1):142-150.
- Hogg, E.H.; Lieffers, V.J.; Wein, R.W. 1992. Potential carbon losses from peat profiles: effects of temperature, drought cycles, and fire. *Ecol. Appl.* 2(3):298-306.
- Lee, B.S.; Buckley, D.J. 1992. Forestry Canada applies GIS technology to forest fire management. *Earth Obs. Mag.* (June 1992).
- Moore, W.; Newstead, R. 1992. Evaluation of research and development accomplishments: Northern Forestry Centre. *Can. J. Program Eval.* 7(1):41-51.
- Ondro, W.J. 1992. Kam kracas lesnictvo Brazílie zaciatkom devatdesiatych rokov? (Where is forestry going in Brazil in the early 1990s). *LES c.* 10:20-22.
- Timoney, K.P.; La Roi, G.H.; Zoltai, S.C.; Robinson, A.L. 1992. The high subarctic forest-tundra of northwestern Canada: position, width, and vegetation gradients in relation to climate. *Arctic* 45(1):1-9.
- Volney, W.J.A. 1992. The distribution and estimation of jack pine budworm defoliation. *Can. J. For. Res.* 22(8):1079-1088.
- Volney, W.J.A.; Cerezke, H.F. 1992. The phenology of white spruce and the spruce budworm in northern Alberta. *Can. J. For. Res.* 22(2):198-205.
- ii) Information Reports and Special Report:
- Cerezke, H.F.; Gates, H.S. 1992. Forest insect and disease conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories in 1991. *For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-325.*
- Kalra, Y.P.; Maynard, D.G. 1992. Méthodes d'analyse des sols forestiers et des tissus végétaux. *For. Can., Rég. Nord-Ouest, Cent. for. Nord, Edmonton, Alberta. Rapp. inf. NOR-X-319F.*

Kurz, W.A.; Apps, M.J.; Webb, T.M.; McNamee, P.J. 1992. The carbon budget of the Canadian forest sector: Phase I. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-326.

Mallett, K.I. 1992. Armillaria root rot in the Canadian prairie provinces. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-329.

Moody, B.H.; Amirault, P.A. 1992. Impacts of major pests on forest growth and yield in the prairie provinces and the Northwest Territories: a literature review. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-324.

Quintilio, D.; Alexander, M.E.; Ponto, R.L. 1991. Spring fires in a semimature trembling aspen stand in central Alberta. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-323.

Special Report:

Peterson, E.B.; Peterson, N.M. 1992. Ecology, management, and use of aspen and balsam poplar in the prairie provinces. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. Spec. Rep. 1.

- iii) Other reports: supplemental bibliography (Northern Forestry Centre publications, 1991-92)

Book:

Hiratsuka, N.; Sato, S.; Katsuya, K.; Kakishima, M.; Hiratsuka, Y.; Kaneko, S.; Ono, Y.; Sato, T.; Harada, Y.; Hiratsuka, T.; Nakayama, K. 1992. The rust flora of Japan. Tsukuba Shuppankai, Ibaraki, Japan.

Forestry Leaflets:

Cerezke, H.F. 1992. Large aspen tortrix. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leafl. 21.

Cerezke, H.F. 1992. Mon arbre est-il malade? For. Can., Rég. Nord-Ouest, Cent. for. Nord, Edmonton, Alberta. Dépliant for. 23.

Cerezke, H.F. 1992. Tordeuse du tremble. For. Can., Rég. Nord-Ouest, Cent. for. Nord, Edmonton, Alberta. Dépliant for. 21.

Cerezke, H.F. 1992. What's wrong with my tree? For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leafl. 23.

Denyer, W.G.B.; Volney, W.J.A. 1992. Le compostage pour jardin résidentiel: un premier pas dans le domaine du recyclage. For. Can., Rég. Nord-Ouest, Cent. for. Nord, Edmonton, Alberta. Dépliant for. 17.

- Denyer, W.G.B.; Volney, W.J.A. 1992. Urban home garden composting. A first step in recycling. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leaflet. 17.
- Drouin, J.A.; Langor, D.W. 1992. Phytote des bourgeons du peuplier. For. Can., Rég. Nord-Ouest, Cent. for. Nord, Edmonton, Alberta. Dépliant for. 15.
- Drouin, J.A.; Langor, D.W. 1992. Poplar bud gall mite. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leaflet. 15.
- Ip, D.W. 1992. Dutch elm disease. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leaflet. 19.
- Ip, D.W. 1992. Dwarf mistletoe. For. Can., Northwest Reg., North For. Cent., Edmonton, Alberta. For. Leaflet. 18.
- Ip, D.W. 1992. Faux-gui. For. Can., Rég. Nord-Ouest, Cent. for. Nord, Edmonton, Alberta. Dépliant for. 18.
- Ip, D.W. 1992. Maladie hollandaise de l'orme. For. Can., Rég. Nord-Ouest, Cent. for. Nord, Edmonton, Alberta. Dépliant for. 19.
- Kusch, D.S.; Langor, D.W. 1992. Cochenille des aiguilles du pin. For. Can., Rég. Nord-Ouest, Cent. for. Nord, Edmonton, Alberta. Dépliant for. 16.
- Kusch, D.S.; Langor, D.W. 1992. Pine needle scale. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leaflet. 16.
- Stewart, H.M. 1992. L'extraction des graines de cônes de pin et la culture des semis. For. Can., Rég. Nord-Ouest, Cent. for. Nord, Edmonton, Alberta. Dépliant for. 22.
- Stewart, H.M. 1992. Pine cone seed extraction and seedling cultivation. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leaflet. 22.
- Zalasky, H.; Hiratsuka, Y. 1992. Dégâts causés aux peupliers par le gel. For. Can., Rég. Nord-Ouest, Cent. for. Nord, Edmonton, Alberta. Dépliant for. 20.
- Zalasky, H.; Hiratsuka, Y. 1992. Frost damage of poplar. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Leaflet. 20.
- Forest Management Note:
- Langor, D.W.; Drouin, J.A.; Wong, H.R. 1992. The lodgepole terminal weevil in the prairie provinces. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta. For. Manage. Note 55.

Partnership Agreement in Forestry (Alberta)

Brace Forest Services. 1992. Protecting white spruce understories when harvesting aspen. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta.

Sauder, E.A. 1992. Timber-harvesting techniques that protect conifer understory in mixedwood stands: case studies. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta.

Partnership Agreement in Forestry (Saskatchewan)

Blouin, G. 1992. Manitoba maple: an untapped resource. A preliminary report on the feasibility of developing a viable industry in the Canadian prairie provinces based upon the utilization of products derived from the sap of Manitoba maple (Acer negundo L.). For. Can., Sask. Dis. Office, Prince Albert, Saskatchewan.

iv) Lectures, courses, seminars and scientific addresses

Arnott, J.T.; White, W. 1992. The influence of nursery systems on plantation establishment in British Columbia. Pages 56-66 in Efficiency of stand establishment operations. Proc. IUFRO Symp., September 11-15, 1989, Rotorua, New Zealand. FRI Bull. 156.

Bella, I.E.; Ondro, W.J. 1992. Effect of harvest timing on yields and revenues in western Canada's aspen stands. Pages 7-11 in Proc. IUFRO Symp., September 5-9, 1992, Zvolen, Czechoslovakia.

Filion, F.L.; DuWors, E.; Boxall, P.; Reid, R.; Hobby, E.; Bouchard, P.; Gray, P.; Jacquemot, A. 1992. The importance of wildlife to Canadians in 1987: trends in participation in wildlife-related activities, 1981-2006. Environ. Can., Can. Wildl. Serv., Ottawa, Ontario.

Hirsch, K.G., comp. 1992. Minimizing the risk of wildfire: a symposium to address wildfire problems in the wildland/urban interface. Proc. Symp., September 27-30, 1992, Jasper, Alberta. Partners in Protection, Edmonton, Alberta.

Kuhnke, D.H. 1992. Sustainable development and biodiversity in Canada's boreal forest. Pages 151-160 in M. Minowa and S. Tsuyuki, eds. Proc. Symp. Integrated For. Manage. Inf. Syst., October 13-18, 1991, Tsukuba, Japan. Japan Soc. For. Plann. Press, Tokyo, Japan.

Kurz, W.A.; Apps, M.J. 1992. Atmospheric carbon and Pacific Northwest forests. Pages 69-80 in Symp. Implications Clim. Change for Pac. Northwest For. Manage., 1991, Seattle, Washington. Dep. Geog., Univ. Waterloo, Waterloo, Ontario. Occas. Pap. 15.

v) Technology transfer

Samoil, J., ed. 1992. Timberlines. First Quarter 1992, Second Quarter 1992, Third Quarter 1992. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta.

Strong, W.L. (I.D. Systems Ltd.). 1992. An annotated bibliography of western Canada boreal mixedwood forest and related literature. For. Can., North. For. Cent., Edmonton, Alberta, Edmonton, Alberta.

16. Goals 1993-94

1. Assist the research staff through the provision of editing and publishing services, in the preparation and publication of approximately:

- a) 7 Information Reports
- b) 5 Forest Management Notes
- c) 10 Forestry Leaflets
- d) 20 Journal articles and miscellaneous publications
- e) 20 Conference proceedings
- f) 1 Fact Sheet on regional issue. (English and French)
- g) 1 Fire poster (French and English)

Provide editorial, typographic, and printing assistance for public information activities.

Oversee production and printing or reprinting of locally published scientific and technical information.

2. Continue responsibility for the distribution of scientific and technical information, and carry out the necessary correspondence.
3. Maintain an up-to-date list of NoFC publications.
4. Supervise indeterminate and term employees. Provide leadership, coordination, work assignment, priority assessment, and training.
5. Present in-house workshops for scientific staff on common problems with word usage and references.
6. Assess the potential and feasibility of alternate publication and information dissemination mechanisms, including priced publications options re: alternative printed hard copies, electronic transmission, field guides, etc. in the Northwest Region.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
NWR		Communications	J.Samoil/ B. Newstead
H.Q. Laurentian		Publications Translations	J. Tomlinson B. Arsenault

ii) External -

Establishment	ID#	Title	Contact name
Univ. of Alberta	-	Ives & Wong NOR-X-292	Dr. J. Spence
Univ. of Alberta N.A.I.T. Alberta For. Lands & Wildlife Weldwood For. Tech. School Prov. Parks Serv. Ab. Environ. Cent. Blue Ridge Lumber Weyerhaeuser Procter & Gamble B.C. Minist. of For. Zeidler For. Prod.	- -	Corns & Annas Field guide	Dr. B.P. Dancik Alan J. Pollock Harry Archibald D.W. Laisley Howard Anderson Bruce M. Duffin Dr. David McNabb Murray Summers Bruce Macmillan Pat Wearmouth Richard Kabzems Terry Kristoff

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement: N/A
- ii) FC-NWR EARP Committee Approval Date:

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Communications
2. Responsibility Centre: Northwest Region (8111)
3. Activity: 2313
4. Program: Regional Director General - Northwest
5. Status: Continuing
6. Last Evaluation: December 18, 1992
7. Next Evaluation:

B. KEYWORDS:

009 Communications
 039 Scientific & technical
 054 Public Information/Awareness
 100 Green Plan
 103 Program director/manager
 605 Publications
 709 Technology Transfer

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	8.00	8.00	4.00	0.00	0.00
Salaries	\$397.2	\$397.2	\$202.5	\$0.0	\$0.0
O & M	\$124.3	\$103.0	\$48.9	\$0.0	\$0.0
Capital	\$0.6	\$0.0	\$5.2	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$522.1	\$500.2	\$256.6	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS

Maintaining client, public, and media awareness of Forestry Canada's traditional activities and programs in the Northwest Region and promoting the benefits of the forest resource requires an ongoing effort with an emphasis on research activities and results. A new challenge is how to take advantage of the opportunities for increased contact with other audiences as a result of the new set of federal-provincial/territorial forestry agreements and the programs under the Green Plan. One of the key ways in which Forestry Canada will accomplish its mission statement is through enhancing public awareness of the benefits of Canada's forests.

The Communications Project will use the full range of public and media relations activities to promote client, public, and media awareness of our accomplishments and ongoing activities in both the short and long term.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary (\$s):

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary					
Secondary					
Total					
Green Plan		68.66			

3. Collaborators:

N/A

4. Green Plan:

This project is intricately involved with several Forestry Canada initiatives under Canada's Green Plan. From a regional communications perspective, Tree Plan Canada involves an array of public communication, media relations, and promotional endeavours. Communications plans and deliverables have been established for both regional Green Plan activities and the national "Partners in Sustainable Development of Forests" programs coordinated by the Northwest Region, specifically the Canadian Forests and Climate Change and Fire Management Research programs.

5. Milestones:1993-94:

1. Coordinate activities of communications staff within the Northwest Region, including public information, public relations, media relations, French translation, school tours and extension services, and internal communications (including issues management).
2. Develop and implement a public exhibition schedule to include major regional exhibitions and Alberta National Forest Week events, information fairs, and invitational events; provide tours and other extension services to schools, youth groups, and the public.
3. Prepare, implement, monitor, and assess regional corporate communications plans such as the strategic and operational communications plans and advertising plan.
4. Coordinate preparation of the monthly Inside Information newsletter and the quarterly Timberlines magazine.
5. Provide regional coordination of communications activities under the four federal-provincial forestry agreements, in conjunction with the district office communications officers.
6. Provide coordination of Green Plan communications activities in the Northwest Region, including the Canadian Forests and Climate Change and Fire Management Research programs for which the region is the national lead agency.

6. Accomplishments:

1. Coordinated activities of communications staff within the Northwest Region, including public information, public relations, media relations, French translation, school tours and extension services, and internal communications.
2. Attended 11 major public information exhibitions in Alberta and British Columbia. Region-wide, NoFC and district office personnel contacted 64,000 members of the general and other targeted publics and distributed more than 42,000 pieces of literature.
3. Work was begun on a regional operational communications plan following attendance at nearly all project reviews; the advertising plan was submitted to Headquarters; input was provided to draft communications plans for the Alberta and NWT agreements; a new planning approach was developed for Green Plan communications activities, resulting in detailed operational communications plans and budgets.
4. Prepared and published on a regular basis the monthly Inside Information newsletter and the quarterly Timberlines magazine, including a special program preview section in the second quarter 1992 issue. The Fourth Quarter 1992 Timberlines was delayed due to other activities.

5. Coordinated communications activities under the four regional forestry partnership/cooperation agreements, including organizing the Alberta Agreement signing ceremony; coordinated publishing the first issue of Partners, the regional agreements newsletter, and initiated planning for the second issue.
 6. Planned and delivered regional Green Plan communications activities such as media releases, special events, announcements, articles, advertising, and displays, primarily for Tree Plan Canada and the Model Forests program.
7. Link to Strategic Plan:

National:

Communications activities are fundamental to achievement of Forestry Canada's 1990 Strategic Plan by maintaining client, public, and media awareness of Forestry Canada's traditional and new programs and promoting the benefits of our forest resource.

Regional/Institute:

In the Northwest Region's 1990-95 Strategic Plan one of the operating principles is dissemination of information and technology to forest sector clients and the general public. The Strategic Plan further makes a special note of the need for a strong communications strategy as a compliment to the regional plan.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 18, 1992

1. **STUDY TITLE:** Public Information
2. **Responsibility Centre:** Northwest Region (8111)
3. **Program:** Regional Director General
4. **Project Title:** Communications
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Region-Wide
7. **Study Staff:**

	Name
Study Leader	J. Samoil
Professional	R. Holehouse
Technical	H. Stewart
	D. Lee
	D. Leroy

8. **Study Key Words:** Project management, public relations, public information, publications, exhibitions, displays, tours, forestry agreements, Green Plan
9. **Study Activity:** 2313

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
J. Samoil	IS-4 (A)					
R. Holehouse	IS-3 (A)					
H. Stewart	GT-4 (T)	0.00	0.00	0.00		
D. Lee	DD-4	0.83	0.83	0.00		
D. Leroy	CR-3 (S)	1.00	1.00	0.00		
FTEs		4.83	4.83	2.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	
O&M	79.91	19.70			
Capital	0.61	3.20			
G & C					
TOTAL:	80.52	22.90			

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries: Alta.	A8007		6.50			
O&M: Alta.	A8007		68.50			
Capital						
G & C						
TOTAL:			75.00			

STUDY TOTAL		102.73			
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11. Study Background and Problem Analysis

Internal and external communications activities at the regional level must be planned and managed in consideration of regional and departmental strategic initiatives and priorities. Through effective issues monitoring, public environment analysis, advice and guidance to program managers, proactive communications activities can be directed at the needs and expectations of all target audiences, from the in-house research community to the news media and the public-at-large. The Communications Project employs the full range of public and media relations activities to promote client, public, and media awareness of the Northwest Region's accomplishments and ongoing activities in both the short and long term. Focusing on the general public requires an ongoing effort to identify opportunities for public involvement that will have a significant impact and will be cost-effective. Whenever possible, the public information program draws on resources available from special programs such as the forestry partnership agreements and Green Plan. The overall goal, however, is to present a cohesive overview of Forestry Canada's many activities to as wide an audience as possible.

12. Study Objectives:

i) Objectives

1. Coordinate the planning and delivery of an effective regional client, public, and media awareness and forestry extension program.
2. Promote increased public awareness and understanding of Forestry Canada and Northwest Region initiatives in the forest sector and inform target audiences of the benefits of the forest resource both to people in our region and Canadians as a whole (a Northwest Region Strategic Plan operating principle and communications perspective.).
3. Enhance internal communications opportunities to exchange information, solicit feedback, and identify and act upon concerns or issues warranting attention (a Northwest Region Strategic Plan operating principle and communications perspective).
4. Provide public information and extension services.
5. Provide a range of graphics services to regional staff.

ii) Deliverables

Short Term (1-5 years)

- management of regional communications programs and activities;
- provision of communications advice, planning, and services;
- provision of functional leadership and guidance to District Office communications officers;
- ongoing contact with external forestry clients;

- participation in planning and activities for 1994 Forestry Capital of Canada events in Edmonton;
- organizational and communications activities for the 1994 NoFC Open House.

Long Term (5 years and beyond)

- continued forestry client, general public, and news media awareness of Northwest Region activities.

iii) Significant Linkages:

- district offices;
- federal-provincial/territorial forestry agreements;
- Green Plan programs;
- other Forestry Canada establishments;
- forestry agencies such as provincial departments, industry, universities, and associations;
- other federal departments.

13. Progress and Achievements (up to and including 1992-93)

Regional surveys of clients in 1990 showed strong support for ongoing activities but also pointed out new directions. A telephone survey of representatives of the region's primary client groups in January 1990 indicated that they had a fairly good knowledge about Forestry Canada, Northwest Region's role. There was, however, a desire for more information about current and future research activities plus more personal contact with Forestry Canada staff. The need for greater emphasis on interim research results, shorter and more applications-oriented publications, and personal contact was reiterated in the results of a questionnaire sent to the scientific and technical publications mailing list also in 1990. As a result, a strategic communications plan was developed that outlined activities directed to both external and internal audiences. Delivery of these goals depends on action by staff throughout the region and not just by Communications personnel.

The increase in special programs in the Northwest Region has resulted in more demand for planning and coordination of regional communications activities. Communications planning and delivery are well under way for the forestry partnership agreements in Manitoba, Saskatchewan, and Alberta and the forestry cooperation agreement in the Northwest Territories. There has been significant involvement in the coordination, review, approval, and evaluation of district office communications activities for agreement as well as A-base and Green Plan programs. Communications officers in the district offices (hired under the forestry partnership agreements) have been instrumental in promoting Forestry Canada activities in their provinces. The first issue of Partners in Forestry, the regional agreements newsletter, was published.

In addition, the Northwest Region has been participating in a number of Green Plan programs since 1991. In the Partners in Sustainable Development of Forests program, the Northwest Region has the lead role for several national programs and is conducting regional studies under others. The model forests and Tree Plan Canada programs have significant

activities regionally. All of these Green Plan programs have a need for a strong communications component.

An active extension services schedule has taken displays throughout the region and into B.C. to present information on Forestry Canada's programs and accomplishments. The Graphic Artist continues to provide essential support to all communications endeavors through work on publications, displays, and signs.

The Technology Transfer and Communications project was divided in September 1992 into separate Communications and Publications projects. Studies within the Communications project were renamed Public Information and Media Relations to more accurately reflect each study's responsibilities.

14. Goals and Accomplishments (1992-93)

1. *Provide project leadership and coordination of technology transfer, communications, and other information services and activities within Northwest Region including public information, public relations, scientific and technical editing and publishing, extension services and graphics services. (Newstead)*

Until September 1992, R. Newstead provided project leadership and coordination. Leadership of the new Communications project was passed on an acting basis to J. Samoil, while B. Laishley took over leadership of the Publications project. The Communications project continued to provide communications advice, planning, and services to Northwest Region staff, including functional guidance to district office communications officers. (Newstead, Samoil)

2. *Serve on in-house, regional, national, and NGO working/advisory committees as required. (Newstead)*

Served on the following committees:

- Northwest Region Achievement Award Committee (Newstead);
- NoFC classification committees (Newstead and Samoil);
- NoFC Management Committee (Newstead and Samoil);
- National Forest Week Organizing Committee (Newstead, Holehouse);
- Canada-Alberta Partnership Agreement in Forestry, C.1 Subcommittee (Newstead and Samoil, as chairperson);
- FEESA forestry videos advisory committee (Newstead and Samoil);
- Focus on Forests advisory committee (Newstead and Samoil);
- NoFC Action Committee (Samoil);
- NoFC Children's Christmas Party Committee (Samoil).

3. *Participate as required in the signing of the Canada-Alberta Partnership Agreement in Forestry and participate in the development and implementation of the necessary communications plan required to serve this agreement. Serve as Canada-Alberta PAIF communications sub-committee co-chairman. (NOR-36-02) (Newstead).*

In conjunction with AFS, organized signing of the Canada-Alberta Partnership Agreement in Forestry on April 23, 1992. Established the C.1 subcommittee and served as co-chairperson (Newstead) and chairperson (Samoil). Committee terms of reference and proposal acceptance criteria were prepared and work was begun on a communications plan.

4. *Attend semi-annual meeting of Federal Laboratory Consortium for Technology Transfer. (Newstead)*

Due to changed work assignment, Newstead did not attend this meeting.

5. *Coordinate international forestry matters stemming from regional R&D initiatives as required, with particular attention to implementation of the 1992/93 workplan concerning cooperative exchanges between the Heilongjiang Academy of Forestry Sciences and Northwest Region. (Newstead)*

Responsibility stayed with R. Newstead.

6. *Continue development of a photographic records system and library including acquisition and duplication of general purpose forestry information slides and photos. (Stewart)*

Original slides turned in from retiring staff were added to the photo library. The photo library was moved to the basement. A catalogue of audiovisual material was prepared that included one or two sentences about the subject and audience.

7. *Develop and implement NoFC public exhibition schedule to include major regional exhibitions, National Forest Week events, information fairs, and other invitational events. (Stewart)*

Presented NoFC displays at Edmonton Sportsman's Show, First Aboriginal Youth Conference, Forestry Capital of Alberta in Slave Lake, Envirofest, Klondike Days, Science and Technology Week, Career Fairs, Alberta Urban Municipalities Conference, Forestry Demo '92, Wood Expo '92, Alberta Science Teachers' Conference, Environmental Trade Show, Stony Plain and Drayton Valley trade shows and Prince George Forestry Exhibition. Region-wide, NoFC and District Office personnel contacted 31,000 members of the general and other targeted publics and distributed more than 37,000 pieces of literature and posters.

8. *Co-ordinate and provide tours and other extension services to schools, youth groups and other publics visiting NoFC. (Stewart)*

Several in-school presentations were provided at Career Fairs and Career Days. Tours of the Centre were provided to Lakeland College students, Junior Forest Wardens, and N.A.I.T. students. Produced 30,000 in-house Colorado blue spruce seedlings for Tree Plan Canada (18,000) and general public (12,000) distribution at fairs, trade shows, and exhibits. Also contracted for the private production of 16,000 Colorado blue spruce. Distributed 4,900 tree seedlings to Edmonton school groups, Girl Guide and Boy Scout troops, and other community organizations for outplanting. Acted as regional distribution centre for AFA "Forever a Tree" school tree planting program.

9. *Maintain inventory control, stock supplies, reorder materials, and prepare schedules for all NoFC public information materials, exhibition materials, and educational supplies to present and distribute to public audiences and educators. (Stewart)*

The last of the Tree Cheers activity booklets (French) were shipped to 16 French schools in Edmonton. Ordered literature and posters from the following: Forestry Canada regions and Headquarters, Canadian Pulp and Paper Association, Abitibi Price, Environment Canada, TransAlta Utilities, and the Alberta Forest Service.

10. *Participate as required in the development and implementation of Departmental communications initiatives that stem from such national program activities as the Green Plan, BOREAS Project, etc. (Newstead)*

Oversaw the preparation of communication plans and organization of special events relating to national Green Plan programs such as Tree Plan Canada Model Forests, BOREAS (see also) 1993-94 Study work plan for NOR-33-02. (Newstead, Samoil, Holehouse)

11. *Contract for the presentation of up to two seminars on the effective use of presentation visuals. (Newstead)*

Two half-day seminars on presentation visuals were presented in October 1992 at NoFC.

12. *Coordinate the solicitation and awarding of the Forestry Canada sponsored Alberta Forestry Innovation Award. (Newstead)*

Despite promotion of the award, no entries were received this year.

13. *Assess the feasibility and cost of developing a video-based slide reference library for NoFC. (Stewart)*

Preliminary inquiries were made into the technology availability and cost. Further study is required.

14. *Assess opportunity to include Forestry Canada educational materials in FEESA distribution network. (Newstead)*

There has been ongoing discussion with FEESA regarding sharing of resources. (Newstead, Samoil)

15. Information Activities

v) Technology transfer:

Promoting technological accomplishments by raising client, public, and media awareness of Forestry Canada research and development activities is the basis of the Communications project.

16. Goals 1993-94

1. Provide project leadership and manage the planning and delivery of a regional client, public, and media awareness and forestry extension program. (Samoil)
2. Serve on in-house, regional, national, and other types of working and advisory committees. (Samoil, Holehouse)
3. Plan, coordinate, and evaluate regional forestry partnership agreement communications activities; serve as chairperson of the C.1 Subcommittee for the Alberta Partnership Agreement (NOR 44) and as federal cochairperson of the C.1 Subcommittee of the Northwest Territories Cooperation Agreement (NOR 48). (Samoil)
4. Plan and organize the NoFC public exhibition schedule in conjunction with other Northwest Region programs. (Stewart)
5. Coordinate the provision of tours and other extension services to schools, youth groups, and visitors to the Centre. (Stewart)
6. Maintain a photographic records system and slide library. (Stewart)
7. Maintain inventory control and restock supplies of public information materials for general and special distribution. (Stewart)
8. Provide graphic services to Northwest Region staff. (Lee)
9. Participate in the planning, organization, and presentation of an NoFC Open House in 1994.
10. Participate in planning and activities for the 1994 Forestry Capital of Canada events in Edmonton. (Samoil)

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Northwest	All programs		All staff
All regions & HQ			Communications staff

ii) External -

Establishment	ID#	Title	Contact name
Forestry organizations			Across region
AFS			Program Support
AFPA			Mike Voisin
AFA			Audrey Ruff
MNR			Dan Bullock
SRN			Valerie Nicholson
GNWT			Bob Larson

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

Not Applicable.

ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 18, 1992

1. STUDY TITLE: Media Relations
2. Responsibility Centre: Northwest Region (8111)
3. Program: Regional Director General - Northwest
4. Project Title: Communications
5. Office Location(s): Edmonton, Alberta
6. Work Location: Region-wide
7. Study Staff:

	Name
Study Leader	Judy Samoil
Professional	Regina Holehouse
Technical	Hugh Stewart
	Dennis Lee
	Denise Leroy

8. Study Key Words: Public relations, media relations, public information, publications, Green Plan, forestry agreements
9. Study Activity: 2313

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
J. Samoil	IS-4 (A)	0.00	0.00	1.00		
R. Holehouse	IS-3 (A)					
H. Stewart	GT-4 (T)	1.00	1.00	0.00		
D. Lee	DD-4	0.00	0.00	1.00		
FTEs		2.00	2.00	2.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	
O&M:					
33-02	19.87				
33-04	10.12	29.20			
Capital		2.00			
G & C					
TOTAL:	29.99	31.20			
STUDY TOTAL	12.50	31.20			

11. Study Background and Problem Analysis

Maintaining client, public, and media awareness of Forestry Canada's traditional activities and programs in the Northwest Region and promoting the benefits of the forest resource requires an ongoing effort with an emphasis on research activities and results. A new challenge is how to take advantage of the opportunities for increased contact with other audiences as a result of the new set of federal-provincial/territorial forestry agreements and the programs under the Green Plan. One of the key ways in which Forestry Canada will accomplish its mission statement is through enhancing public awareness of the benefits of Canada's forests. In the Northwest Region's 1990-95 Strategic Plan one of the operating principles is dissemination of information and technology to forest sector clients and the general public. The Strategic Plan further makes a special note of the need for a strong communications strategy as a compliment to the regional plan. Greater effort must be directed at regional news media, both the traditional daily newspapers and radio and

television stations as well as the more specialized forestry and environmental publications and weekly newspapers.

12. Study Objectives:

i) Objectives

1. Promote increased media and public awareness of Forestry Canada and Northwest Region initiatives in the forestry sector and inform target audiences of the benefits of the forest resource both to people in our region and Canadians as a whole (a Northwest Region Strategic Plan operating principle and communications perspective).
2. Enhance internal communications opportunities to exchange information, solicit feedback, and identify and act upon concerns or issues warranting attention (a Northwest Region Strategic Plan operating principle and communications perspective).
3. Provide a range of public and media relations services.
4. Coordinate the Northwest Region's public and media relations activities under the federal-provincial/territorial forestry agreements and the Green Plan.

ii) Deliverables

Short Term (1-5 years)

- establishment of working relationships with both general and specialized news media in the region
- news releases, articles, and publications about the Northwest Region's research and development activities
- communications activities under the federal-provincial/territorial forestry agreements
- communications activities under the Green Plan
- organizational and communications activities for the 1994 NoFC Open House
- participation in planning and communications activities for the 1994 Forestry Capital of Canada events in Edmonton

Long Term (5 years and beyond)

- continued forestry client, general public, and news media awareness of Northwest Region activities

iii) Significant Linkages:

- district office communications officers
- federal-provincial/territorial forestry agreements
- Green Plan programs

- departmental communications staff
- news media
- forestry agencies such as provincial departments, industry, universities, and associations

13. Progress and Achievements (up to and including 1992-93)

As a result of client surveys in 1990, a strategic communications plan was developed that outlined activities directed to both external and internal audiences. Delivery of these communications goals depends on action by staff throughout the region and is not restricted to Communications personnel. Signing of forestry partnership agreements with Manitoba and Saskatchewan in 1991 and the hiring of communications officers for the district offices is producing a significant increase in communications activities directed at both the forestry sector and general public in those provinces. An Alberta forestry partnership agreement was signed in 1992, as was a forestry cooperative agreement with the Northwest Territories. Communications strategies were developed for these two agreements in 1992 and had already been prepared for Manitoba and Saskatchewan agreements.

The startup of Green Plan programs in the Northwest Region necessitated the hiring of a term communications officer to coordinate and implement communications efforts. Tree Plan Canada activities have generated positive media coverage throughout the region, most of it associated with special events such as visits or announcements by the minister or major planting projects. Announcement or signing ceremonies for the region's three model forests received positive media coverage as well. Communications plans have been prepared for all Green Plan programs in the region, including those for which the Northwest Region is the national lead agency. Two issues of Impact, the newsletter of the national Canadian Forests and Climate Change program, were published in 1992-93.

The delivery of general media relations activities in 1992-93 was affected by a staff shortage starting halfway through the year when the Regional Communications Manager accepted an assignment to another program and the Regional Communications Officer moved into the Manager's position on an acting basis, leaving the officer position vacant.

The name of this study has been changed to Media Relations for 1993-94 to better reflect its objectives and priorities.

14. Goals and Accomplishments (1992-93)

1. *Prepare, implement, monitor, and assess regional communications plans such as the strategic communications plan, the advertising plan, and the operational communications plan. (Samoil, Holehouse)*

Work was begun on a regional operational communications plan following attendance at nearly all project reviews; the advertising plan was submitted to Headquarters; input was provided to draft communications plans for the Alberta and NWT agreements; a new planning approach was developed for Green Plan communications activities, resulting in detailed operational communications plans and budgets.

2. *Coordinate general information services and activities on a regional basis, including French translation, public information, public relations, media relations, media training and coordination, and internal communications (including issues management involving Headquarters). (Samoil, Holehouse)*

General communications activities were provided, including coordinating the planning of visits of the Minister to the region, preparing numerous briefing notes, event notes, and ministerial correspondence, coordinating regional news releases and media advisories, and monitoring regional media coverage of forestry.

3. *Coordinate preparation of the monthly Inside Information newsletter and the quarterly Timberlines magazine, including a special program preview insert to appear in the Second Quarter 1992 issue. (Samoil, Holehouse)*

Prepared and published on a regular basis the monthly Inside Information newsletter and the quarterly Timberlines magazine, including a special program preview section in the Second Quarter 1992 issue. The Fourth Quarter 1992 Timberlines was delayed due to other activities.

4. *Update and print the Northwest Region's Contacts brochure in English and French.*

Updated and printed the Northwest Region's Contacts brochure in English and French.

5. *Act as regional coordinator of communications activities under the Saskatchewan and Manitoba forestry partnership agreements (NOR 36-03 and NOR 36-01), including events and attendant media activities, in conjunction with the district office communications officers.*

Acted as regional coordinator of communications under the four forestry partnership/cooperation agreements, including organizing the Alberta agreement signing ceremonies.

6. *Coordinate production and publishing of the regional agreements newsletter.*

Coordinated publishing of the first issue of Partners in Forestry and initiated planning for the second issue.

7. *Prepare and publish a revised brochure on the Northwest Region in both English and French.*

Due to personnel and funding constraints, this has been delayed.

8. *Prepare and publish a postcard/publication request card for the Northern Forestry Centre.*

Due to funding constraints, this was cancelled.

9. *Arrange a contract for the production of an updated Northwest Region slide-tape presentation. (Newstead)*

A draft script was prepared and then the contract was cancelled due to funding constraints.

10. *In conjunction with regional communications officers, advise on and assist in the delivery of Green Plan communications activities within the Northwest Region. (Samoil, Holehouse)*

Planned and delivered Green Plan communications activities such as media releases, special events, announcements, advertising, displays, and articles.

11. *Develop and implement a 1992-93 communications plan for the Green Plan's community tree planting program in the Northwest Region. (Holehouse)*

Developed and implemented a 1992-93 regional communications plan for Tree Plan Canada.

12. *Develop and implement a 1992-93 communications plan for the Green Plan's Canadian forests and climate change program being led by the Northwest Region. (Holehouse)*

Prepared a draft 5-year strategic communications plan for the national Canadian forests and climate change program.

13. *Prepare and publish a quarterly newsletter for the Green Plan's Canadian forests and climate change program. (Holehouse)*

Designed, wrote, and published one issue of Impact (now a twice yearly newsletter) and wrote articles for the second issue.

14. *Added Goal: Prepare a draft communications strategy for the Green Plan's forest fire research program being led by the Northwest Region. (Holehouse)*

Prepared a draft communications strategy for the Green Plan's national forest fire research program.

15. *Added goal: Participate in the GE conversion exercise. (Samoil)*

In the fall of 1992 participated in work description writing and evaluating training sessions and was a member of the regional evaluation committee for the GE conversion.

15. Information Activities

v) Technology transfer:

Holehouse, R., ed. 1992. Impact. No. 1. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta.

Holehouse, R., ed. 1992. Inside Information. Monthly, June to December 1992. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta.

Samoil, J.K., 1992. Contacts. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta.

Samoil, J.K., ed. 1992. *Inside Information*. Monthly, January to May 1992. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta.

Samoil, J.K., ed. 1992. *Timberlines*. First Quarter 1992, Second Quarter 1992, Third Quarter 1992. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta.

Samoil, J.K., Holehouse, D., eds. 1992. *Partners in Forestry*. Vol. 1, No. 1. For. Can., Northwest Reg., North. For. Cent., Edmonton, Alberta.

16. Goals 1993-94

1. Prepare, implement, monitor, and assess regional corporate communications plans such as the strategic and operational communications plans and advertising plan. (Samoil)
2. Coordinate general information services and activities on a regional basis, including French translation, public information, public relations, media relations, media training and coordination, and internal communications (including issues management involving Headquarters). (Samoil, Holehouse)
3. Coordinate preparation of the monthly Inside Information newsletter and the quarterly Timberlines magazine, including a special program preview section. (Samoil, Holehouse)
4. Update and print the Northwest Region's Contacts brochure in English and French. (Samoil)
5. Prepare and publish a revised brochure on the Northwest Region in English and French. (Samoil)
6. Act as regional coordinator of communications activities under the Saskatchewan and Manitoba forestry partnership agreements (NOR 46 and NOR 42), including special events and attendant media activities, in conjunction with the district office communications officers. (Samoil)
7. Coordinate production and publishing of Partners in Forestry, the twice yearly regional agreements newsletter. (Samoil)
8. In conjunction with regional communications officers, advise on and assist in the delivery of Green Plan communications activities within the Northwest Region. (Samoil, Holehouse)
9. Develop, implement, monitor, and assess Green Plan communications activities for Climate Change (NOR 16), Fire (NOR 50-89, NOR 5), Tree Plan Canada (NOR 22), and Model Forests (NOR 26) programs being carried out in the region. (Holehouse)
10. Prepare and publish Impact, the twice yearly newsletter for the Green Plan's Canadian forests and climate change program. (Holehouse)

11. Participate in the planning, organization, and presentation of an NofC Open House in 1994. (Samoil, Holehouse)
12. Participate on the regional evaluation committee for the GE conversion. (Samoil)

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Northwest	All programs		All staff
All regions & HQ			Communications staff

ii) External -

Establishment	ID#	Title	Contact name
News media			Across region
Forestry organizations			Across region
AFS			Program Support
AFPA			Mike Voison
AFA			Audrey Ruff
MNR			Dan Bullock
SRN			Valerie Nicholson
GNWT			Bob Larson

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
Not Applicable.
- ii) FC-NWR EARP Committee Approval Date:

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Library
2. Responsibility Centre: Northwest Region (8151)
3. Activity: 2251
4. Program: Regional Development
5. Status: Continuing
6. Last Evaluation: January 31, 1992
7. Next Evaluation:

B. KEYWORDS:

037 Research Support
603 Library
605 Publications

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	0.00	0.00	1.00	0.00	0.00
Salaries	\$0.0	\$0.0	\$28.3	\$0.0	\$0.0
O & M	\$0.0	\$0.0	\$79.5	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$0.0	\$0.0	\$107.8	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS:

The library is responsible for providing the staff at the centre and the District Offices with access to publications and printed materials to meet the needs of NoFC's mandate within Forestry Canada. The library also serves university and college personnel, staff from other federal, provincial and municipal government departments and members of the public. These tasks are accomplished by budgeting, planning and developing library services to support ongoing forestry related activities in the Northwest Region; by developing and maintaining

a collection which contains copies of all Forestry Canada publications and significant internal reports and other publications required to meet ongoing and planned needs of NoFC and its District offices; by providing reference and current awareness services; by coordinating requests for translation of relevant scientific and technical literature; by selecting and obtaining library materials by means of purchase, gift of exchange; or cataloguing and classifying library materials according to a recognized standard or system to provide a means of access to the collection; and by providing information or publications through interlibrary loan services where items are not available in the local collection and cooperating with other libraries by supplying reciprocal interlibrary loan services.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary (\$s & PYs): \$000s

N/A

3. Collaborators:

N/A

4. Green Plan:

N/A

5. Milestones:

1. Continue to provide library services to support the research, development, and technology transfer at NoFC and its District Offices.
2. Undertake required and supplemental courses and training in such areas as cataloguing, on-line searching and Sydney PLUS (if required).
3. Continue to implement Sydney, and then, dependent upon the release of the VAX version, convert to Sydney PLUS. This conversion will require assistance from Informatics personnel and possibly the vendor (International Library Systems).
4. Attend the Special Libraries Association Annual Conference and the Council of Forestry Canada Libraries annual meeting.
5. Continue to provide guidance and assistance to the Manitoba and Saskatchewan District Offices.

6. Continue to provide advice and act as liaison for library related needs in the development of the Aspen Resource Centre and the Technology Development Unit.
7. Continue to utilize the Internet and DOBIS cataloguing resources to assist in the reduction of the current back-log as well as retrospective conversion.
8. Continue to use ENVOY and DOBIS for interlibrary loans, and implement CAN/OLE and ROMULUS—the ultimate goal being the complete automation of interlibrary loan services.
9. Continue on-line searching on CAN/OLE, as well as implement searching on DIALOG.
10. Continue to offer CD-ROM databases and their updates as well as purchase CABCD by the end of this calendar year.
11. Develop a comprehensive marketing strategy for the library and its services, e.g., an information pamphlet detailing and/or announcing library services.
12. To re-activate LUAC and/or explore possible alternatives.

Accomplishments:

1. Library services continued to be provided to NoFC and its District Offices.

Approximately 8 boxes of duplicates were sent to the Canadian Book Exchange as well as several boxes of publications to the Manitoba District office.

Binding of library periodicals is being kept up-to-date; 195 vols. were sent out for binding.

Approximately 375 interlibrary loan requests were handled by the library, as well as 12 translation requests.

The library's reference collection is gradually being updated.

Chairs for clients, new signs and display racks have contributed to the library's new image this year. As well the entire monograph collection was shelf-read and new cards and labels were made as needed.

The library continues to receive publications by way of gifts or exchange on an on-going basis.

2. Both the head of library services and the library assistant attended a Sydney PLUS Implementation Workshop.
3. The Sydney database continues to grow, with approximately 16,000 records entered as of January 15, 1993.
4. The Council of Forestry Canada Libraries did not pursue this at the '92 annual meeting, and Regional Development's Informatics Specialist left NoFC.

5. The head of library services attended the Special Libraries Association Annual Conference. NoFC hosted the annual Council of Forestry Canada Libraries meeting in September 1992.
6. The library continues to provide guidance and assistance to both District Offices.
7. Continued to provide advice and act as liaison for library related needs in the development of the Aspen Resource Centre and Technology Development Unit. e.g., forest nursery database.
8. DOBIS is used extensively for cataloguing and interlibrary loans. CAN/OLE is not being used for interlibrary loans yet because training will not be offered until spring of '93.

ROMULUS (a complete CD-ROM system for locating serials and ordering documents from Canadian libraries) has been ordered and will facilitate the complete automation of interlibrary loans.

The Internet, via Pacific Forestry Centre, allowed access of American university library catalogues, whose cataloguing copy was instrumental in reducing the United States Department of Agriculture back-log.

9. CAN/OLE on-line searching has been implemented; training for DIALOG will be held in spring or summer of '93.
 AGRICOLA (1984 to date) was purchased and has been used by clients since summer of '92
 TREECD (a comprehensive forestry information source on CD-ROM) has been ordered but has not yet arrived.
 CABCD will be ordered at the end of this calendar year. CAB journals have already been cancelled in preparation.
10. The project to totally re-organize and re-label entire contents of library storage room and prepare guides for retrieval and shelving of material is close to completion.
11. The project to update the serials holdings of Forestry Canada-Northwest Region on CISTI's Union database will be completed by March 31st, 1993.

7. Link to Strategic Plan:

National:

Regional/Institute:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 22, 1993

1. **STUDY TITLE:** Library
2. **Responsibility Centre:** Northwest Region (8151)
3. **Program:** Regional Development
4. **Project Title:** Library Services
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northern Forestry Centre
7. **Study Staff:**

	Name
Study Leader	E. Hopp
Team Members	D. Oranchuk
	D. Triggs
	Student
	D. Leroy
	C. Brokop
	G. Cannan

8. **Study Key Words:** Library, acquisitions, cataloguing, interlibrary loans, circulation, reference, on-line literature searching, automated library systems, information science, data bases, CD-ROMs, aspen information database
9. **Study Activity:** 2251

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
E. Hopp	CR-04 (S)	0.00	0.00	1.00		
D. Oranchuk	CR-03 (S)					
D. Leroy	CR-03 (S)					
C. Brokop	CR-04 (S)					
G. Cannan	CR-03 (S)					
FTEs		0.00	0.00	1.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00		
O&M	69.95	79.50			
Capital					
G & C					
TOTAL:	69.95	79.50			
STUDY TOTAL	69.95	79.50			

11. Study Background and Problem Analysis

The library is responsible for providing the staff at the centre and the District Offices with access to publications, printed and non-print materials to meet the needs of NoFC's mandate within Forestry Canada. The library also serves university and college personnel, staff from other federal, provincial and municipal government departments and members of the public.

12. Study Objectives:

i) Objectives

- To budget, plan and develop library services to support ongoing forestry related activities in the Northwest Region.
- To develop and maintain a collection which contains copies of all Forestry Canada publications and significant internal reports and other publications required to meet the ongoing and planned needs of NoFC and its District Offices.
- To provide reference and current awareness services.
- To coordinate requests for translation of relevant scientific and technical literature.
- To select and obtain library materials by means of purchase, gift, or exchange.
- To provide a means of access to the collection by cataloguing and classifying library materials according to a recognized standard or system.
- To provide information or publications through interlibrary loan services where items are not available in the local collection and cooperate with other libraries by supplying reciprocal interlibrary loan services.

ii) Deliverables

Short Term (1-5 years)

- To develop and implement a marketing plan for the library.
- To acquire an additional computer terminal for client use, dedicated to searching the University of Alberta on-line catalogue.
- To bring book purchasing back to the library.
- To increase on-line searching (additional databases).
- To build a database library of CD-ROM titles.
- To re-activate LUAC and/or explore possible alternatives, e.g., a project leaders' meeting prior to budget proposal time.
- To increase the SYDNEY/SydneyPLUS database.
- To implement all modules of SydneyPLUS.
- To convert Sydney to SydneyPLUS.
- To keep the Northwest Region's serials holdings current for inclusion in CISTI's Union list.

- To continue to streamline/enhance information retrieval (using new or existing technology) both in-house as well as through interlibrary loan.
- To continue to build and update the library's reference collection.
- To do a complete library inventory of items on loan.
- To increase staff to 3 F.T. plus a summer student, and still keep the part-time staff.

Long Term (5 years and beyond)

- To have a fully automated library.
- To eliminate (catalogue) 75% of the back-log.
- To be actively involved in the linkage of Forestry Canada library resources.
- To have fewer paper-copy journals, which will be replaced with full-text CD-ROM databases.
- To be housed in a new, larger and more strategically positioned location.
- To offer full library services to the District Offices.
- To increase full-time staff to 3, keeping the part-time staff as well as a full-time summer student.
- To continue marketing strategies.

13. Progress and Achievements

A new library image was created with: increased work space for clients, library furnishings, 'face-lift' for the collection, e.g., new spine labels and sign-out cards, neater general appearance of collection and library as a whole.

- automation of interlibrary loans.
- a start made in building and updating the reference collection.
- complete overhaul of the library storage room, e.g., colour-coded filing system, new labels, shelving organized and re-organized.
- library at long last has its own photocopier.
- on-line searching and CD-ROM databases.
- automated database is steadily increasing.
- binding of library journals has been brought up-to-date and is being kept current.

- use of DOBIS and the Internet for cataloguing copy.
- implementation of EBSCONET (on-line ordering/claiming of journal subscriptions and or issues).

14. Goals and Accomplishments (1992-93)

1. *Continue to provide library services to support the research, development, and technology transfer at NoFC and its District Offices.*

Continued to provide library services to NoFC and its District Offices.

Approximately eight (8) boxes of duplicates were sent to the Canadian Book Exchange as well as several boxes of publications to the Manitoba District Office.

Binding of library periodicals is being kept up-to-date; 195 volumes were sent out for binding.

Approximately 375 interlibrary loan requests were handled by the library, as well as 12 translation requests.

The library's reference collection is gradually being updated.

Chairs for clients, new signs and display racks have contributed to the library's new image this year. As well the entire monograph collection was shelf-read and new cards and labels were made as needed.

The library continues to receive publications by way of gifts or exchange on an on-going basis.

2. *Undertake required and supplemental courses and training in such areas as cataloguing, on-line searching and SydneyPLUS (the new version of Sydney).*

Both the Head of library services and the library assistant attended at SydneyPLUS Implementation Workshop. CAN/OLE training sessions will not be held until spring of 1993.

3. *Continue to implement Sydney and build the database up to 20,000 records from retrospective conversion, original cataloguing, MARC records and DOBIS.*

The Sydney database continues to grow, with approx. 16,000 records entered as of January 15, 1993.

4. *Plans for the national retrospective conversion of card catalogues will continue, with a stronger effort from this region to coordinate the Forestry Canada libraries in this project.*

The Council of Forestry Canada Libraries did not pursue this at the 1992 annual meeting, and Regional Development's Informatics Specialist left NoFC.

5. *Attend the Special Libraries Association Annual Conference and the Council of Forestry Canada Libraries annual meeting.*

The head of library services attended the Special Libraries Association Annual Conference. NoFC hosted the annual Council of Forestry Canada Libraries meeting.

6. *Continue to provide guidance and assistance to the Manitoba and Saskatchewan District Offices.*

Continues to provide guidance and assistance to both District Offices.

7. *Continue to provide and act as liaison for library related needs in the development of the Aspen Resource Development Centre and Technology Development Unit.*

Continued to provide advice and act as liaison for library related needs in the development of the Aspen Resource Centre and Technology Development Unit, e.g., forest nursery database.

8. *Use DOBIS for cataloguing and interlibrary loans and CAN/OLE for on-line searching and interlibrary loans. These two search services, together with ENVOY, will aid the complete automation of interlibrary loans.*

DOBIS is used extensively for cataloguing and interlibrary loans. CAN/OLE is not being used for interlibrary loans yet because training will not be offered until spring of 1993.

ROMULUS (a complete CD-ROM system for locating serials and ordering documents from Canadian libraries) has been ordered and will facilitate the complete automation of interlibrary loans.

The Internet, via Pacific Forestry Centre, allowed access of American university library catalogues, whose cataloguing copy was instrumental in reducing the United States Department of Agriculture back-log.

9. *To implement on-line searching on CAN/OLE and DIALOG, as well as acquire CAB and AGRICOLA on CD-ROM.*

CAN/OLE on-line searching has been implemented; training for DIALOG will be held in spring or summer of 1993.

AGRICOLA (1984 to date) was purchased and has been used by clients since summer of 1992.

TREECD (a comprehensive forestry information source on CD-ROM) has been ordered but has not yet arrived.

CABCD will be ordered this fiscal year; CAB journals have already been cancelled in preparation.

10. *To totally re-organize and re-label entire contents of library storage room, and prepare guides for retrieval and shelving of material.*

This mega project is close to completion.

11. *To update the serials holdings of Forestry Canada-Northwest Region on CISTI's Union database.*

This project will be completed by March 31st, 1993.

(NOTE: This project was completed Feb. 10, 1993).

15. Information Activities

Not applicable

16. Goals 1993-94

1. Continue to provide library services to support the research, development, and technology transfer at NoFC and its District Offices.
2. Undertake required and supplemental courses and training in such areas as cataloguing, on-line searching and SydneyPLUS (if required).
3. Continue to implement Sydney, and then, dependent upon the release of the VAX version, convert to SydneyPLUS. This conversion will require assistance from Informatics personnel and possibly the vendor (International Library Systems).
4. Attend the Special Libraries Association Annual Conference and the Council of Forestry Canada Libraries annual meeting.
5. Continue to provide guidance and assistance to the Manitoba and Saskatchewan District Offices.
6. Continue to provide advice and act as liaison for library related needs in the development of the Aspen Resource Centre and the Technology Development Unit.
7. Continue to utilize the Internet and DOBIS cataloguing resources to assist in the reduction of the current back-log as well as retrospective conversion.
8. Continue to use ENVOY and DOBIS for interlibrary loans, and implement CAN/OLE and ROMULUS – the ultimate goal being the complete automation of interlibrary loan services. Also to implement an automated in-house program, wherein clients can electronically place orders for publications outside of our holdings.
9. Continue on-line searching on CAN/OLE, as well as implement searching on DIALOG.
10. Continue to offer the present CD-ROM databases and their updates as well as purchase CABCD by the end of this calendar year.

11. Develop and implement a comprehensive marketing strategy for the library and its services, e.g., an information pamphlet detailing and/or announcing library services.

12. To re-activate LUAC and/or explore possible alternatives.

17. Major Co-operators:

i) Internal - Forestry Canada

Not applicable

ii) External -

Not applicable

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement: Not applicable

ii) FC-NWR EARP Committee Approval Date:

PROJECT SUMMARY

A. General Information:

1. Title: Technology Development Unit
2. Responsibility Centre: Northwest Region (8151)
3. Activity: 3121, 2211
4. Program: Regional Development
5. Status: Continuing
6. Last Evaluation: January 17, 1992
7. Next Evaluation:

B. KEYWORDS

023 Genetics/Tree Improvement
 059 Demonstration Forests
 326 Silviculture
 520 Mechanization of Silviculture
 709 Technology Transfer

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	0.00	0.00	0.00	0.00	0.00
Salaries	\$2,248.9	\$1,958.9	\$0.0	\$0.0	\$0.0
O & M	\$4,214.1	\$6,422.7	\$0.0	\$0.0	\$0.0
Capital	\$692.2	\$260.0	\$0.0	\$0.0	\$0.0
G & C	\$5,713.0	\$4,805.0	\$0.0	\$0.0	\$0.0
Total	\$12,868.2	\$13,446.6	\$0.0	\$0.0	\$0.0

D. PROJECT DESCRIPTION:

Forestry issues involve increasing complex issues including climate change, ecosystem conservation, fibre supplies, and integration of non-timber values. The need for closer

coordination and planning of research, delivery of research and extension and planning is more important now than ever before.

The Technology Development Unit was established to proactively disseminate knowledge and technologies based on sound research principles to clients and promote innovation in the forest sector. Main objectives are to improve the capability to deliver forestry programs through effective technology transfer to forest sector clients, provide technical and professional support to other Northwest Region staff in their technology transfer activities, provide extension services and establish and coordinate the Aspen Resource Centre at NoFC.

1. Environmental Review Process

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/ Green Plan Resource Summary

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u>	<u>Upcoming</u>	<u>Planning 1</u>
			\$000s		
Primary Total	17.7	12.3			
Green Plan	28.1	29.1			

3. Collaborators:

Primary:

Alberta Forest Service
Parks Canada - Jasper National Park

Secondary:

Abitibi
Re-Pap
Alberta Pacific
Weldwood,
Weyerhaeuser
Daishowa-Marubeni
Millar Western
Blue Ridge Lumber
Slave Lake Pulp
Alberta Newsprint Company
Canadian Forest Products
Mistik Management
FERIC

University of Saskatchewan
 Dept of Soil Science
 University of Alberta
 Department of Forest Science
 Saskatchewan Department of Environment and Resource Management
 Manitoba Natural Resources

Secondary:

Smaller timber quota holders throughout the region, regional colleges (eg. Olds College), private nurseries, silviculture equipment manufacturers (eg. Beaver Plastics).

4. Green Plan:

The Technology Development Unit and Aspen Resource Centre have two small Green Plan projects involving technology transfer and information dissemination under Forestry Practices component. (Aspen Resource Centre (3781) and Silviculture Systems (3782).

5. Milestones:

1993-94:

1. Provide extension service to clients on technology transfer, development and demonstration opportunities within the Region in consultation with Program Directors, Project Leaders and Northwest Region staff.
2. In collaboration with Northwest Region managers and staff, identify regional technology transfer needs and opportunities, prepare technology transfer plans and action plans to meet regional and national strategic plan objectives, and explore and develop commercialization opportunities subject to funding these activities from A-base, Agreements, Model Forests and Green Plan sources.
3. Continue with the introduction, development and demonstration of new techniques to enhance silvicultural operations in the Northwest Region from the perspective of cost effectiveness, biological suitability and operability through cooperation with major provincial agencies, forest sector and research organizations such as FERIC.
4. Provide support to the Northwest Region activities by serving on relevant in-house, regional and NGO working and advisory committees as required.
5. Attend, plan and participate in relevant conferences, seminars, meetings and workshops with the purpose of providing technology transfer opportunities on behalf of clients.
6. Coordinate the 1993 RRTC Annual Meeting and field workshop and technical session in Alberta.

7. Assessment of past research trials both locally and nationally to determine the best possible ones to demonstrate effective forest renewal options for forest managers.
8. In collaboration with NoFC Communications officers, determine themes, messages and displays for various forest exhibitions and meetings to transfer technology and new developments.
9. Continue to develop the Procite nursery and tree improvement information system for forestry managers.
10. Continue with evaluations and technology transfer projects to meet seedling growers and seed orchard managers needs throughout the NWR.
11. Develop IRM technology transfer initiatives that resulted from the recommendations of the NWR - IRM Task Force set up in 1992.

6. Accomplishments:

1. Technology Development Unit staff collectively handled over 500 written, telephone, and face to face contacts with clients over 1992-93.
2. Technology Development Unit staff provided the following formal extension activities which included 115 face to face meetings with clients on silviculture, nursery and tree improvement issues and another 33 formal presentations on a variety of topics.
3. Technology Development Unit staff prepared or assisted in the preparation of 38 different proposals and plans involving technology transfer, development or demonstration activities in 1992-93 and worked with six Projects to assist in the delivery of various technology transfer activities.

The Technology Development Unit Nursery Specialist assisted with a major retrofit of the NoFC greenhouse and nursery complex to assist Tree Plan Canada with its activities.

4. Technology Development Unit staff members serve on several in-house, regional and NGO working and advisory committees including:

In-House:

EDP and Greenhouse committees,
RRTC
Alberta B.1 sub-committee
NoFC Action Committee

Outside:

FERIC (ASCER)
CIF Rocky Mountain Section
Poplar Council of Canada
Olds College Nursery Growers Curriculum committee

Canadian Pulp and Paper Association Woodlands Group
Weldwood Forest Resource Advisory Group
Project 8032 (White Spruce Understorey Committee)

5. The Technology Development Unit cooperated with a number of provincial and forest industry clients on operational silvicultural demonstration and technology transfer projects in 1992-93 including the following:
 - FERIC Rototiller in Saskatchewan;
 - British Columbia Moulder and Silvanah Selective brushing machine in Alberta;
 - Savannah Stump-Jump disc machine to Alberta and Saskatchewan;
 - introduced the VH Mulcher site preparation tool for Alberta foresters;
 - conducted the first operational demonstrations of site preparation techniques in the Northwest Territories with conventional shear blading and disc trenching techniques.
 - assisted clients with a number of trials involving Forestry Canada technology (A2 Forester and Grizz Mixer) in Alberta, Saskatchewan, Manitoba and British Columbia;
 - Seppi-M brush cutter in Manitoba.
6. The demonstration project in SE Manitoba involving pre-conditioned seed was completed in 1992 and was extended to Saskatchewan with Weyerhaeuser. It will be re-measured in 1993.
7. The RRTC annual meeting and technical session was coordinated by Technology Development Unit staff in Saskatchewan in 1992 and involved 17 speakers representing scientific, technical and professional levels. The meeting attracted over 90 participants.
8. The Procite database for nursery and tree improvement/seed orchard managers was partially completed in 1992-93 with over 110 references added. The database is expected to be completed sometime in 1993 for delivery in early 1994.
9. The Green Plan "Good News" project developed a number of story ideas in 1992 although the two stories selected came from Ontario for the final project. This activity was completed in 1992 and no further plans for 1993 were developed.
10. The position for the Aspen Resource Centre specialist was advertised and hiring was completed by early December of 1992. The ARC had a display at the annual CIF Meeting in Vancouver and other promotional work was initiated during the year.
11. The Technology Development Unit coordinated a major workshop on stand tending which involved over 110 participants and speakers from as far away as Montana and Ontario.

7. Link to strategic plan:National:

Enhancing the effectiveness of forestry research programs through more effective technology transfer is one of the major thrusts in the national strategic plan. Promoting better techniques to reduce and ameliorate environmental impacts from forest operations is another significant strategic plan objective met through Technology Development Unit projects.

Regional:

The Technology Development Unit and Aspen Resource Centre are two of five new thrusts in the NWR 1990-95 Strategic Plan.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January. 28, 1992

1. **STUDY TITLE:** Technology Development Unit
2. **Responsibility Centre:** Northwest Region (8151)
3. **Program:** Regional Development
4. **Project Title:** Technology Development Unit
5. **Office Location(s):** Edmonton, Alberta,
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	R. Bronstein
Team Members	A. Nanka
	D. Sidders
Term	G. Bell
Summer Students	

8. **Study Key Words:** Technology Development Unit, Genetics/Tree Improvement, Forestry Extension, Mechanization of Silviculture, Innovation, Development, Demonstration
9. **Study Activity:** 3121, 2211

10. Study Resources:Personnel Information

		1992-93	Fiscal Year 1993-94			1994-95
Employee Name	Category	Previous	Budget	Revised	Forecast	Upcoming
R. Bronstein	FO-3 (P)	0.00	0.00	1.00		
A. Nanka	EG-6 (T)	0.00	0.00	1.00		
D. Sidders	EG-6 (T)	0.00	0.00	1.00		
G. Bell						
Summer Students						
Aspen Specialist						
FTEs		0.00	0.00	3.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00		
O&M	7.17	15.00			
Capital					
G & C					
TOTAL:	7.17	15.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries:						
Alta.	A8011		15.50			
NWT	N8007		24.12			
Sask.	S8073		10.50			
O&M:						
Alta.	A8011		74.50			
	A8054		1.00			
Man.	M8048		50.00			
	M8050		8.00			
NWT	N8007		30.88			
	N8014		25.00			
Sask.	S8073		77.30			
	S8081		25.00			
	S5002		120.00			
Capital						
G & C:						
Alta.	A3003		8.00			
TOTAL:			469.80			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>						
Salaries						
O&M:	36-86	19.25				
	36-88	8.85				
	37-81		19.40			
	37-82		9.70			
Capital						
G & C						
TOTAL:		28.10	29.10			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Other</u>						
Suspence	36-96 37-99	10.00	10.00			
Parks Canada						
AFS	36-99 37-99	7.74	2.26			
TOTAL:		17.74	12.26			

STUDY TOTAL		526.16				
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11. Study Background and Problem Analysis

Forestry issues today encompass an ever increasing range of complex problems such as ecosystem conservation, climate change, community stability, landscape integration of non-timber forest values, and even international concerns about current forestry practices. Due to the complexity of issues, no one organization is equipped to address them all. As a result, within the forest sector there is a strong need for closer cooperation, sharing of information, and team approaches to solving problems in a more coordinated manner.

The Technology Development Unit was established in 1991 to proactively package and demonstrate our knowledge to potential users through a technology transfer, development and demonstration program. There is a strong mandate for this activity within the Forestry Canada Mission Statement at both National and Regional levels. In collaboration with NWR program managers and staff, the TDU assists in identifying client needs, develops opportunities in meeting our regional technology transfer and development objectives, and strives to ensure Forestry Canada is a recognized, active and important player in forest sector activities within the Region.

12. Study Objectives:

i) Objectives

1. To improve the delivery of forestry programs on provincial, private and native lands through the effective technology transfer and demonstration of research results to forest sector clients throughout the NWR.
2. Provide technical and professional support to NoFC scientists and District field offices in the delivery of technology transfer activities to field managers.
3. Provide consultative, extension and advisory services on technology transfer and development opportunities to exploit the best forest management practices and programs within the NWR to meet overall strategic and national forest strategies.

ii) Deliverables

Short Term (1-5 years)

1. Each year, develop and conduct workshops and demonstrations for field natural resource managers to fulfil technology transfer obligations of R&D projects and other programs (eg. Green Plan, Model Forest, Regional Development Agreements).
2. Provide support to scientists through technical advice, commercialization and intellectual property coordination, guidelines, courses, A/V and other activities in direct support of regional technology transfer projects.
3. Provide forestry extension services to clients on current advancements in nursery, tree improvement, silviculture operations and the Aspen Resource Centre and assist in promoting other disciplines research and development activities to the forest sector.
4. Establish linkages and networks with other technology transfer programs and specialists outside the region.
5. Involve non-traditional clients (eg. native organizations, NGO's, interest groups) in forestry technology transfer activities and programs to demonstrate our knowledge base and encourage their involvement in more hands on forestry activities.
6. Provide opportunities and incentives from programs within the NWR to provide exposure and credit for forestry projects through communications activities and with important forest sector client groups.

Long Term (5 years and beyond)

1. Develop long-term commercialization opportunities for R&D products.
2. Establish a lifelong forestry continuing education opportunity for forestry technical and professional staff based on, in part, Forestry Canada programs of technology transfer and extension.

iii) Significant Linkages:

(Region): FERIC (West and East); B.C. Continuing Forestry Education Program, Canadian Institute of Forestry; Alberta Registered Professional Foresters Association; University of Alberta (Dept. of Forest Science, Faculty of Extension); U. of Saskatchewan; U. of Manitoba.

(National): National Technology Transfer Working Group; PFC (Prince George District Office and Victoria, Seed Physiology); MFC (Silviculture); USFS Portland Station Technology Transfer Station

13. Progress and Achievements

The TDU completed its first full year of operations in 1992-93. Planning and consultation with client groups occupied a significant portion of the year as new staff familiarized themselves with the mandate and regional function of the group.

Unforeseen problems included a spending freeze in the middle of the planning cycle which affected the ability to meet with clients. Delays in signing the Alberta PAIF and extensive paperwork to develop projects resulted in some lack of cohesion of activities. The final major problem occurred as a result of delays with the staffing process which resulted in unacceptable progress with respect to hiring a fourth staff member for the Aspen Resource Centre.

However, notwithstanding the above problems, progress was made on tackling the list of projects and needs identified by our client groups over the past year. The TDU attempted to establish itself throughout the Region and given the resources available, a significant amount of progress was made this past year.

Several more prominent technology transfer accomplishments were:

- the Regional Reforestation Technical Committee (RRTC) workshop and annual meeting in Saskatchewan with over 90 participants from the Region and elsewhere;
- several new forest renewal projects in the Northwest Territories involving site preparation, seedling response study, and an aerial survey methodology for stocking;
- new site preparation demonstration projects across the prairie provinces including high-speed mixing (Grizz, A-2, FERIC Rototiller, VH Mulcher), passive discing (Savannah) and mounding implements (BC Moulder) in cooperative with provincial agencies and forest companies from Manitoba to British Columbia;
- advisory and consultative services to improve current nursery facilities at NoFC, Prince Albert and Weyerhaeuser (Sask.) operations;
- introduction of a course for seedling growers for Alberta;
- chair of Forestry Canada working group on Technology Transfer.
- coordinate NWR participation at Demo'92, a major forest exhibition held every four year;
- development of three workshops in Alberta on the final project results from the "Spruce Understorey Protection Trials established in 1988 (Project 1480).

Other accomplishments in 1992-93 include several other small scale workshops and seminars for field forest practitioners throughout the Region which helped to create awareness for Forestry Canada programs and developed many new ties with a wide range of clients groups.

Outside the Region, the TDU established linkages with researchers and other technology transfer programs to assist in serving local and regional needs, such as George Edwards from PFC on seed physiology and seed pre-conditioning, the B.C. Forest Service Site Preparation Research Group, staff at the Prince George District office on Mixedwood related issues.

14. Goals and Accomplishments (1992-93)

1. *Provide consultative and advisory services to clients and staff on technology transfer, development and demonstration opportunities as the need arise and in consultation with Program Directors and Leaders.*

Activity Type:	Telephone Referral	Written Referral	Field Advice	Internal or Other
Alberta	136	63	69	39
Saskatchewan	40	35	16	8
Manitoba	17	19	18	9
NWT	4	6	8	-
Outside Region	20	15	5	4
Total	217	138	116	60

(to supply literature requests only, 261 requests handled in 1992-93)

Examples:

- i) advice to Jasper National Park and Jasper Park Lodge on options for nursery establishment, seedling development and tree transplant program.
- ii) written comments on project proposals from IRAP, Agreements and forestry fabricators/manufacturers;
- iii) field advice on forest renewal problems with industrial and provincial clients throughout the Region;
- iv) providing copies of literature from library sources, FERIC and in-house publications on a variety of forest management topics ranging from girdling aspen trees to right-of-way clearing machines.

2. *Establish and maintain contacts with NoFC clients.*

Activities:	Client Meetings (face to face)	Client Presentations	Proposals & Plans	Other (colleges, suppliers, fabricators)
Alberta	54	12	12	33
Saskatchewan	27	10	14	11
Manitoba	24	9	6	6
NWT	4	2	6	-
BC or Other	6	-	-	25
TOTAL	115	33	38	77

3. *In collaboration with NWR managers and project staff, identify regional technology transfer needs and opportunities, prepare an action plan outlining appropriate roles and responsibilities of TDU staff in meeting our technology transfer and development objectives.*

Activities that were either completed or are continuing to end of current fiscal year include:

NOR 5 (Fire Management):

- assistance with planning a workshop on fire remote sensing in Salt Lake City for April 8-9, 1993 (ON GOING 1993);
- a conference planning manual for Project staff to assist with their Urban/Wildland Fire Management Conference.

NOR 7 (Environmental Stresses on Forest Ecosystems):

- coordinated final submission for Green Plan Forest Practices proposal;
- J. Feng presentation at RRTC Annual Meeting in Saskatchewan;
- developed preliminary plans with J. Feng to conduct scientific analysis for an operational herbicide demonstration trial in cooperation with AFS and Millar Western in 1993 (ON GOING through 1993-94);
- utilized analytical lab services for samples from various nurseries throughout the Region to assist growers (private and commercial) with their unique problems.

NOR 10 (Mixedwood Silviculture):

- assisted Project leader in the organization and coordination of the 1992 RRTC Annual Meeting and technical Workshop in Waskesiu which involved presentations by Navratil, MacIsaac, Hayward;
- coordinated in-house workshop in Saskatchewan on experimental design and applications for NOR-10 staff;
- assisted with the implementation of field data collection for the Aspen Sensitivity Study in Saskatchewan;

- coordinated presentation with I. Edwards at the Seedling Growers course held at Olds College in December;
- organized 3 technology transfer workshops related to the Project 1480 final reports in Drayton Valley, Hinton and Whitecourt in conjunction with NOR-10 staff, FERIC and Brace Forest Services;
- consulted with NOR-10 Project Leader regarding active silviculture demonstrations projects and results from aspen and herbicide field trials established throughout the Region.
- obtained financial support and provided assistance to Navratil on his compendium of silviculture systems through the Green Plan (scheduled for completion by Mar 31/93).

NOR 11 (Insects and Disease):

- assisted K. Mallett with logistics related to a contract in Manitoba to push over stumps as part of a root rot study.
- helped review one edition of FIDS Notes.

NOR 22 (Tree Plan Canada):

- provided technical assistance and coordinated the rebuild of one NoFC greenhouse and nursery upgrade for use by Tree Plan Canada;
- provided consultation and advice to clients and Tree Plan Canada coordinators on potential project options.

NOR 33 (Communications):

- coordinated the NWR display at Demo '92 in cooperation with NWR Communications Staff (who assisted with displays, banners and provided on site assistance);
- assisted Communications staff in filling requests for interviews, information or other needs related to TDU activities (eg. media demonstration of the Grizz Mixer which resulted in several interviews and coverage in a prominent Edmonton daily newspaper and a clip on ITV News).

4. *Respond to client request, offer forestry extension or other technology transfer services to clients covering a wide range of forest management activities through consultation with appropriate scientific and technical staff.*

TDU staff record all client requests and extension services throughout the year. A total of 792 requests (reported under Goal #1) were handled in 1992-93. Requests may be handled in the following way:

- hard information gleaned from current research reports or work in progress is provided directly to the client;
- telephone advice on a problem faced by the client;
- redirecting the request for follow up by other NoFC research staff to provide specific services/information to meet the clients needs;
- directing the request to other agencies who are better able to serve the request;
- providing presentations, field tours, field information directly to clients at their request.

Examples of several specific extension services include:

- a) two day tour of a delegation of Chinese Foresters to several silviculture demonstration projects in Alberta;
 - b) assist Alberta Newsprint Company Ltd. with a project using site preparation equipment to ameliorate soil conditions caused by whole tree chipping;
 - c) provide technical assistance to Blue Ridge Lumber Ltd. on seedling crop management practices and establishment of a demonstration trial for overwinter protection of containerized seedlings.
 - d) organize contracts for winter and summer site preparation trials at several locations throughout the Northwest Territories;
 - e) organize contract in Manitoba for a mechanized strip thinning/hand clearing operation.
5. *Provide operational and general support through four provincial and territorial partnership agreements and other programs such as Green Plan.*

NOR 42 (Manitoba PAIF provided funding for the following projects):

- a) consulted with clients through a series of meetings and presentations in every forest district and major forest company operation in Manitoba on the opportunities available for technology transfer and development projects with the TDU;
- b) established demonstration and seedling response trials involving high speed mixing site preparation (Grizz) and stand tending (Seppi M releasing and juvenile spacing) in the Sandilands and Swan River regions;
- c) developed and established a "Stock-Performance/Microsite Demonstration trial" in conjunction with Manitoba Forestry Branch which included several site preparation techniques, current stock types grown by MFB and one new stock type reared at NoFC;
- d) implemented a seed demonstration trial with pre-conditioned seed with assistance from G. Edwards (PFC) in both Saskatchewan and Manitoba (funding from both agreements). The trial is scheduled for assessment in 1993 and another stage using "Reclaimer Ameliorating Polymer Generator (RAPG) for coating seed to demonstrate regeneration potential is planned for 1993;
- e) met with District Staff to coordinate technology transfer activities and involved local them in projects with the TDU;
- f) participated in a jack pine breeding program in the Sandilands Forest in cooperation with J. Klein and MFB.
- g) coordinated a seminar for MFB silviculture and other staff by G. Ash (U. of Manitoba) on soil moisture related to drought in the SE;
- h) obtained financial support for MFB Silviculturist to participate in field tour/workshop in B.C. on site preparation and planting stock types in early summer.

Many of the projects listed above are scheduled as On Going in 1993-94.

NOR 44 (Alberta PAIF provided funding for the following projects):

- a) provide technical advice to the B.1 sub-program committee on technology transfer, development projects and applied research programs;
- b) developed and implemented projects in cooperation with Weyerhaeuser, Millar Western, Alberta Newsprint Company, the Alberta Forest Service, and FERIC-West including several small scale site preparation demonstration trials showcasing the following treatments: mounding (BC Moulder), high-speed mixing (Grizz, VH Mulcher) and passive discing (Savannah) to assist clients in meeting their forest renewal obligations;
- c) conducted over 10 presentations and meetings with Alberta clients to solicit requirements and needs for technology transfer in silviculture development, nursery and tree improvement and other program areas;
- d) established four (4) biological seedling/crop tree response study areas within the silvicultural demonstration sites;
- e) supported the Federal Lands program through a site preparation mounding demonstration trial;
- f) negotiated a seedling supply (10 K/year) and technical advisory agreement with Jasper National Park (JNP) and NoFC for a period of five years to assist JNP with a Tree Rehabilitation Program - funding provided by JNP at \$10 K per year;
- g) investigated various institutions best suited for delivery of a "seedling growers course" with Olds College selected to deliver the courses, included curriculum development and course planning sessions, selection committee of growers and evaluators as other completed activities. The first course was held Dec. 8-10 1992 with 57 registrants. Future plans include continued curriculum development for courses in 1993 and beyond;
- h) conducted three (3) workshops for industry and provincial staff to meet technology transfer requirements related to completed reports from Project 1480 - "White Spruce Understorey Protection Trials" in Whitecourt, Drayton Valley and Hinton.;
- i) held an active demonstration for AFS/industry silviculture staff to see the B.C. Moulder in action during November - 40+ participants;
- j) developed a major technical workshop with AFS Reforestation Branch for Alberta's foresters on stand tending for March 10-11, 1993;
- k) completed following activities related to the development of a "Site Preparation Field Manual" for Alberta clients: collected historic data sets from AFS on the existing PSP monitoring plot; stratified field sites on the basis of ecoregions; completed aerial survey of regeneration status, vegetation competition and tree heights; to determine the representativeness of the sites. Further activities for 1993 include linkages with H. Archibald on ecosystem classification of the most represented sites, soil sampling, drainage classification and final field analysis for the draft report.

Many of projects above will continue in some form in 1993-94.

NOR 46 (Saskatchewan PAIF provided support and funding for the projects listed below):

- a) provided technical assistance and contract development to program managers to set up the technology transfer and development projects for 1992-93;

- b) continued as project authority and worked with District Staff to complete several specific forest renewal and tending projects at different locations throughout the province including: Aspen Sensitivity field surveys; Grizz development and field tests; A-2 demo.; FERIC Rototiller trial; and vegetation mats applications;
- c) obtained District staff assistance for the TDU with projects in the NWT (aerial stocking survey) and Manitoba (Seppi M trials) to provide on site supervision support ;
- d) provided technical advice to Prince Albert Nursery personnel on greenhouse retrofit options and seedbed rehabilitation by arranging a loan of a subsoil vibrator from the B.C Ministry of Forests;
- e) procured financial support for nursery personnel from Big River and Prince Albert to attend the B.C Forest Nursery annual meeting and tour several B.C. nurseries to see new nursery innovations and growing techniques;
- f) held the RRTC annual meeting with funding and staff support provided by the Saskatchewan District Office;
- g) providing assistance to the Saskatchewan District Office to complete various project status reports for publication and distribution to clients (on going this winter);

NOR 48 (NWT Agreement provided funding for the projects listed below):

- a) prepared two Implementing Party Workplans for the following programs in 1992-93: "Reforestation and Intensive Forest Management" and "Applied Research, Marketing and Technology Transfer";
 - b) reviewed specific project proposals for Agreement managers as required;
 - c) conducted demonstration projects in cooperation with GNWT Renewable Resources staff involving the first summer and winter site preparation trials in the NWT, an artificial renewal demonstrations using Cerkon direct seeding;
 - d) developed a workshop on forest renewal and ecosystem related options for GNWT Renewable Resources staff to be held in February of 1993;
 - e) trained GNWT staff to implement an aerial depletion forest land survey that classified approximately 18,000 ha of cutover and previously burned lands.
6. *Attend relevant conferences, seminars, meetings and workshops to gather information on behalf of clients and disseminate information and technology to clients.*

	Conferences	Seminars	Meetings (external)	Workshops
R. Bronstein	4	2	4	3
A. Nanka		2	5	2
D. Sidders	1	2	10	1

7. *TDU serve on in-house, regional and NGO working and advisory committees.*

TDU staff sit on the following active committees:

In-House: NoFC EDP and Greenhouse committees, Regional Reforestation Technical Advisory Committee, Alberta B.1 sub-committee, NoFc Action Committee

Outside: FERIC-West ASCER, CIF Rocky Mountain Section (Secretary-Treasurer), Poplar Council of Canada (Secretary-Treasurer), Olds College Nursery Growers Curriculum committee, Canadian Pulp and Paper Association Woodlands Group, Weldwood Forest Resource Advisory Group

TDU staff participated in the following committees that either completed in 1992 or require ad hoc support: NWR IRM Task Group, FERIC-East ASCER, AFS/AFPA Silviculture Subcommittee.

8. *Cooperate with clients including FERIC on operational development, demonstration and technology transfer projects for silvicultural equipment and related technologies through the Region.*

Accomplishments were also reported under goals #3 and #5. Briefly the following activities were accomplished:

- Saskatchewan demonstration and development project with FERIC East for the Rototiller high-speed mixing tool;
- obtained a workshop presentation by FERIC-East at the RRTC annual workshop and promoted their Rototiller innovation at Demo '92;
- FERIC-West Harvesting Group Leader participated as a presenter under contract for the workshops related to Project 1480 - Spruce Understorey Protection for Alberta clients in 1992;
- two cooperative projects began in November 1992 with FERIC-West on development trials for the B.C. Moulder and Silvanah Selective brushing machine in Alberta in cooperation with AFS staff and industry support;
- held a planning meeting with the I. Hedin from FERIC West and D. Patterson (AFS) to develop cooperative project proposals for 1993-94 in Alberta and Saskatchewan.

Response to active field trials and demonstrations in 1992 was very positive throughout the region, and especially in Alberta with staff and financial support from the AFS, Millar Western, Weyerhaeuser, Blue Ridge and Alberta Newsprint companies offering continued assistance and access to operating areas for continued work in 1993..

9. *Continue with demonstration project in SE Manitoba involving stand establishment, site classification and climate change and with the operational rooted cutting program funded partially by Saskatchewan and Manitoba agreements.*

A contract was let to a consultant to produce a report on the three most promising site types within the area as part of a larger demonstration project (reported under goal #5) in the Sandilands Forest Reserve in SE Manitoba. Contract report in progress for submission by end of fiscal year.

10. *Coordinate 1992 RRTC Annual Meeting and workshop.*

A technical field workshop was held in Waskesiu, SK during August 25-27, 1992 which involved 17 speakers representing scientific, technical and professional levels from 5

provinces. The workshop attracted over 90 participants and was heavily supported by the Saskatchewan PAIF (some limited support by the Manitoba PAIF for travel expenses). Support, advice and coordination was required for the workshop from NOR-10 program staff, the Saskatchewan Department of Renewable Resources and SDO staff. Project 8066.

The annual meeting of the RRTC resulted in a renewed mandate and expanded membership. The next annual meeting and workshop will be held in Lac La Biche, Alberta in 1993 on the theme "Planting Stock Compatibility with Site and Microsite" and will be coordinated by the TDU in cooperation with the Alberta Forest Service.

11. *Host and conduct Forestry Canada national Working Group meeting and field tour in Alberta in 1992.*

The 1992 meeting was held in Edmonton in May. Representatives from most Forestry Canada regions and guests from the United States Forest Service in Portland, Industry, Science and Technology Canada, National Research Council and FEFIC West resulted in many new ties and linkages. A field tour followed the meeting to visit one of the Project 1480 research trials and a TDU cooperative trial demonstration project with Weyerhaeuser near Edson. The TDU Chief continued to provide assistance in the preparation of a draft Working Group Action Plan for 1993-94.

12. *Develop workshop on the Productive Forest Land Depletion Classification for Saskatchewan clients in cooperation with the District Office and Saskatchewan Forestry Branch.*

No action on a workshop in 1992 although field data gathering continued throughout the year by NOR 10 and District Office staff.

13. *Conduct workshops as required to meet regional tree improvement, nursery, and silviculture needs as they arise from clients.*

Accomplishments have been detailed under previous goals #3 and 5, the list of workshops completed in 1992-93 include:

- on-site consultation and trouble shooting for several nursery managers/growers in Alberta and Saskatchewan;
- 3 workshops were conducted in July in Alberta involving approximately 95 field foresters from industry and government in Alberta and Saskatchewan on harvesting/tending options to favour white spruce advance regeneration;

Two workshops planned for the period January - March 1993:

- workshop on silvicultural renewal, seedling quality and ecosystems in Hay River, NWT;
- a large workshop on stand tending in Edmonton in March in conjunction with the AFS Silviculture Branch;
- provided guidance to NOR-5 staff for a workshop scheduled for April in Salt Lake City, UT on remote sensing applications for fire management.

14. *Assist NoFC managers and project staff with specific technology transfer and development needs during the year and continue to host R&D Forums for staff throughout the year.*

- the semi-annual R&D Forum was held May 5th at NoFC as part of National Forest Week activities, next FORUM is planned for Feb '93;
 - other accomplishments are reported under goals #3 and 5.
15. *Explore continuing education seminars for foresters through the Department of Forest Science at the University of Alberta and with the Alberta Registered Professional Foresters and Canadian Institute of Forestry.*
- meetings were held with the CIF, RPF and Department of Forest Science representatives to develop a continuing forestry education program for Alberta's foresters.
 - liaison and information was obtained from the B.C. Forestry Continuing Education program.
 - convened a meeting with industry, government and NGO groups on June 11 1992 in Slave Lake to determine needs and develop an action plan if possible
 - discussions continue to date.
16. *Continuing development of the following projects:*

i) Procite database for nursery and tree improvement/seed orchard managers:

Implemented literature organization for the Forest Nursery Technical Information System by having a summer student flag required reference literature which will be used to develop phase I. Phase I involves the use of selective literature to develop a "Technical Growers guide". Funding in 1992/93: Can-Sask PAIF. This project will continue in 1993.

ii) Green Plan technology transfer and demonstration projects.

Obtained financial support from the Green Plan for the Aspen Resource Centre Specialist. The majority of activity was related to continued staffing action and release of the Aspen Bibliography data base to several clients. A second project on preparing a compendium of silviculture systems with S. Navratil will involve publishing this report by March 31, 1993.

iii) Assist Manager of Communications with the Green Plan "Good News" project.

This project was initiated by the Manager of Communications until the Technology Transfer Working Group assumed control in mid-year as an Action Item under their plan. One "Good News" project story was initiated in 1992 in Ontario Region by Guy Smith in consultation with other working group members. Several regions contributed potential story ideas for future projects.

17. *Complete the establishment of the Aspen Resource Centre.*

Staffing for the position of ARC Specialist proceeded slowly. Final interviews for the position were completed in November and soon thereafter another hiring freeze has frozen all activities with this goal until recently. Offers will be made this week.

18. *Initiate planning in support of a major symposium in the Region of national significance on a forestry issue for 1993.*

The IRM Task Force met 3 times in 1992 and produced a report to Management Committee that recommended a major symposium be developed on integrated resource management. The TDU will continue to develop this initiative in 1993. The TDU Chief accepted the role of internal coordinator for National Forestry Capital activities within NoFC in 1994 which may also involve a major symposium (ON GOING 1993).

Added Goals and Accomplishments - 1992-93:

19. *Prepare a display and provide support for the NWR participation in Demo'92.*

The TDU organized the NWR display for Demo'92 in cooperation with all three provincial agreements which provided funds. In addition, staff from both District Offices assisted with display development, equipment movement, and helped man the display on site. The Poplar Council of Canada also joined in and shared display space with Northern.

This event was held in Kelowna from September 16 - 21, 1992 and drew approximately 7500 participants to view active and static displays on silviculture and logging technology. The NWR display consisted of active demonstrations and static displays demonstrating the linkages between research and field level applications.

20. *Provide technical assistance and coordinate major upgrades to NoFC greenhouse and nursery facilities.*

Planned and implemented greenhouse #1 retrofit at NoFC, planned crop schedules from Jan. 19 through June 1993 and secured funding from Jasper National Park (\$10 K) and Tree Plan Canada (\$37 K) in 1993 in lieu of 200 K seedlings for delivery over the next 4 years.

15. Information Activities

- iv) Lectures, courses, seminars and scientific addresses:

Bronstein: "Technology Transfer Overview" - CIF Saskatchewan AGM; "Planning From A public Point of View" - RRTC Meeting, Waskesiu, SK; upcoming presentation scheduled before Mar'93 include "Woodlot Management" at the Northern Native Agriculture Development Conference in Slave Lake and "Professional Ethics and Policy" for P. Murphy at U. of A.

Sidders: "Silviculture Operations Development and Technology Transfer" - CIF Saskatchewan AGM; "Site Preparation Influence on Forest Soils" - lecture at U. of A. Soils Dept. Apr'92; "Mixing Site Preparation Development" and "Aspen Sensitivity Study" - RRTC Annual Meeting - Aug'92; 4 different presentations to MFB district offices on "Silvicultural Development and Technology Transfer" during summer'92.

16. Goals 1993-94

1. Provide extension service to clients on technology transfer, development and demonstration opportunities within the Region in consultation with Program Directors, Project Leaders and NWR staff.
2. In collaboration with Northwest Region managers and staff, identify regional technology transfer needs and opportunities and prepare technology transfer plans and action plans to meet regional and national strategic plan objectives. Funding for these activities is derived from A-base, Agreements, Model Forests and Green Plans sources.

Examples:

- technology transfer related to new options for favouring white spruce development during harvest operations in the Peace and Slave Lake Forests (proposed under Green Plan Forest Practices);
 - remote sensing for fire management workshop (A Base);
 - technology transfer package related to alternative silviculture/ old CFS trials in Riding Mountain National Park (Manitoba Agreement);
 - explore commercialization and development opportunities for new technologies with various projects in the NWR;
 - explore possible linkages with Wood Buffalo National Park to develop techniques for regeneration of cutover lands.
3. Continue with the introduction, development and demonstration of new techniques to enhance silvicultural operations in the NWR from the perspective of cost effectiveness, biological suitability and operability through cooperation with major provincial agencies, forest sector and research organizations such as FERIC.
 4. Provide support to the NWR activities by serving on relevant in-house, regional and NGO working and advisory committees as required.
 - Alberta Agreement B.1 Subcommittee
 - NWT Implementing Party Work Plans
 - 1994 National Forestry Capital Committee
 - Weldwood Forest Resource Advisory Group
 - NoFC EDP and Greenhouse Committees
 - Chair Technology Transfer Working Group
 5. Attend, plan and participate in relevant conferences, seminars, meetings and workshops with the purpose of providing technology transfer opportunities on behalf of clients.
 6. Coordinate the 1993 RRTC Annual Meeting and field workshop and technical session in Alberta.
 7. Assessment of past research trials both locally and nationally to determine the best possible ones to demonstrate effective forest renewal options for forest managers.
 8. In collaboration with NoFC Communications officers, determine themes, messages and displays for various forest exhibitions and meetings to transfer technology and new developments. examples:
 - Northern Alberta Forestry Show (May '93)

9. Continue to develop the Procite nursery and tree improvement information system for forestry managers.
 10. Continue with evaluations and technology transfer projects to meet seedling growers and seed orchard managers needs throughout the NWR. examples:
 - Olds College course development for seedling growers;
 - on site trouble shooting and evaluations at NWR nursery and seed orchard establishments;
 - planting stock development technology transfer and demonstration projects.
 11. Develop IRM technology transfer initiatives that resulted from the recommendations of the NWR - IRM Task Force set up in 1992 to link forest sector groups with NGO's and other interested parties.
17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
NWR	NOR-10	Mixedwood Silviculture	Navratil, Edwards, Lux
	NOR-05	Fire	Lee, Ogilvie
	NOR-06	Economics	White, Boxall
	NOR-11	I & D	Mallett, Langor
	NOR-22	Tree Plan Canada	De Franceschi
	NOR-33	Communications	Samoil, Pronger, Worster

ii) External -

Establishment	ID#	Title	Contact name
Alberta Forest Service		Reforestation Branch	D. Fatterson, D. McCullough, S. Robertson, C. McDonald
Manitoba Forest Branch		Reforestation Section	L. Yarn, J. Dojak
Saskatchewan Forestry Branch		Silviculture Branch	J. Thompson, J. Chernyk
Weyerhaeuser Canada Ltd.			B. Macmillan, J. Lane, J. Spencer
Millar Western Industries Ltd.			T. Wakelin
Alberta Newsprint Company Ltd.			J. McCammon
Blue Ridge Lumber Ltd.			B. McDonald
GNWT			B. Larson
B.C. Forest Service		Site Prep. Research Group	L. Bedford

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Canada-Manitoba Partnership Agreement in Forestry and Manitoba District Office
2. Responsibility Centre: Northwest Region (8351)
3. Activity: 3121
4. Program: Regional Development
5. Status: Continuing
6. Last Evaluation: January 25, 1993
7. Next Evaluation:

B. KEYWORDS:

005 Development
 021 Sustainable Development
 023 Genetics/Tree Improvement
 037 Research Support
 054 Public Information/Awareness
 061 Private Woodlots Owners
 062 Aboriginal lands
 065 Increased prediction/preparation
 100 Green Plan
 121 University Support
 326 Silviculture
 709 Technology Transfer

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	0.00	0.00	13.00	0.00	0.00
Salaries	\$0.0	\$0.0	\$631.1	\$0.0	\$0.0
O & M	\$0.0	\$0.0	\$1,339.1	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$100.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$1,614.5	\$0.0	\$0.0
Total	\$0.0	\$0.0	\$3,684.7	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS:

NOR-42 includes the Canada-Manitoba Partnership Agreement in Forestry as well as Forestry Canada district activities within the Province of Manitoba. The objectives of this agreement are:

- i) to ensure the availability of long term economically accessible timber supplies in Manitoba through planning, forest renewal, intensive forest management, applied research and technology transfer.
- ii) to optimize management and utilization of Manitoba's forest resources including improved knowledge and understanding of non-timber forest values through planning, applied research, market development, technology transfer and public information;
- iii) to contribute to the economic diversification of the provincial forest sector, including the improvement of employment opportunities through applied research, market development, technology transfer and public information.

The district office also provides support for research and management activities which originate from the Northern Forestry Centre and the Northwest region but take place within the Province of Manitoba.

NOR 42 has established studies for Tree Plan Canada activities within Manitoba and aspects of the Communication program related to it. TPC is a community tree planting program initiative under The Green Plan to have Canadians become involved in urban and rural community tree planting projects to improve the environment and the intent is to beautify communities and rural landscapes.

NOR 42 also has an established study for the Model Forest program within this province. Significant staff time has been required within this program to provide support to the model forest board.

1. Environment Assessment Review Process:

The NoFC Environmental Screening Committee has evaluated the proposed different studies within this project on the basis of information provided by the Agreement PAIF or the study leader. There may be components of individual studies that need to be screened or assessed by the Environmental Screening Committee for specific activities, but as a whole the proposed activities and studies are not potentially detrimental to the environment.

2. Collaborators/Green Plan Resource Summary (\$s):

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary					
Secondary					
Total					
Green Plan					

3. Collaborators:Secondary

Manitoba Department of Natural Resources
 Abitibi Price Inc.
 Repap Manitoba Limited
 University of Manitoba
 University of Brandon
 Municipalities
 Indian Reserves/tribal councils
 Non-government organizations

4. Green Plan:

NOR 42 has been active in supporting Tree Plan Canada; assisting in the development of Manitoba's Model Forest as well as in giving research support services and advice to research technology transfer and communications programs/projects that are being developed under the S&T initiatives.

5. Milestones:1993-94:

1. Develop, manage, implement and deliver the Canada-Manitoba Partnership Agreements in Forestry.
2. Represent Forestry Canada interests throughout the region by participating in appropriate meetings, committees, workshops, etc.
3. Participate in the development and implementation of Tree Plan Canada in the Province of Manitoba.
4. Participate in the development and implementation of Model Forests in the Province of Manitoba.

6. Accomplishments:

1. The Manitoba PAIF activities continued in reforestation, research and development, private land forestry, Indian land forestry, long term integrated forest resource management planning and communications and technology transfer.
2. Forestry Canada was represented throughout the region by attendance at a large number of meetings, workshops, seminars and committee work.
3. District staff participated and chaired a regional IRM task Force which looked at and made recommendations concerning the NoFC role in integrated resource management. (McQueen)
4. Significant private lands activities have resulted in this portion of the program being overloaded with requests for forest inventory plans. It is expected that many more requests will occur in the very near future.
5. Manitoba's model forest has now completed its first annual operating plan using format recommended by the district.

7. Link to Strategic Plan:

National:

NOR 42 has direct linkages by providing Forest Sector Leadership, negotiating New Forestry Agreements and developing programs for Demonstration Forests, forest workers, Private Woodlot Owners and Aboriginal Lands.

Regional/Institute:

NOR 42 is linked to resolving regional issues in economic forest use and regional development, federal and private lands and research, development and innovation.

8. Establishment/Institute Specific Information:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 31, 1993

1. **STUDY TITLE:** Can.-Man. Partnership Agreement in Forestry and Manitoba District Office
2. **Responsibility Centre:** Northwest Region (8151)
3. **Program:** Regional Development
4. **Project Title:** Can.-Man. Partnership Agreement in Forestry and Manitoba District office
5. **Office Location(s):** Winnipeg, Manitoba
6. **Work Location:** Primarily within Manitoba
7. **Study Staff:**

	Name
Study Leader	J. McQueen
Team Members	J. Klein
	P. Chapman
	B. Beaton
	G. Brunet
	D. Pronger
	G. Williamson
	J. Dyck
	D. Ip
	M. Grandmaison
	N. Walker
	J. Ball
	R. McMahon

8. Study Key Words: Forest renewal, intensive management, Private Land Forestry, Federal Land Forestry, Resource data base, FIDS, fire management, nursery management, tree improvement, communications, public information, development agreement, administration, evaluation, economic development
9. Study Activity: 3121, 2212
10. Study Resources:

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
J. McQueen	CO-03 (A)	1.00	1.00	1.00		
J. Klein	SE-RES-2 (P)	1.00	1.00	1.00		
P. Chapman	EG-05 (T)	1.00	1.00	1.00		
B. Beaton	CR-04 (S)	0.00	0.00	1.00		
G. Brunet	CR-03 (S)	0.00	0.00	0.00		
D. Pronger	IS-03 (A)	1.00	1.00	1.00		
G. Williamson	FO-02 (P)	1.00	1.00	1.00		
J. Dyck	EG-05 (T)	1.00	1.00	1.00		
D. Ip	FO-02 (P)	1.00	1.00	1.00		
Grandmaison	EG-05 (T)	1.00	1.00	1.00		
N. Walker	EG-05 (T)	1.00	1.00	1.00		
J. Ball	FO-01 (P)	1.00	1.00	1.00		
R. McMahon	CS-02 (A)	1.00	1.00	1.00		
FTEs				13.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	0.00
O&M	5.84	0.00	0.00	0.00	0.00
Capital					
G & C					
TOTAL:	5.84	0.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries		448.85	476.98	0.00	0.00	
O&M		957.32	1248.49			
Capital		214.32	100.00			
G & C		1516.03	1614.50			
TOTAL:		3136.53	3439.94			
STUDY TOTAL		3142.37	3439.94			

11. Study Background and Problem Analysis

To provide regional liaison for all Forestry Canada activities occurring within the Province of Manitoba.

To coordinate the implementation of sectoral forestry employment stimulation programs in Manitoba.

To facilitate the maximization of funding available to the Forestry sector in Manitoba from other federal agencies.

To represent Forestry Canada in matters related to federal and provincial governments, industry and the general public.

12. Study Objectives:

i) Objectives

The overall goal of this project/study is:

To manage and coordinate the implementation of federally-funded initiatives and monitor the use of federal funds related to the Canada-Manitoba Partnership Agreement in Forestry by:

- a) assisting in the development and maintenance of timber supplies to help ensure the long term viability of the forest industry in Manitoba;
- b) promoting the efficient utilization of the forest resource in Manitoba;
- c) contributing to the economic development of the Manitoba forestry sector including the improvement of employment opportunities in the sector; and

d) assessing Forestry Canada and Manitoba Natural Resources forestry related needs.

Within Program A - Reforestation and Wood supply

Enhancement, there are several objectives to accomplished within the Agreement time frame:

A.2 Management of Federal Crown Lands

1. To initiate forest inventories and management plans on Native Reserves that have forestry potential. Based on these plans implement a silviculture program that will enhance the forest value of the land and provide some long term economic opportunities.
2. To allow natives to gain experience in forest industry activities and a better opportunity to benefit from employment opportunities generated by local forest industries.

A.3 Private Land Forests

3. To establish a incentive program for private land owners that will enhance their private forest resources and provide some diversification of the rural economy.
4. To provide extension services to private land owners that will provide them with direction and information on how to properly manage their private woodlots.

A.4 Wood Supply Enhancement - Forest Management Areas

5. To enhance the wood for the forest industry by stand tending and cleaning of overcrowded stands. Over the course of the Agreement some 1,800 hectares will be treated.

Within Program B. - Applied Research, Marketing and Technology Transfer and continuing research initiatives, the following objectives as well as short term and long term deliverables are outlined for several research areas:

ii) Deliverables

Insect and Disease

Short Term Deliverables

1. Project progress reports, publishable analyses and recommendations, technical notes.
2. Feedback and follow-up reports from extension work and cooperative projects.
3. Forest pest condition updates: FIDS annual file, regional, and national reports.

4. Contributions to monthly Insect and Disease Notes.
5. ARNEWS annual updates.

Long Term Deliverables

1. Critical analysis of forest pest management techniques, specifically root disease control, and spruce budworm outbreak prediction.
2. Contributions to national FIDS data bank.
3. Enhanced understanding and management of forest pests by all forest interest groups in Manitoba.

Tree Improvement

Short Term Deliverables

1. For eastern breeding district jack pine, establish seed orchard trees based on 15-year selection, establish first generation gain test, establish and report on retrospective progeny test, complete and publish plan for second generation breeding, and begin implementing second generation breeding using selection based on 20-21 year measurements.
2. Provide preliminary results of applied research on seed orchard management, including early tending, crown management, nitrogen level, and container culture.
3. Publish results of contract research on vegetative propagation of jack pine, and begin transfer of results of new controlled pollination system for delivery of genetic improvement.
4. For central breeding district jack pine, complete grafting for potted seed orchard and determine final composition of seed orchard by analysis of 17-18 year measurements.
5. Provide advice and assistance on forest genetics and tree improvement to clients in Northwest Region as required, in consultation with Nursery and Tree Improvement Specialist in TDU.
6. Analyze data and report on black spruce range-wide provenance experience.

Long Term Deliverables

1. Develop new delivery system for genetic improvement of jack pine, using controlled pollination with large-scale vegetative propagation.
2. Advise and assist tree improvement programs in Northwest Region and elsewhere, especially in analysis of test data, index selection, and breeding program strategy.

3. Conduct research on tree breeding strategy, using established jack pine breeding populations.

Decision Support

Short Term Deliverables

1. Five reports by Ball/Walker: Pine Falls Stock Trials Information Report; MS 166 (1993-94 goals 1, 3, and 4; MS 160 (goal 5). Other work outlined in Waldron contract (preliminary report, January 6, 1993) will be prioritized in consultation with DSS project leader (in-house).
2. Report on 1992 field assessment of shelterwood and site preparation demonstrations carried out under the Brace contract. (Canada-Manitoba PAIF contract).
3. MS 226 report (Canada-Manitoba contract).
4. MS 147 report (Canada-Manitoba contract).
5. A journal article and Agreement report on seedling ingress and growth after shelterwood harvesting in boreal mixedwoods.

Long Term Deliverables

1. To reassess high priority Forestry Canada R&D projects primarily in the former Riding Mountain Experimental Area, Manitoba. Results from ecologically site-classified mixedwood and aspen ecosystems 30+ years after treatment will provide valuable answers to questions being asked by mixedwood managers today as well as providing a valuable contribution to NoFC's Decision Support Systems for mixedwood silviculture.

iii) Significant Linkages:

Manitoba Natural Resources - Forestry Branch
 Saskatchewan Environmental and Resource Management - Forestry
 Agriculture Canada, Morden Research Station - Contract for research on vegetative propagation of jack pine
 NOR-11, Y. Hiratsuka - Inheritance of resistance of western gall rust in jack pine
 NOR-10, S. Navratil - mixed wood silviculture

13. Progress and Achievements

See Annual and Semi-annual Reports of the Manitoba Partnership Agreement in Forestry.

14. Goals and Accomplishments (1992-93)

Communications

1. Initiated "Blurb" - District Office Newsletter; distributed 4 news releases; produced a 4-minute video for community cable television; developed display "Forest Values"; distributed 20,000 seedling at fairs and exhibitions; produced pamphlet, "Living With Our Forests"; planned and coordinated Tree Plan Canada launch; responded to 200 requests for information; maintained liaison and support with forest sector and Green Plan programs. (McQueen, Pronger)

Informatives and GIS

2. Researched, procured, and began the integration of various computer hardware, computer software, peripherals, and data services into a stable, fully functional, and highly useful network computing system. Acquired hardware and software to enhance office automation, scientific analysis, and spatial data analysis. Also, assisted Manitoba District Office staff in learning this new environment. (McMahon)

A.2 Management of Federal Crown Lands

3. *The goals of this sub program were: i) to initiate inventory and management plans on eight (8) Reserves within the province of Manitoba; ii) to establish an annual silvicultural program on Reserve Lands based on management plans that will meet the forest renewal objectives and provide employment and training for Native people. (Williamson, Dyck)*

By the end of March 1993, five inventories and a management plan will have been completed. Four of these are on Reserves that are member bands of the Southeast Resource Development Council Corp. (Hollow Water, Berens River, Little Black River, and Bloodvein). The fifth management plan was completed for the Mathias Colomb Reserve which is a member of the Swampy Cree Tribal Council. Band members were employed in forest inventory and management planning work.

Forest renewal activities based on management plans completed in 1991/92 took place on five Reserves (Sagkeeng, The Pas, Indian Birch, Shoal River, and Moose Lake; the last four are members of the Swampy Cree Tribal Council). Eight hundred thousand seedlings were employed and trained in all phases of silviculture work.

A.3 Private Land Forests

4. *The goals of this sub program were: i) to establish the private lands forests program in the province through provision extension services and the development of management plans on private woodlots by agro forestry specialists; ii) to develop demonstration forests that will allow people to visually see forest management activities and the benefits derived from them. Brochures and informational pamphlets were provided to land owners with some ideas for diversifying their income through non-traditional agricultural land use. (Williamson, Dyck)*

Approximately 120 management plans will be completed by the end of March 1993; 80 of these will be in southeast, interlake and northern part of Manitoba and 40 will be in the southwest. Brochures describing the woodlot program have been prepared.

Successful field days were held by the Woodlot Association of Manitoba (WAM) and The Christmas Tree Growers Association (MCTGA). WAM's field days were at La Broquerie in the southeast and at Neelin in southwest; MCTGA's field day was held at Hadashville in the southeast. WAM also organized a highly successful and well attended "townhall" meeting in the interlake area at Teulon. Support was also provided for newsletters and other PR work for both associations.

Forest demonstration sites were chosen at the MFA Conservation centre at Hadashville and at the University of Brandon forest, although no developmental work on these sites is contemplated this year. A preliminary pamphlet on growing Shitakee and oyster mushrooms will be completed by the end of this year.

A.4 Wood supply Enhancement - Forest Management Area

5. *Goals of this subprogram were: i) to thin 620 hectare of fire origin jack pine stands to increase their growth and productivity; ii) to inventory backlog work needed on spruce sites to bring these sites back into production and to place priorities on those sites that will benefit most from treatment. (Williamson, Dyck)*

Three hundred and sixty hectares of land were thinned on industrial forest management areas; 260 on the Repap lease and 100 on the Abitibi-Price lease, forest management areas. However, the provincial forestry branch must approve the permit to work on provincial crown lands prior to any work being initiated.

Insect and Disease

6. M. Grandmaison coordinated, planned, and conducted pest surveys in Manitoba plantations, PSPs and ARNEWS plots, and reported the results in an annual File Report.

M. Grandmaison and D. Ip provided 50-60 extension call services including telephone advice, and a 1.5 day professional workshop for 21 clients.

M. Grandmaison and D. Ip both attended the Pest Management Section Peer Review (Edmonton), RIDTAC meeting (Saskatoon), FIDS Study Review (Edmonton), pest-related meetings and training workshops (survey techniques, First Aid, CPR, chainsaw safety).

D. Ip attended Northwest Regional Session (Edmonton), Advanced Forest Herbicide Program, Supervisors' Orientation Program, Interpersonal Skills Workshop, Tree and Shrub Maintenance Course; and gave presentations at Entomological Society of Manitoba Annual Meeting, and University of Manitoba Lecture Series.

D. Ip represented Forestry Canada at DEDTAC meetings, and on University of Manitoba grant projects.

D. Ip accompanied M. Grandmaison to his field sites to observe the FIDS work and conditions first hand.

D. Ip and M. Grandmaison both hired and supervised summer students; D. Ip supervised four contractors in various work.

Tree Improvement

7. *Publish the draft Forest Management Note on estimation of wood density in jack pine at 16 years from planting using the Forest Model 6-joule Pilodyn. (Klein/Chapman)*

This goal was not accomplished owing to lack of sufficient time.

8. *Draft a manuscript for a joint journal paper on results in the eastern breeding district family test to 15 years. (Klein; Chapman)*

Despite numerous contacts and attempted contacts with the co-author, analysis results have not been received from the co-author.

9. *Plan, organize, and implement controlled breeding among selected trees in the eastern breeding district family test to 15 years. (Klein; Chapman)*

Controlled breedings was planned, organized, and successfully implemented in cooperation with the Nursery and Tree Improvement Specialist of the TDU, and with staff of Manitoba Forestry Branch.

10. *Assist as required in controlled breeding to produce progenies for research on inheritance of response to infection by the western gall rust fungus, and other aspects of research on this disease. (Klein; Chapman)*

Controlled breeding of western gall rust research progenies was integrated with controlled breeding of seed orchard progenies (goal 3), and was successfully accomplished. Assisted in finding original source stands of family test progenies for the rust research program.

11. *Revise the second-generation breeding plan for Manitoba as required, including detailed planning of selection and mating of parents of second generation progenies. Pursue publication of final plan. (Klein; Chapman)*

Revision of the second generation plan has not been done, but processing of 20-21 year measurement data for selection is in progress.

12. *Draft and publish a Forest Management Note on selection of parents and breeding of seed orchard progenies for the western and eastern breeding districts.*

An Agreement Report entitled "Selection and mating of jack pine family test trees to produce seed orchard progenies for Saskatchewan and Manitoba" was written, rather than a Forest Management Note.

13. *Analyze height and diameter from the eastern breeding district family test at 20 years from planting, select about half of these trees for assessment of secondary traits, and collect samples for stem analysis.*

About half of the trees measured for height and diameter at 20 years were chosen for assessment of secondary traits by inspection of measurement records. Scoring of stem quality, counting of rust galls, and estimation of wood density using the Forest Model

Pilodyn were accomplished for four of the five sets of replications. Collection of wood samples is in progress and scheduled for completion before the end of January.

14. *Plant some of the seedlings from the 1991 greenhouse early test in a short-term field test at Pineland Forest Nursery, and begin analyzing greenhouse data from the test.*

Seedlings not harvested for destructive tests in Edmonton were planted at Pineland Forest Nursery. Greenhouse data have not been received.

15. *Tend, verify documentation, and measure the black spruce provenance experiment plantations in Saskatchewan and Manitoba at 17-18 years from planting.*

The Saskatchewan plantation was measured at 18 years from planting.

16. *Initiate trials on rooting stem cuttings of jack pine seedlings, and monitor progress on rooted cutting contract.*

A first rooting trial at Pineland Forest Nursery achieved modest success using the "bouturatheque" method. The contract research project at Morden was visited in November 1992. Early results are encouraging.

17. *Measure height and diameter in the central breeding district family test at 17 years from planting.*

Measurements were completed as planned, with assistance from the Canada-Saskatchewan PAIF, Saskatchewan District Office, and Manitoba Forestry Branch.

18. *Continue developing and implementing plan for PAIF tree improvement activities (C/M PAIF:8012, 8033).*

Seed orchard applied research was planned and initiated, and advice and assistance were provided to Manitoba Forestry Branch for seed orchard development.

19. *Enhance capability in analysis of family test results by augmented collaboration and by self-directed study of quantitative genetics and data analysis literature.*

Some enhancement of capability has resulted from familiarization and use of SAS software on the Manitoba District Office computer network. There has been progress in self-directed study, but efforts toward enhanced collaboration have not yet been fruitful.

20. *Provide technical advice to client agencies as needed on maintenance of jack pine family test plantations and seed orchards and assist as needed with analysis of family test data.*

There have been only minor needs for advice and preliminary discussions on analysis assistance. (Klein, Chapman).

Decision Support

21. *To act as Scientific Authority and develop contract specifications jointly with Waldron Forestry Services for the field assessment of "Operational Program A, Natural Regeneration, RMFEA—Compartments 1,2,3,6,9 and 11. (Ball/Walker)*

Acted as Scientific Authority and wrote up contract specifications with Waldron for field assessment of Operational Program A, *Natural Regeneration, RMFEA—Compartments 1,2,3*. Several weeks were spent in midsummer with Waldron relocating approximately 60 tenth-acre PSPs to determine areas of shelterwood treatments for transect and plot remeasurement for this contract.

22. *Remeasure project MS-166, Cutting methods for management of white spruce, Riding Mountain Forest Experimental Area in accordance with the protocol developed jointly with the consultant, analyze and interpret the results and prepare a draft of an Agreement or Information Report. (Ball/Walker)*

- (a) Relocated (with Walker and students) 18 ten-acre cutting compartments and corners of 90 fifth-acre PSPs for 1992 remeasurements.
- (b) Developed (with Waldron, Navratil and others) procedures for 1992 PSP remeasurements and assessments of green, dead standing and downed trees and stumps for six cutting treatments on the PSPs.
- (c) Remeasured (with Walker and students) trees and assessed snags, logs and stumps, on 90 MS-166 PSPs; relocated (with metal detectors) and remeasured approximately 3000 (1/4000-acre) and 720 ha regeneration quadrats on bladed trips located on the 18 compartments.
- (d) Assessed (with Walker and students) all hardwood and softwood regeneration (>30 cm) on 90 fifth-acre PSPs. Assessed six acres of seedbeds distributed over 30 PSPs for all softwood regeneration.

23. *Remeasure project MS-160 To determine the effect of transplant size (or age of stock) on the early survival and growth of white spruce planted out on grass and hazel-covered sites. (Jim Ball/Norm Walker)*

- (a) *Remeasure plantations 1951A, 1952A, 1953A, 1954A to assess the effects of density on tree and stand development.*
- (b) *Remeasure plantations 1951A, 1953A, 1953B, 1954 8a & 8b to assess plantation performance.*
- (c) *Measure red pine/white pine and jack pine plantations and compare growth to planted white spruce of the same age and prepare a Forest Management or Forest Management Demonstration Note manuscript by March 31, 1993.*

Remeasurement of MS-160 was dropped in early summer (with concurrence of Waldron and Navratil) due to lack of time.

24. *To publish two Kolabinski manuscripts under the auspices and logo of the Canada-Manitoba PAIF viz. Agreement Reports.*

- (a) *"Clearcutting alternate strips and scarifying in white spruce-aspen stands to induce white spruce regeneration, Manitoba."*
- (b) *"Shelterwood cutting and mechanical seedbed treatment in white spruce-trembling aspen stands to induce white spruce regeneration, Manitoba and Saskatchewan" and evaluate the feasibility of condensing the above reports into Forest Management Notes or other publications with added authorship (J. Ball).*

A small contract was drawn up in September with Kolabinski to prepare Agreement Reports from two existing file reports by March 31, 1993. Work started in October; I have assisted with layout of tables and figures on computer.

25. *Participate in development of regeneration modules of Aspen and Mixedwood Decision Support systems viz: (Ball/Walker)*
- (a) *Access, evaluate and formulate the Manitoba data base on aspen regeneration (stocking, density and height).*
 - (b) *Formulate data base on white spruce regeneration from the Riding Mountain assessments.*

Arrangements were made with Repap, Abitibi and Manitoba Forestry Branch to obtain their survey data. Trembling aspen and white spruce data (from regeneration surveys) have been obtained on disc in MS DOS Lotus and d-Base format.

26. *Act as the Forestry Canada liaison person through contact with Parks Canada in Manitoba by coordinating communication, permit collection and reporting with regards to the Riding Mountain Program. (Ball/Walker)*

Arrangements were made with Parks Canada and permits obtained to carry out contract and in-house work on the Riding Mountain Experimental Area. Performed several liaison functions viz. Attended Manitoba Regional Workshop on Ecological Monitoring, Manitoba Environmental Council annual and other meetings, RRTC/TDU meeting and workshop in Saskatchewan, Manitoba Site classification meeting in Winnipeg and workshop in Pine Falls, assisted David Ip with selection of Riding Mountain sites for workshop on insects and diseases on aspen, participated in CIF tour of Riding Mountain arranged by Ross Waldron, participated in a silviculture field tour of the Western Region with officials of Manitoba Forestry Branch, reviewed two TDU proposals from Al Nanka, reviewed a manuscript on vegetation management from Peter Todd, completed work as scientific authority for Johnson and Brace contracts and reviewed the reports. Performed a number of miscellaneous duties.

27. *To reassess (1988) stock/site preparation trials at Pine Falls. (Ball/Walker)*

Remeasured (with Walker) height, root collar diameter and condition of approximately 6400 seedlings after five growing seasons.

15. Information Activities

i) Journal Publications

Ip, David W. Armillaria November, 1992 Trapping in a Pinus Koraiensis Plantation in Northeast China, Journal of Northeast Forestry University, English Edition, Vol. 3 No. 2 Northeast Forestry University, Harbin, P.R. China.

ii) Information Reports

iii) Other reports

A report on assessment of high priority R&D projects (Johnson 1992).

Two Canada-Manitoba Agreement reports (Kolabinski 1993) directed at industrial and provincial foresters to show alternatives to cut, scarify, plant and herbicide. A Canada-Manitoba Agreement Report (Ball 1993) to clarify and quantify the issue of wood loss through windfall, subsequent growth of residuals, white spruce advance growth and regeneration ingress.

A progress report (Brace 1992) on a contract "Permanent sample plot remeasurement and regeneration surveys, Riding Mountain Forest Experimental Area.

Progress reports on a contract "Remeasurement and evaluation of old CFS silviculture projects in the Northwest Region" (Waldron 1992/93).

File Reports

Ball, J. March, 1993 The Impact of Partial Harvesting White Spruce and Aspen in Mature Mixedwood Stands on Residual Stand Development.

Grandmaison, M. March, 1993 Forest Insect and Disease Conditions in Manitoba, 1992.

Klein, J.I. July, 1992 Selection and Mating of Jack Pine Family Test Trees to Produce Seed Orchard Progenies for Saskatchewan and Manitoba.

Kolabinski, V. March, 1993 Clearcutting Alternate Strips and Scarifying in White Spruce and White Spruce-Trembling Aspen Stands to Induce White Spruce Regeneration.

Kolabinski, V. March, 1993 Shelterwood cutting and Scarifying in White Spruce-Trembling Aspen Stands to Induce White Spruce Regeneration.

Forest Management Demonstration Note No. 20

Walker, N.R. March, 1992 Thinning in a Two-Story Jack Pine-Black Spruce Stand in the Duck Mountain Forest Reserve.

Forestry Leaflets

Ip, D.W. 1922 Dwarf Mistletoe

Ip, D.W. 1922 Dutch Elm Disease

Booklet: Canada-Manitoba Partnership Agreement in Forestry (revision)

Brochure: Living With Our Forests

Contributed funds towards publication of:
"See The Forest And The Trees" for Manitoba Forestry Association

"Private Woodlands - Working With Nature" for Woodlot Association of Manitoba
 "The Market for Christmas Trees in Manitoba" for Manitoba Christmas Tree Growers Association

iv) Lectures, courses, seminars and scientific addresses

A technical field tour (Waldron 1992) relating to mixedwood management was conducted for members of the Manitoba Section of the CIF.

David Ip, November 17, 1992 Forest Insect and Disease Interactions seminar presented to University of Manitoba Department of Entomology.

David Ip, November 6, 1992 Moisture content of white spruce trees defoliated by spruce budworm. Scientific paper presented at Annual meeting of Entomological Society of Manitoba.

David Ip, September 1, 1992 Aspen Pest - Field Identification Workshop for 25 people from six agencies.

v) Technology transfer:

Two displays: "Forest Values"; and "Manitoba Maple - An Untapped Resource" developed for extension activities that included:

Manitoba Christmas Tree Growers Association Field Day in Hadashville, July 11
 Woodlot Association of Manitoba Field Day in Neelin, Oct. 24
 Hardwood Utilization Seminar in Pine Falls, Oct. 27
 Woodlot Management Seminar in Teulon, Oct. 29
 Tree Plan Canada Technical Workshop in Brandon, Dec. 9

16. Goals 1993-94

Communications

1. Produce and distribute District Office newsletter, "Blurb" monthly. (Pronger)
2. Plan and coordinate two Road Show Seminars: The Pas - March 23; Pine Falls - March 25. (Pronger)
3. Produce educational videos for community cable television on two topics: Ecosystem; and Riparian Forests; and produce a half-hour program about Forestry in Manitoba to be aired during National Forest Week, 1993. (Pronger)
4. Plan and coordinate a media seminar focused on forestry research at Manitoba universities for September, 1993. (Pronger)
5. Coordinate summer fairs and exhibitions tour to distribute 20,000 seedlings: June - September. (Pronger)

6. Produce a photojournalism news release for rural community newspapers quarterly. (Pronger)
7. Initiate a one-week noon-hour speakers program at Centennial Library for National Forest Week. (Pronger)
8. Redesign Forest Insect & Disease display for exhibitions - June, 1993. (Pronger)
9. Develop a speakers bureau for forest sector in Manitoba - December, 1993. (Pronger)
10. Maintain forest sector liaison and support: Chairman, National Forest Week; Urban Forests Conference; Chairman, Manitou Abi Model Forest Public Awareness & Education Committee. (Pronger)
11. Support Green Plan programs - document events: Tree Plan Canada; Model Forest. (Pronger, Williamson, Dyck)

Informatics and GIS

12. Complete the integration of various computer hardware, computer software, peripherals, and data services into a stable, fully functional, and highly useful network computing system. (McMahon)
13. Implement an operational geographic information system programme of data capture, data storage, and data manipulation to meet the needs of MDO staff and approved outside agencies. (McMahon)

A.2 MANAGEMENT OF FEDERAL CROWN LANDS

14. To complete forest inventories and management plans on five Reserves within the province of Manitoba. Inventories will be GIS compatible and completed to the Province of Manitoba specifications. Federal guidelines for collecting inventory will be met. (Williamson, Dyck)
15. To implement a silviculture program on Reserve Lands based on the recommendations of approved management plans. The goal of the silviculture program will be to scarify 320 hectares of NSR land in preparation for a spring planting project (800,000 seedlings will be planted in June of 1994). (Williamson, Dyck)
16. To provide local employment for natives that will allow them to gain experience and access to job opportunities generated by the local forest industry. (Williamson, Dyck)

A.3 PRIVATE LAND FORESTS

17. To provide extension services to private land owners that will enable them to maximize the gains from a well managed woodlot. Incentive funding is available to private land owners for appropriate forest management projects that will enhance the value of private land forests. (Williamson, Dyck)

18. To investigate the potential of traditional and non-traditional forest products that could be produced from private lands and will help to diversify the rural economy. (Williamson, Dyck)
19. To assist the Woodlot Association and the Christmas Tree Growers Association in promoting and strengthening their organizations. (Williamson, Dyck)

A.4 WOOD SUPPLY ENHANCEMENT - FOREST MANAGEMENT AREAS

20. To complete 350 - 400 hectares of thinning and stand tending in overcrowded jack pine and black spruce stands. This activity will improve the capacity of the site for fibre production and enhance the future wood supply for the forest industry. (Williamson, Dyck)
21. To provide local employment opportunities through the tendering of contracts for intensive forest management projects. (Williamson, Dyck)

Insect and Disease

22. Coordinate, plan, conduct and report on pest surveys in Manitoba. (Grandmaison)
23. Provide pest extension service and technology transfer to client agencies. (Grandmaison)
24. Represent Forestry Canada (MDO) at meetings. (Grandmaison)
25. Assist D.Ip with forest pest work as requested. (Grandmaison)
26. Continue pest intelligence systems study, as appropriate. (Ip)
27. Initiate a demonstration project on control of tip weevil in Manitou-Abi Model Forest. (Ip)
28. Provide pest extension service and technology transfer to client agencies. (Ip)
29. Represent Forestry Canada (MDO) on committees and at meetings. (Ip)
30. Publish appropriate reports for each project (refereed and non-refereed). (Ip)
31. Undertake training to use Geographic Information System technology (if available). (Ip)
32. Initiate implementation of GIS of pest work in MDO (if available). (Ip)
33. Continue root rot control study, as scheduled. (Ip)

Tree Improvement

34. Advise and assist Manitoba Forestry Branch in implementation of tree improvement program activities, including second thinning of Northern mass selection jack pine seed

orchard, soil management, irrigation system installation, and genetic upgrading of 1988 Hillside jack pine pedigreed seed orchard, stock rearing and layout design for new full-sib jack pine seed orchard at Hillside, providing scions for grafting of jack pine potted orchards and advice on tending of jack pine and white spruce potted seed orchards. (Klein, Chapman)

35. Collaborate with Manitoba Forestry Branch and Agriculture Canada, Morden Research Station in applied tree improvement research, including trials of nitrogen level and crown management in jack pine seed orchards, early tending techniques for black spruce seed orchards, culture systems for white spruce and jack pine potted seed orchards, vegetative propagation of jack pine, gain assessment for eastern breeding district jack pine, early testing of jack pine, and estimation of wood density using a Pilodyn. (Klein, Chapman)
36. Continue conducting long-term forest genetics research, including measurement of jack pine family test plantations and a black spruce provenance experiment plantation, refinement of statistical analysis and quantitative genetic analysis of family test data, and development, application, and reporting of multiple-trait combined index selection of second-generation parents using 20-21 year data from the jack pine eastern breeding district family test. (Klein, Chapman)

Decision-Support

37. To act as scientific authority or to supervise in-house assessment of: a) impact of chemical removal of the aspen overstory on white spruce advanced growth crown development; and b) on MS-166 plots where all aspen was cut (now dense aspen saplings) and determine management implications to future growth and yield. (Ball, Walker)
38. To complete miscellaneous field work at Riding Mountain: a) complete site classification on MS-166 plots; b) assess MS-160 planting experiments on compartments 5, 7 and 11; and c) remeasure six MS-226 plantations. (Ball, Walker)
39. To publish a Canada-Manitoba Agreement Report, *Natural white spruce regeneration on mineral soil and rotten wood seedbeds 27-years after partial harvesting and site preparation in mature white spruce-aspen mixedwoods at RMFEA*. (Ball, Walker)
40. To publish a Canada-Manitoba Agreement Report, *Stand structure and vegetation diversity following partial cutting and site preparation in mature white spruce-aspen mixedwoods at RMFEA*. (Ball, Walker)
41. To supervise remeasurements of MS-160 *To determine the effect of transplant size (or age of stock) on the early survival and growth of white spruce planted out on hazel and grass-covered sites* and prepare a Canada-Manitoba Agreement report. (Ball, Walker)
42. To act as Forestry Canada liaison person with Parks Canada; to communicate with NOR 10 project leader regarding four RMFEA contracts; to participate in MDO Dog & Pony shows; to provide public information; to participate in CII, MEC and RRTC meetings and workshops. (Ball, Walker)

B-1: TECHNOLOGY TRANSFER

The following projects have been approved for 1993-94

Project Number	Project Name	Project Leader	Total
4001	IDS Plants/Mammals	Williamson	40
4002	IDS-Eval. of for. Prac.	Williamson	17.5
5019	Hoskins Fire Video	Hirsch	13
6007	Poplar Council		7
8002	Operational Support	Ball/Grandmaison	135
8008	Remeasurement of CFS Plots	Ball	80
8015	Fire Management System	Lee	20
8016	Large Fire Suppression	Lee	40
8017	Western Gall Rust	White	10
8031	White Spruce Mono.	Navratil	20
8037	DSS Development	Yang	33
8045	Site Classification	Corns	79
8050	Site Treatment	Nanka	
8048	Tech. Transfer-Edmonton	Bronstein	50
TOTAL:			552.5

B-2: APPLIED RESEARCH, DEVELOPMENT, DEMONSTRATION

The following projects have been approved for 1993-94

Project Number	Project Name	Project Leader	Total
4003	Synthen - Vision Plots	McQueen	18
4004	Marr - Duck Mountain	McQueen	15
5006	Dwarf Mistletoe Hoskip		82
5010	Molecular Analysis	Hiratsuka	36.5
5013	Stand Succession Shea	McQueen	56
5017	Holiday-Carabid	IP	7.5
5018	Kendal-Grow/Model	McQueen	15
8012	JP Tree Improvement	Klein	48
8013	Forest Pest Information	IP	10
8020	Fire Prediction Res.	Lee	5
8021	Initial. Att. Effectiveness	Lee	25
8026	Comp/Growth in Regeneration	Navratil	30
8027	Eval. of West. Gall Rust	Hiratsuka	17.5
8028	Operational Support	McQueen	134
8033	Green House Operation	Klein	78
8035	Armillaria Root Rot	Ip	39.5
8036	Wetlands Mapping	Zoltai	73
8047	Nopoming Park	Boxall	61
9001	JP Rooting (AG Canada)	Klein	86
TOTAL			972.9

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

All measures to be carried out under this Agreement shall be subject to the requirements of all environmental protection legislation of Canada and the province, including the Environmental Assessment Review Process guidelines order made pursuant to Section 6 (2) of the Government Organization Act 1979 and such measures will be carried out in accordance with any and all such legislation.

ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION

1. Title: Canada-Alberta Partnership Agreement in Forestry and Alberta District Office
2. Responsibility Centre: Northwest Region (8151)
3. Activity: 3121
4. Program: Regional Development
5. Status: Continuing
6. Last Evaluation: January 31, 1993
7. Next Evaluation:

B. KEYWORDS:

005 Development Agreements
 021 Sustainable Development
 024 Reforestation
 037 Research Support
 054 Public Information/awareness
 057 Negotiate New Forestry Agreements
 061 Private Woodlot Owners
 062 Aboriginal lands
 121 University Support
 709 Technology Transfer

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	16.07	12.82	14.00	0.00	0.00
Salaries	\$0.0	\$0.0	\$605.3	\$0.0	\$0.0
O & M	\$0.0	\$0.0	\$1,455.3	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$100.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$2,284.5	\$0.0	\$0.0
Total	\$0.0	\$0.0	\$4,445.1	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS

Nor 44 includes the Canada-Alberta Partnership Agreement in Forestry, and regional development activities in the Northwest Region. The objectives of the agreement are:

- a) to ensure the sustainability of a long term economically accessible timber supply in Alberta through planning, forest renewal, intensive forest management, applied research and technology transfer;
- b) to optimize management and utilization of Alberta's forest resources including improved knowledge and understanding of non-timber forest values through planning, applied research, market development, technology transfer and public information;
- c) to contribute to the economic diversification of the provincial forest sector, including the improvement of employment opportunities through applied research, market development, technology transfer and public information.

The agreement provides support for research activities. Project proposals are reviewed and approved based on the extent to which they fit the mandate of the agreement.

1. Environment Assessment Review Process:

The NoFC Environmental Screening Committee has evaluated the proposed different studies within this project on the basis of information provided by the Agreement PAF or the study leader, there may be components of individual studies that need to be screened or assessed by the Environmental Screening Committee for specific activities, but as a whole the proposed activities and studies are not potentially detrimental to the environment.

2. Collaborators/Green Plan Resource Summary (\$s & PYs):

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary					
Secondary					
Total					
Green Plan					

3. Collaborators:

Secondary

Alberta Department Environmental Protection
 Alberta Economic Development and Tourism
 University of Alberta
 Indian and Northern Affairs Canada
 Municipalities

Indian Reserves/tribal Councils
Non-government organizations
Forestry Industry

4. Green Plan:

5. Milestones:

1993-94:

1. Develop, manage, implement and deliver the regional Partnership Agreements in Forestry.
2. Represent Forestry Canada interests throughout the region by participating in appropriate meetings, committees, workshops, etc.

6. Accomplishments:

1. The Canada-Alberta Partnership Agreement in Forestry was signed on 23 April 1992. One hundred and twenty (120) Projects were implemented in 1992-93.
2. Forestry Canada was represented throughout the region by attendance at a large number of meetings, workshops, seminars and committee work.

7. Link to Strategic Plan:

National:

NOR 44 has direct linkages by providing Forest Sector Leadership, negotiating New Forestry Agreements, and developing programs for Demonstration Forests, forest workers, Private Woodlot Owners and Aboriginal Lands.

Regional/Institute:

NOR 44 is linked to resolving regional issues in economic forest use and regional development, federal and private lands and research, development and innovation.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 22, 1993

1. **STUDY TITLE:** Canada-Alberta Partnership Agreement in Forestry Management and Co-ordination
2. Responsibility Centre: Northwest Region
3. Program: Regional Development
4. Project Title:
5. Office Location(s): Edmonton, Alberta
6. Work Location: Northwest Region
7. Study Staff:

	Name
Study Leader	M. Stephen
Team Members	J. De Franceschi
	L. Ross
	J. Mrklas
	R. Bohning
	C. Abma
	G. Cannan
	J. Gamlin
	C. Brokop
	Aspen Resource Centre Specialist (Vacant)
	Social Forester(Vacant)
	Forest Development Technician (Vacant)
	Info System Specialist (Vacant)
Total	9 Agreement/4 A-Base

8. Study Key Words: Canada-Alberta Partnership Agreement in Forestry, reforestation, forestry research, marketing, demonstration, hardwood development, public information, administration, evaluation, technology transfer, management plans, job creation, economic development, agreement reports, integrated resource management, stand improvement, private woodlots, federal lands.
9. Study Activity: 3121
10. Study Resources:

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
M. Stephen	CO-02 (A)					
J. De Franceschi	CO-02 (A)	1.00	1.00			
L. Ross	CO-01 (A)	1.00	1.00			
J. Mrklas	FO-02 (P)	1.00	1.00			
R. Bohning	CO-01 (A)					
C. Abma	ST-SCY-02 (S)	1.00	1.00			
G. Cannan	CR-03 (S)	1.00	1.00			
J. Gamlin	CR-04 (S)	1.00	1.00			
C. Brokop	CR-04 (S)	1.00	1.00			
FTEs		16.07	12.82			

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	0.00
O&M	5.99	112.00			
Capital	0.00	0.00			
G & C					
TOTAL:	5.99	112.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries		281.70	673.07			
O&M		1067.72	1434.70			
Capital		496.00	27.83			
G & C		1843.84	2107.50			
TOTAL:		3689.26	4243.09			
STUDY TOTAL						

11. Study Background and Problem Analysis

The Canada-Alberta Partnership Agreement in Forestry was signed on April 22, 1992 and will be in effect until March 31, 1995 with provision for two wrap-up years.

The primary objectives of this agreement are:

- a) to ensure the availability of long term economically accessible timber supplies in Alberta through planning, forest management, applied research and technology transfer;
- b) to optimize management and utilization of Alberta's forest resources including improved knowledge and understanding of non-timber forest values through planning, applied research, market development, technology transfer, training and public information and
- c) to contribute to the economic health and diversification of the Alberta forest sector, including the improvement of employment and human resource development through applied research, market development, technology transfer and public information.

12. Study Objectives:

I. Management and Coordination

- (a) To manage and coordinate the implementation of federally-funded initiatives and monitor the use of federal funds related to the Canada-Alberta Partnership Agreement in Forestry
- (b) To coordinate the development, implementation and administration of forestry employment stimulation in Alberta as required.
- (c) To provide effective administration and financial control and technical support services for the Regional Development Agreement Program.
- (d) Some of the support for this study comes from Sub-program C.2 Administration, Monitoring and Agreement Support.

The objective of this sub-program is to provide for the administration and coordination of all programs under this Agreement, and to ensure the effective involvement of all agencies and government departments with related responsibilities.

Activities will include the review and reporting of detailed proposals for projects under this Agreement, the preparation of annual work plans, program budgets, and progress reports, as well as the monitoring and reporting of supported projects to determine their progress, including comprehensive data capture as per Section 4.3 of this Agreement.

In addition, this sub-program will provide for a review and evaluation of other sub-programs and specific projects, prior to the expiration of this Agreement, to establish their effectiveness in meeting the objectives stated in this Agreement.

II Reforestation Intensive Forest Management

Sub-program A.1. Silviculture on Provincial Crown Lands

This sub-program is for a total of \$10 million and the funds are directly delivered by the province. Both the forest industry and Forestry Canada will be cooperators in the delivery of this sub-program.

Based on the goals of establishing forests on harvested areas that are not reforested under provincial quota or forest management agreements and enhancing growth and yield of juvenile coniferous and deciduous stands; this sub-program will conduct activities in the following areas:

- (1) reforestation (7,500 ha);
- (2) stand tending (5,000 ha);
- (3) spacing (1,000 ha);
- (4) equipment development to enhance growth and yield; and
- (5) assessment and monitoring of project results.

Sub-program A.2 Management of Federal Crown Lands

This sub-program is for a total of \$2 million and the funds are directly delivered by Forestry Canada.

This sub-program will facilitate the collection of inventory data suitable for loading in a Geographic Information System (GIS), preparation of forest management plans, and reforestation of cutover lands. Under this sub-program, inventory and management plans will be completed for up to 40 Native bands. Reforestation activities will include site preparation of approximately 350 ha and planting of one-half million seedlings. Subject to available funding, and in cooperation with the Indian community, human resource development needs will be identified and training provided to natives to enable them to participate in forestry activities both on and off reserves.

Sub-program A.3. Information and Resource Data

This sub-program is for a total of \$1 million with \$400,000 of that being federal direct delivery funds.

The purpose of this sub-program is to enhance Alberta's inventory systems and their capability to analyze and evaluate actual or proposed changes in the provincial forest resource base. A more comprehensive system will permit assessment of the effects of fire, insects and disease, modified harvesting schedules, forest land alienation, and intensive forest management of the forest resource.

Activities will include system hardware acquisition as well as software development and data loading. Direct on-line access by Forestry Canada to the provincial data base has been established to facilitate data sharing and the transfer of research results from Forestry Canada to Alberta. This new link is referred to as the National Forestry Database Program.

Sub-program A.4. Private Woodlots

This sub-program is cost-shared and is therefore implemented and delivered by the province for a total sum of \$700,000.

The goals of this sub-program are aimed at developing both the timber as well as the non-timber aspects of private woodlots. Specifically, the goals include: increased economic activity in marketing both traditional and non-traditional forest products; an active woodlot owner organization(s); creation of a general understanding and awareness of the resource; and the integration and involvement of other sectors including agriculture, wildlife and fisheries into development of the resource.

Management of private woodlots is at an early developmental stage in Alberta. Opportunities presented will be through two main project areas:

- a) Public information and awareness; and
- b) Sectoral development projects.

Public information and awareness will focus on informing landowners of the potential benefits that can be derived from managed forests. Projects in this sub-program will stress both timber and non-timber values attainable on private forested land, and the appropriate management necessary to realize those benefits. Sectoral development projects will include promoting non-traditional forest products such as Christmas trees, fruit, berries, and others. Research activities of benefit to the private wood sector and preparation of management guidelines applicable to private landowners will also be considered under this sub-program. Special emphasis will be placed on identification of markets for both traditional and non-traditional outputs from forest land, and preparation and delivery of suitable technology transfer products such as brochures, manuals, and workshops.

Sub-program A.5. Site Classification

This sub-program will build on accomplishments in ecological site classification achieved during the last Agreement. Funding will be targeted primarily to classify northern sections of the province. Activities expected from this sub-program include:

- development of a new site classification field guide for northern Alberta, including related field data collection;
- testing classification information from west-central Alberta to determine its use and applicability to northern Alberta;
- creation of high-quality map products;
- relating site classification information to management prescriptions; and
- presentation of workshops and field tours to demonstrate and promote ecological site classification and its use and application to forest management.

Projects funded in this program will contribute to development and implementation of an ecological site classification applicable to most of the province's Green Area.

III Research and Technology Transfer

Sub-program B.1. Integrated Forestry-Wildlife Management, Research, and Technology Transfer

This broad and diverse sub-program is for a total of \$6.3 million and is federal direct implementation and delivery. Research activity will focus on issues related to forestry-wildlife interactions, the environment, forest management, and forest protection. Specifically, research activities will be in the following areas:

- (a) To study the relationship between current forest management practices and a wide range of wildlife species. This information will be used to develop new strategies aimed at improving the integrated management of all resources found on provincial forest lands.
- (b) Management (including documenting, monitoring and minimizing) of environmental impacts of forestry practices;
- (c) Application and demonstration of current technology and, where appropriate, development of new technology that will enhance the ability of forest management agencies to apply integrated resource management principles and decision support systems in their operations; and
- (d) Forest protection including monitoring of forest insects and diseases, and further development, application and demonstration of fire management and detection techniques.

Sub-program B.2. Wood/Fibre Utilization-Related Research and Development

This sub-program has 3 delivery streams: federal direct (\$1.4 million), provincial direct (\$1.20 million) and cost shared (\$3.10 million) for a total of \$5.75 million.

The focus of this sub-program will be to conduct research and development designed to increase and improve the use of Alberta's forest resources, with special emphasis on hardwoods, small-diameter trees, and mill residues.

IV Public Information, Education and Demonstration

Sub-program C.1. Public Information, Education and Demonstration

This sub-program has 3 delivery streams for a total of \$1.75 million federal direct (\$450,000), provincial direct (\$450,000), and cost shared (\$600,00).

This sub-program will provide funds to develop and implement informational and educational activities aimed specifically at Albertans and at Canadians in general. Activities will focus on fostering a greater public understanding and appreciation of the forest resource. Among key projects funded in this sub-program are, "Focus on Forests" program and the development of a communication plan for Alberta's "Forest Conservation Strategy". Information dissemination on Agreement initiatives, namely objectives and results, will also be a component of this sub-program.

13. Progress and Achievements

In 1991/92 a total of 27 projects were completed with 70% of the funding being spent on federal crown lands. The total budget for that year was \$1.1 million federal dollars. The province did not flow any funds in this fiscal year.

For further details see "Canada-Alberta Partnership Agreement in Forestry, Annual Report 1991/92" as well as DEVMIS (Northwest Region's Development Management Information System and CARS (the Canadian Agreement Reporting System).

Also in fiscal year 1991/92, negotiations and documentation for the new agreement were completed.

14. Goals and Accomplishments (1992-93)

1. *Implement the Canada-Alberta Partnership Agreement in Forestry. Prepare work plans and budgets to ensure efficient delivery of the agreement, participate in the agreement management committee and sub-program technical committees as required.*

A total of 124 projects were implemented in fiscal year 1992/93 with a total budget at year end of \$3.8 million federal dollars. During the course of the year funds were reprofiled into future years and several budget cuts were imposed by the federal government.

Technical sub-committees were struck to review project proposals and make recommendations to the Agreement Management Committee with Regional Development staff participating on the management committee and the technical review committees as required.

Sub-program A.1. (Silviculture on Provincial Crown Lands): This sub-program is 100% provincial dollars and delivered by the province. For information please see "Canada-Alberta Partnership Agreement in Forestry, Semi-Annual Report", September 20, 1992, Compendium Report as well as DEVMIS and CARS.

Sub-program A.2 (Management of Federal Crown Lands): 18 projects were implemented:

Project #	Project Name	PAF Amount
8002	Tree Growing on Federal Lands	\$29.1K
8003	A.2 Support	\$
1011	Tree Plant - Sunchild	\$ 7.5K
1012	Tree Plant - O'Chiese	\$ 7.7K
1013	Tree Plant - Driftpile	\$ 5.0K
1014	Tree Plant - O'Chiese	\$ 9.2K
1015	Tree Plant - Sunchild	\$ 8.1K
1017	Peigan - Inventory/Management Plan	\$35.0K
1018	Blood Tribe - Inventory/Management Plan	\$32.2K
1019	Horse Lake - Inventory/Management Plan	\$61.3K
1020	White Fish - Inventory/Management Plan	\$43.5K
1021	Fort McMurray - Inventory/Mgmt Plan	\$77.0K
1022	Wesley Band - Site Preparation	\$ 2.7K
1023	Janvier - Inventory/Management Plan	\$37.5K
1024	Beaver Lake - Site Preparation	\$ 7.0K
1025	Heart Lake - Site Preparation	\$11.1K

For further information see Semi-Annual Report, Compendium Report, DEVMIS and CARS.

Sub-program A.3 (Information and Resource Data): Federal dollars were utilized to purchase SYBASE and provide training and strategic planning for the province.

Project #	Project Name	PAF Amount
7019	AFS Strategic Plan	\$12.5K
8045	Vegetation Information System	\$58.8K

For Further Information see Semi-Annual Report, Compendium Report, DEVMIS and CARS.

Sub-program A.4 (Private Woodlots): This sub-program is cost-shared. Project #7020 provided federal dollars totally \$56.6K.

For further information see Semi-Annual Report, Compendium Report, DEV MIS and CARS.

Sub-program A.5 (Site Classification): This sub-program is cost-shared. Project #'s 7021 and 7022 provided federal dollars totalling \$102.5K towards an Ecoregion of Alberta poster and Southwest Alberta Field Guide.

For further information see Semi-Annual Report, Compendium Report, DEV MIS and CARS.

Sub-program B.1 (Integrated Forestry Wildlife Management, Research, and Technology Development): 60 external and internal projects were implemented

Project #	Project Name	PAF Amount	Project Officer (NOR indicates internal)
7018	Vegetation Management Training Workshop	\$ 3.0K	AFS
7030	Forest Herbicide Research	\$ 30.0K	AFS
7031	Nursery Operations Newsletter	\$ 4.6K	AFS
8004	B.1 Support		Stephen NOR-44-01
8008	Demo and Field Trials	\$ 30.0K	Sidders NOR
8009	Fire Management Wildlife Interface	\$ 10.0K	Hirsch NOR
8010	Forward Looking Interface	\$ 16.0K	Ogilvie NOR
8011	Technology Transfer	\$ 60.0K	Bronstein NOR
8012	Peatland Drainage	\$ 17.3K	Hillman NOR
8013	Vegetation Competition	\$ 20.0K	NOR
8014	Snow Mold/Fungi	\$ 7.5K	Mallett NOR
8015	Savannah Demo Field Trials	\$ 38.3K	Sidders NOR
8016	Economic Impacts of Armillaria	\$ 15.0K	White NOR Mallett NOR
8017	Control WP Weevil	\$ 16.1K	Langor NOR
8018	Impact Forest Tent Caterpillar	\$ 20.0K	Volney NOR
8019	Use of Soil Properties	\$ 32.0K	Maynard NOR
8020	Impact of Forestry Practices	\$ 20.4K	Langor NOR
8021	Dev Aspen Management Information	\$ 16.0K	Yang NOR
8022	Dev Prescribed Fire	\$ 19.1K	De Groot NOR

8023	Impact Spruce Budworm	\$ 18.2K	Volney NOR
8026	Enhanced Fire Suppression	\$ 28.0K	Ogilvie NOR
8027	Fire Weather Model	\$ 10.0K	Anderson NOR
8028	Hardwood Comp Growth	\$ 27.0K	MacIsaac NOR
8029	Conif. Perform. Aspen	\$ 70.0K	Navratil NOR
8030	Water Quality	\$ 68.9K	Feng NOR
8031	Hydrological Impact	\$ 50.0K	Hillman NOR
8032	Harvesting Options	\$ 80.0K	Navratil NOR
8033	Wind Risk Criteria	\$ 34.3K	Navratil NOR
8034	Economic Importance Forest Sector	\$ 34.0	White NOR
8035	WGR Resistance Screen	\$ 16.7K	Hiratsuka NOR
8036	Initial Attack	\$ 5.0K	Hirsch NOR
8037	Vegetation Management Strategy	\$ 19.3K	Navratil NOR
8038	Impact Sustainable Development	\$ 15.0K	Maynard NOR
8039	White Spruce Regeneration	\$ 25.0K	Navratil NOR
8040	Site Sensitivity	\$ 30.0K	Navratil NOR
8041	Aspen Decay and Stain	\$ 3.0K	Hiratsuka NOR
8042	AFS Site Preparation	\$ 48.0K	Sidders NOR
8043	Evaluation Growth Stand	\$ 15.0K	Bella NOR
8045	Assess Ecol and Phys Ws	\$ 7.0K	Navratil NOR
0001	Alberta Environmental Centre	\$135.0K	AEC
0002	Caribou Study	\$115.0K	Weldwood
4002	Integration of Wildlife	\$ 34.0K	NAIA
5003	Env Fin Sustain	\$ 16.7K	U of A
5004	Non-timber Evaluation	\$ 20.0K	U of A
5005	Sr Supply Behavior	\$ 12.0K	U of A
5006	Measuring non-timber	\$ 30.7K	U of A
5007	Marten Habitat	\$ 16.0	U of A
5008	Distribution and Abundance	\$ 50.0	U of A
5009	Imp Mech Site	\$ 10.0	U of A
5010	Impact Forestry Practices	\$ 20.0K	U of A
5011	Aspen Decay	\$ 40.0K	U of A

5012	Aspen Decay Strategy	\$ 35.0K	U of A
5013	Recovery Evapotranspiration	\$ 32.0K	U of A
5014	Wildlife Habitat	\$ 55.0K	U of A
5015	Assess Ecol and Phys Ws	\$ 24.0K	U of A
5016	Spatial Modelling	\$ 50.0K	U of A
6006	Pileated Woodpecker	\$ 3.8K	Foothills Forest

For further information see the individual NOR projects listed above as well as the Semi-Annual Report, Compendium Report, DEVMIS and CARS.

Sub-program B.2 (Wood/Fibre Utilization-Related Research and Development: 31 federal direct and cost-shared projects were implemented.

Project #	Project Name	PAF Amount	Project Officer
7033	Aspen Decay	\$ 9.0K	AFS
8005	B.2 Support		Stephen NOR-44
8025	Primary Wood Survey	\$ 75.0K	Clear Lake
8025	Secondary Wood Survey	\$ 35.0K	Technology Brokers
8044	Aspen Decay	\$ 8.0K	Hiratsuka NOR
3022	Aspen Decay	\$ 5.0K	Millar Western
6004	Aspen Decay	\$ 38.0K	Paprican
6005	Aspen Decay	\$ 38.5K	AFPA
6007	ATN Network	\$ 5.0K	ATN
7007	Composite Furnishings	\$ 62.5K	AFS c/s
7008	Composite Technologies	\$ 60.0K	AFS c/s
7009	Resin for Composites	\$ 55.0K	AFS c/s
7010	MSR Lumber Market	\$ 40.0K	AFS c/s
7011	Laminated Veneer Lumber	\$ 30.0K	AFS c/s
7013	Turpentine Kraft Pulp	\$ 5.0K	AFS c/s
7014	MSR Temperature	\$ 25.0K	AFS c/s
7015	Log Transportation	\$ 25.0K	AFS c/s
7016	OSB Grade Line	\$ 3.5K	AFS c/s
7023	Auto Species Sorting	\$ 20.0K	AFS c/s
7025	Westlam Computer Design	\$ 12.5K	AFS c/s

7026	SPF Promotion in US	\$ 4.6K	AFS c/s
7027	Sash Gang In	\$ 12.0K	AFS c/s
7028	Thin Kerf Headsaw	\$ 15.0K	AFS c/s
7029	Thin Kerf Scrag saw	\$ 25.0K	AFS c/s
7032	X-ray Laser Guided Grade	\$ 30.0K	AFS c/s
7036	Theme Paper	\$ 1.8K	AFS c/s
7037	Blue Ridge Lumber	\$ 20.0K	AFS c/s
7038	Intl Show Theme Paper	\$ 5.0K	AFS c/s
7039	Intl Show Proceedings	\$ 3.3K	AFS c/s

For further information see Semi-Annual Report, Compendium Report, DEVMIS and CARS.

Sub-program C.1 (Public Information, Education and Demonstration): 10 federal direct and cost-shared projects were implemented.

Project #	Project Name	PAF Amount	Project Officer
4006	100 Years Federal Forestry	\$ 33.5K	Murphy Consultants
8007	Federal Direct Communications	\$ 72.0K	Samoil NOR
7001	Friends of Environ Society	\$ 17.5	AFS c/s
7002	KFES Marketing Strategy	\$ 8.8K	AFS c/s
7003	JFW Provincial Camp	\$ 3.8K	AFS c/s
7004	National Forest Week	\$ 1.3K	AFS c/s
7005	Alberta Forestry Association	\$ 7.5K	AFS c/s
7006	FEESA Video	\$ 30.0K	AFS c/s
7034	Agreement Signing Ceremony	\$.4K	AFS c/s
7035	Focus on Forests	\$ 17.5K	AFS c/s

For further information see NOR 33, Semi-Annual Report, Compendium Report, DEVMIS and CARS.

2. *Promote forestry programs, and Forestry Canada to other government agencies and cooperate with these departments in forestry related initiatives.*

Forestry programs were promoted with several federal agencies including EIC, INAC, Corrections Canada, WED, and others. In general, contacts were established with these departments through attendance at meetings where areas of cooperation

between the departments were explored. These have resulted in the development of good working relations with a number of groups.

3. *Implement a new management information system for agreement related activities in the Northwest Region (DEVMIS) to ensure accurate and reliable capture of information and provide timely and current reports to senior management and headquarters. Participate in various agreement committees to review proposals and make recommendations to management committee. Develop in-house capabilities for GIS application for the federal lands data base.*

DEVMIS is in the developmental stage - 80% complete. Participated in meetings in Ottawa and NWR and demonstrated NWR's DEVMIS. GIS hardware to be installed by mid February.

4. *Continue to represent Forestry Canada on committees and meetings of senior officials as required.*

Forestry Canada was represented as required. (i.e. Athabasca Native Development Council).

5. *Manage the financial and human resources of the Canada-Alberta Partnership Agreement in Forestry.*

Staffing actions for the Agreement allotted PYs were completed subject to fiscal restraints. Funds were reprofiled into 95/96 during MYOP exercise. Budget cuts required by HQ were implemented.

6. *Assist the District Office managers in Manitoba (NOR 36-01/NOR 42) and Saskatchewan (NOR 36-03/NOR 46) with the implementation of the new agreements as required.*

Assistance was provided with DEVMIS, Letters of Agreement and other administrative requirements.

7. *Provide regional coordination and liaison with Forestry Canada headquarters and District Offices on regional development issues.*

Coordination between NWR and HQ provided as required.

8. *Provide data base/information system, expertise and data processing services to Regional Development staff and their clients.*

Vice-Kruger position remains vacant. Interim assistance being provided from computer centre.

9. *Publish an information report which summarizes work completed under an ENFOR study; prepare a report outlining cost estimates of treeplanting and recommercial thinning in Manitoba.*

No activity.

10. *Act as study leader for NOR 36-87, Tree Plan Canada, the Green Plan's community tree planting program in the Northwest Region.*

See Study Work Plan for NOR 22.

15. Information Activities

i) Journal Publications

ii) Information Reports

iii) Other reports

- Information brochure; NWR Partnership Agreement Newsletter; Timber-Harvesting Techniques that Protect Conifer Understory in Mixedwood Stands; Protecting Whitespruce Understories When Harvesting Aspen; Management Plans on several Indian Reserves; Canada-Alberta Partnership Agreement in Forestry, Semi-Annual Report, September 30, 1992.

iv) Lectures, courses, seminars and scientific addresses

- client information session held June, 1992; numerous meetings held with industry clients to inform them of opportunities under the agreement.

v) Technology transfer:

16. Goals 1993-94

1. Implement the Canada-Alberta Partnership Agreement in Forestry.
2. Prepare work plans and budgets to ensure efficient delivery of the agreement, participate in the agreement management committee and sub-program technical committees as required.
3. Promote forestry programs, and Forestry Canada to other government agencies and cooperate with these departments in forestry related initiatives.
4. Implement a new management information system for agreement related activities in the Northwest Region (DEVMIS) to ensure accurate and reliable capture of information and provide timely and current reports to senior management and the national system (CARS) at headquarters.
5. Participate in various agreement committees to review proposals and make recommendations to management committee.
6. Develop in-house capabilities for GIS application for the federal lands data base.

- 7. Continue to represent Forestry Canada on committees and meetings of senior officials as required.
- 8. Manage the human resources of the Canada-Alberta Partnership Agreement in Forestry.
- 9. Assist the District Office managers in Manitoba (NOR 42) and Saskatchewan (NOR 46) with the implementation of the agreements as required.
- 10. Provide regional coordination and liaison with Forestry Canada headquarters and District Offices on regional development issues.
- 11. Provide data base/information system, expertise and data processing services to Regional Development staff and their clients.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Canada/Saskatchewan Partnership Agreement in Forestry and Saskatchewan District Office
2. Responsibility Centre: Northwest Region (8251)
3. Activity: 3121
4. Program: Regional Development
5. Status: Continuing
6. Last Evaluation: January 20, 1993
7. Next Evaluation:

B. KEYWORDS:

005 Development Agreements
 021 Sustainable Development
 037 Research Support
 062 Aboriginal Lands
 100 Green Plan
 709 Technology Transfer

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	13.15	13.00	13.00	0.00	0.00
Salaries	\$0.0	\$0.0	\$600.1	\$0.0	\$0.0
O & M	\$0.0	\$0.0	\$1,445.4	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$50.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$1,465.0	\$0.0	\$0.0
Total	\$0.0	\$0.0	\$3,560.5	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS

NOR-46 covers the implementation of the Canada-Saskatchewan Partnership Agreement in Forestry and the operation of the Saskatchewan District Office.

The objectives of the Agreement are as follows:

- a) to ensure the availability of long-term economically accessible timber supplies in Saskatchewan through planning, forest management, applied research and technology transfer;
- b) to optimize management and utilization of Saskatchewan's forest resources including improved knowledge and understanding of non-timber forest values through planning, applied research, market development, technology transfer and public information; and
- c) to contribute to the economic diversification of the provincial forest sector, including the improvement of employment and human resource development through applied research, market development, technology transfer and public information.

The operation of the Saskatchewan District Office includes not only the coordination of the human and financial resources provided through the Agreement, but also provides a focal point for Forestry Canada's role in Saskatchewan for such programs as Model Forest and Tree Plan Canada.

1. Environment Assessment Review Process:

The NoFC Environment Screening Committee has evaluated the proposed studies within this project on the basis of information provided by the Agreement PAF. There may be components of individual studies that need to be screened or assessed by the Environmental Screening Committee for specific activities, but as a whole the proposed activities and studies are not potentially detrimental to the environment.

2. Collaborators/Green Plan Resource Summary (\$s & PYs):

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary					
Secondary					
Total					
Green Plan					

3. Collaborators:

Secondary

Saskatchewan Department Environment and Resource Management
Mistik Management
Weyerhaeuser Canada

Tribal Councils
Saskatchewan Forestry Association
Canadian Institute of Forestry
Universities of Saskatchewan, Calgary, Alberta, and Regina
Saskatchewan Research Councils
Indian Bands
Farm Woodlot Association of Saskatchewan
Saskatchewan Christmas Tree Growers Association

4. Green Plan:

NOR-46 has been assisting in the delivery of the Tree Plan Canada Program through the contractor Tremendous Saskatchewan. As well, NOR-46 staff have been involved with the negotiation, development, and planning tasks of the Prince Albert Model Forest.

5. Milestones:

1. To successfully implement the 1993/94 Agreement Work Plan and its 125 different projects.
2. Continue working with the Prince Albert Model Forest in the development and implementation of its Work Plan.
3. Continue assisting with the implementation of the Tree Plan Canada Program in Saskatchewan.
4. Assist in completing the Saskatchewan Long-Term Integrated Forest Resource Management Plan.

6. Accomplishments:

1. More than 125 separate projects were initiated and funded in reforestation, research and development, technology transfer, private land and Indian forestry, communications and long-term integrated forest resource management planning.
2. The Saskatchewan Long-Term Integrated Forest Resources Management Plan was initiated and will be completed in 1993/94.
3. The contribution agreement with the Prince Albert Model Forest Association was successfully completed.
4. The Tree Plan Canada program was initiated and 16 projects (62,508 trees) were funded to \$108,321.00.

7. Link to Strategic Plan:

National:

NOR-46 is limited by its programs and projects to the following initiatives:

- a) public information;
- b) implementation of federal forestry policies and program;
- c) support to private woodlot owners;
- d) strengthening forest management on Indian Lands;
- e) promotion of market development and diversification;
- f) support for S&T programs.

Regional/Institute:

NOR-46 is involved directly in four of the five regional initiatives:

- a) DSS for integrated boreal mixedwood and aspen forests;
- b) Aspen Innovation Centre;
- c) Technology Development Unit;
- d) Integrated Resources Management programs.

8. Establishment/Institute Specific Information:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 20, 1993

1. **STUDY TITLE:** Saskatchewan District Office
2. **Responsibility Centre:** Northwest Region (8251)
3. **Program:** Regional Development
4. **Project Title:** Canada/Saskatchewan Partnership Agreement in Forestry and Saskatchewan District Office
5. **Office Location(s):** Prince Albert, Saskatchewan
6. **Work Location:** Saskatchewan
7. **Study Staff:**

	Name
Study Leader	V. Begrand
Team Members	K. Gaudet/C. Mardell
	C. Mathiason

8. **Study Key Words:** Development agreements, research support, Green Plan, sustainable development, aboriginal lands, technology transfer
9. **Study Activity:** 3121

10. Study Resources:Personnel Information

		1992-93	Fiscal Year 1993-94			1994-95
Employee Name	Category	Previous	Budget	Revised	Forecast	Upcoming
V. Begrand	CO-3 (A)	1.00	1.00			
K. Gaudet	CR-4 (S)	1.00	1.00			
C. Mardell	CR-4 (S)					
C. Mathiason	CR-3 (S)					
FTEs		2.00	2.00			

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00		
O&M	0.00	0.00	0.00		
Capital	0.00	0.00	0.00		
G & C					
TOTAL:					

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries			86.3			
O&M			207.6			
Capital			114.5			
G & C						
TOTAL:			408.4			

STUDY TOTAL		408.4			
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11. Study Background and Problem Analysis

The objectives of the Canada-Saskatchewan Partnership Agreement in Forestry are:

- a) to ensure the availability of long-term economically accessible timber supplies in Saskatchewan through planning, forest management, applied research and technology transfer;
- b) to optimize management and utilization of Saskatchewan's forest resources including improved knowledge and understanding of non-timber forest values through planning, applied research, market development, technology transfer and public information; and
- c) to contribute to the economic diversification of the provincial forest sector, including the improvement of employment and human resource development through applied research, market development, technology transfer and public information.

12. Study Objectives:

i) Objectives

1. To manage and co-ordinate the implementation of federally-funded initiatives and monitor the use of federal funds related to the following objectives of the Canada-Saskatchewan Partnership Agreement in Forestry:
 - a) to contribute to accelerated economic development in the forest sector through the implementation of improved forest management practices, technological innovation and industrial expansion within the context of federal and provincial policies;
 - b) to maintain and create direct and indirect employment opportunities in the province by enhancing the long term viability of the forest industry;
 - c) to contribute to an increased timber supply;
 - d) to promote improved utilization of the forest resource;
 - e) to strengthen research and technology transfer capability in support of forest management activities, and to shorten the time between conclusion and implementation of research; and
 - f) to support improved forest management of federal and provincial crown lands, private woodlots, and industrial forest management license areas.
2. To provide regional liaison for all Forestry Canada activities related to the Canada-Saskatchewan Partnership Agreement in Forestry.
3. To provide technical input into the implementation of forestry employment programs in Saskatchewan.

4. To represent Forestry Canada in Saskatchewan within the federal and the provincial governments, industry, and the general public.
5. To facilitate the maximization of funding available to the forestry sector in Saskatchewan from other funding agencies.

ii) Deliverables

Short Term (1-5 years)

Long Term (5 years and beyond)

iii) Significant Linkages:

13. Progress and Achievements

The Canada-Saskatchewan PAIF was signed in Prince Albert on June 5/91 and expires March 31/95. Fiscal year 1991/92 marked the first year of implementation.

14. Goals and Accomplishments (1992-93)

1. *Agreement Co-ordination and Management*

Prepared workplans for consideration by the PAIF Management Committee.

Ensured that federal direct projects were implemented, monitored and audited and that provincial direct projects were reviewed and monitored.

Prepared reports for the PAIF Management Committee as it required, including an annual report.

Facilitated the administration and delivery of all Forestry Canada's research and technology transfer programs in Saskatchewan.

Maintained regular contacts with representatives of federal, provincial and industrial agencies as well as interest groups.

Ensured the maintenance of regular contact between NoFC and Saskatchewan District Office staff to ensure cooperation, effective program delivery, information sharing and understanding of issues and concerns which may impact on Forestry Canada's operations in Saskatchewan.

15. Information Activities

Not applicable

16. Goals 1993-94

1. To manage and co-ordinate the implementation of federally-funded initiatives and monitor the use of federal funds related to the following objectives of the Canada-Saskatchewan Partnership Agreement in Forestry:
 - a) to contribute to accelerated economic development in the forest sector through the implementation of improved forest management practices, technological innovation, and industrial expansion within the context of federal and provincial policies;
 - b) to maintain and create direct and indirect employment opportunities in the province by enhancing the long term viability of the forest industry;
 - c) to contribute to an increased timber supply;
 - d) to promote improved utilization of the forest resource;
 - e) to strengthen research and technology transfer capability in support of forest management activities, and to shorten the time between conclusion and implementation of research; and
 - f) to support improved forest management of federal and provincial crown lands, private woodlots, and industrial forest management license areas.
2. To provide regional liaison for all Forestry Canada activities related to the Canada-Saskatchewan Partnership Agreement in Forestry.
3. To provide technical input into the implementation of forestry employment programs in Saskatchewan.
4. Represent Forestry Canada in Saskatchewan within the federal and the provincial governments, industry, and the general public.
5. To facilitate the maximization of funding available to the forestry sector in Saskatchewan from other funding agencies.

17. Major Co-operators:

- i) Internal - FC

Region	ID#	Title	Contact name
Forestry Canada			

- ii) External -
 - Regional offices of Federal Government Departments
 - Indian and Northern Affairs
 - Industry Science & Technology
 - Employment and Immigration
 - Western Economic Diversification
 - Prairie Farm Rehabilitation Administration
 - Provincial Government Departments
 - Environment and Resource Management
 - Agriculture and Food
 - Universities
 - University of Alberta
 - University of Saskatchewan
 - University of Regina

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement

The Chief, Saskatchewan District has been directed by Management Committee to include all pertinent related information on the PAF associated with this project. The PAF will serve as the official document which the Environment Screening Committee will review.

- ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 20, 1993

1. **STUDY TITLE:** Wood Supply Maintenance and Enhancement
2. **Responsibility Centre:** Northwest Region (8251)
3. **Program:** Regional Development
4. **Project Title:** Canada/Saskatchewan Partnership Agreement in Forestry and Saskatchewan District Office
5. **Office Location(s):** Prince Albert, Saskatchewan
6. **Work Location:** Saskatchewan
7. **Study Staff:**

	Name
Professional:	M. Newman
	P. Loeth
	J. Doornbos
	K. Yurach
Technical:	B. Smith

8. **Study Key Words:**
9. **Study Activity:** 3121

10. Study Resources:Personnel Information

		1992-93	Fiscal Year 1993-94			1994-95
Employee Name	Category	Previous	Budget	Revised	Forecast	Upcoming
M. Newman	FO-02 (P)	1.00	1.00			
P. Loseth	FO-02 (P)	1.00	1.00			
J. Doornbos	FO-02 (P)	0.00	0.00			
K. Yurach	CS-02(A)	1.00	1.00			
B. Smith	EG-04 (T)	1.00	1.00			
FTEs						

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries			240.4			
O&M			177			
Capital						
G & C			751.7			
TOTAL:			1169.1			

STUDY TOTAL			1169.1			
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11. Study Background and Problem Analysis

The objectives of the Canada-Saskatchewan Partnership Agreement in Forestry are:

- a) to ensure the availability of long-term economically accessible timber supplies in Saskatchewan through planning, forest management, applied research and technology transfer;
- b) to optimize management and utilization of Saskatchewan's forest resources including improved knowledge and understanding of non-timber forest values through planning, applied research, market development, technology transfer and public information; and
- c) to contribute to the economic diversification of the provincial forest sector, including the improvement of employment and human resource development through applied research, market development, technology transfer and public information.

12. Study Objectives:

i) Objectives

Sub-program A.1 Reforestation on Provincial Crown Lands

- to contribute to Saskatchewan's future timber supply by ensuring adequate reforestation of cutover lands and the improvement of productive stands.

A.2 Management of Federal Crown Lands and Private Woodlots

- to facilitate the collection of inventory data suitable for loading in a Geographical Information System, preparation of forest management plans, reforestation and intensive forest management activities.
- to promote assistance in conducting forest inventories, management planning and implementation and related extension services to the private woodlot sector.

A.3 Stand Tending

- to allocate funds to tending operations in forest stands proximal to existing or anticipated processing facilities.

A.4 Forest Data Base

- to enhance Saskatchewan; data collection, analysis and reporting systems.

ii) Deliverables

Short Term (1-5 years)

Long Term (5 years and beyond)

iii) Significant Linkages:

13. Progress and Achievements

See Annual and Semi-annual Reports of the Saskatchewan Partnership Agreement in Forestry.

14. Goals and Accomplishments (1992-93)

A.1 Reforestation on Provincial Crown Lands

1. *To coordinate the planning and implementation of federal direct backlog forest renewal and stand tending projects in cooperation with forest companies and Saskatchewan Environment and Resource Management.*

In cooperation with three (3) major forest companies, projects were completed which resulted in 118 hectares site prepared and 1,510,905 seedlings planted on approximately 816 hectares of backlog areas.

A.2 Management of Federal Crown Lands and Private Woodlots

1. Federal Crown Lands

Develop a multi year operational plan for Federal Lands within the commercial forest belt.

Review, amend and process for approval, Project Authorization forms (PAFs) for forestry projects under the Indian Lands Forestry Program in conformance with the work plan.

Plan, implement (directly or indirectly), monitor and audit federally delivered forestry projects.

Complete projects outlined in the first year of the multi year plans Indian Bands.

A total of \$292,295 was budgeted in 1992-93. It was divided into 4 main areas, planting, site preparation, inventories and management plans and other.

Planted 502,000 seedlings on 170 ha of land which included four (4) First Indian Lands - Big River, Pelican Lake, Waterhen Lake, and Red Earth areas. A total of \$73,000 or 25% of program dollars was spent on the planting.

Purchased of 300,000 pine seedlings for 1992/93 and another 250,000 were purchased for 1993/94 for a total of \$36,000 or 12.5% of budget.

Site preparation of two (2) areas, a total of 245 ha planted, 145 completed to date for a total of \$52,000 or 18% of budget.

Inventories on a total of eight (8) First National Lands - Waterhen Lake, Canoe Lake, La Loche, Turnor Lake, Buffalo, English River, Mistawasis, Mirond Lake. Mirond and Mistawasis are completed. Management plans on Mistawasis, Turnor Lake and Buffalo are to be completed this fiscal year. A total of \$117,225 was spent on Management plans for a total of 40% of budget.

Released 20 hectares of White Spruce plantation for a total of \$2,000 or 68% of budget.

Supported First Nation members to attend conferences for a total of 10,500 or 3.59% of budget.

Transferred of the previous Terrasoft information into the ARC INFO standard that the Northwest Region has adopted.

First Nation lands south of the Commercial forest were stratified into Agricultural Land, Productive Forest, Non Productive Forest, water and other.

Provincial forestry information on federal lands is being loaded into our ARC INFOR system.

2. Private Woodlots

To coordinate, plan, develop and administer the private land forestry program in Saskatchewan.

To continue to maintain a leadership role in the development of agro forestry initiatives in Saskatchewan by promoting the continued involvement and cooperation of the Farm Woodlot Association, industry, and other federal and provincial agencies.

To continue to assist the Farm Woodlot Association of Saskatchewan Christmas Tree Growers Association, and the Agro Forestry Development Committee.

The following projects were undertaken:

6003	Woodlot Extension Service	\$ 65,932
6024	Agro Forestry Guide Book	\$ 14,000
6026	Legislative and Policy Review	\$ 25,500
6033	Land Owners Inventory	\$ 19,125
6027	Woodlot Incentive	\$ 30,000
6036	National Christmas Tree Growers	\$ 1,000
6037	Christmas Tree School Kit	\$ <u>6,377</u>
		\$161,934

A.3 Stand Tending

No plan or accomplishments

A.4 Forest Data Base

Continued to serve as a contributing member of the Steering Committee which monitors the development of the Saskatchewan Integrated Forest Resource Management Plan.

Served as facilitator of the Biometrics and Site Classification Working Group.

Specifications for site classification work have been drafted with the input of the Biometrics and Site Classification Working Group, and are currently being tendered.

15. Information Activities

Long Term Plan:

Introductory Public Information Meetings

Site Classification:

Workshop on Forest Site Classification in December 1992, for 48 participants

16. Goals 1993-94

A.1 Reforestation on Provincial Crown Lands

No plans

A.2 Management of Federal Crown Lands and Private Woodlots

1. Federal Lands

- a) Plant 500,000 seedlings
- b) Contract growing of 500,000 seedlings
- c) Site prepare 250 hectares
- d) Inventory 5 First Nation Lands
- e) Release 100 ha.
- f) Survey 500 ha plantations
- g) Liaison with First Nations to promote education and understanding of forest issues.
- h) Support employment of First Nations members in forestry.
- i) Complete the transfer of GIS information into ARC INFO System.
- j) Develop GIS capability at the Tribal Council level.
- k) Survey bands about forestry concerns in the commercial forest zone.

2. Private Lands

To coordinate, plan, develop, and administer the private land forestry program in Saskatchewan.

To continue to maintain a leadership role in the development of agro forestry initiatives in Saskatchewan by promoting the continued involvement and cooperation of Farm Woodlot Association, industry and other federal and provincial agencies.

To continue to assist the Farm Woodlot Association of Saskatchewan, the Saskatchewan Christmas Tree Growers Association, and the Agro-forestry Development Committee.

The following projects have been approved:

Woodlot Extension Services FWAS	\$70,000
Woodlot Improvement Incentives	\$30,000
Landowner Inventory-Meadow Lake	\$15,000
Private Lands Forestry Specialist Support	\$10,000
Sectoral Projects	\$45,000
Communications Incentives	\$20,000
Other <u>20</u>	
	\$210,000

A.3 Stand Tending

No plans

A.4 Forest Data Base

Long Term Plan:

Continue as a member of the Steering Committee for the Saskatchewan Long Term Integrated Forest Resource Management Plan.

Site Classification:

Serve as facilitator of an expanded Site Classification Steering Committee, to monitor the progress of work.

Contract specifications call for a workshop (Autumn 1993) on the evolving system.

Growth and Yield Data:

Assist with remeasurement of Provincial PSP plots, in cooperation with DNR and industry representatives.

National Forestry Statistics:

Cooperate with PNFI in a pilot Indian Lands statistics project.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Northwest Region			J. Mrklas I. Corns I. Bella D. Boylen

ii) External -

Establishment	ID#	Title	Contact name
Indian and Northern Affairs Canada			
Tribal Councils			
Indian Bands			
Farm Woodlot Association of Saskatchewan			
Saskatchewan Christmas Tree Growers Associations			
Saskatchewan Department of Environmental and Resource Management			
Weyerhaeuser Canada Ltd.			
Prince Albert Model Forest			

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 20, 1993

1. **STUDY TITLE:** Applied Research Marketing and Technology Transfer
2. **Responsibility Centre:** Northwest Region (8251)
3. **Program:** Regional Development
4. **Project Title:** Canada/Saskatchewan Partnership Agreement in Forestry and Saskatchewan District Office
5. **Office Location(s):** Prince Albert, Saskatchewan
6. **Work Location:** Saskatchewan
7. **Study Staff:**

	Name
Tem members: Professional	J. Doornbos
	P. Loeth
	K. Yurach
Technical:	R. Froc
	B. Smith
	G. Brahniuk

8. **Study Key Words:**
9. **Study Activity:** 3121

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
J. Doornbos	FO-02 (P)			1.00		
P. Loseth	FO-02 (P)			1.00		
K. Yurach	CS-02 (A)			1.00		
R. Froc	EG-04 (T)			1.00		
B. Smith	EG-04 (T)			1.00		
G. Brahniuk	EG-04 (T)			1.00		
FTEs				6.00		

	ID #	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries			84.2			
O&M			860.3			
Capital						
G & C			486.0			
TOTAL:			1430.5			

STUDY TOTAL			1430.5			
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11. Study Background and Problem Analysis

The objectives of the Canada-Saskatchewan Partnership Agreement in Forestry are:

- a) to ensure the availability of long-term economically accessible timber supplies in Saskatchewan through planning, forest management, applied research and technology transfer;
- b) to optimize management and utilization of Saskatchewan's forest resources including improved knowledge and understanding of non-timber forest values through planning, applied research, market development, technology transfer and public information; and
- c) to contribute to the economic diversification of the provincial forest sector, including the improvement of employment and human resource development through applied research, market development, technology transfer and public information.

12. Study Objectives:

i) Objectives

B.1 Technology Transfer

This sub-program will facilitate the prompt transmission and utilization of research results from forestry Canada's scientific staff to the practising field foresters. This will be encouraged and supported by providing funds to allow both groups (i.e., scientific staff and field foresters) to frequently interact and exchange ideas and views on forestry problems and their solutions through such vehicles as workshops, conferences or other gatherings. This sub-program will also support innovative development of equipment and procedures which will improve forest management and pilot projects to demonstrate newly developed technology and techniques.

This Sub-program will provide funding for the establishment and operation of a Technology Development Unit (TDU) within Forestry Canada's Northwest Region. This TDU will serve as the interface between the field practitioner and researcher to ensure clear problem identification and timely application of new research findings.

B.2 Applied Forest Research

This sub-program will provide directed funding into those areas of forestry research identified through various research advisory processes as germane to the improvement of forestry activity in Saskatchewan.

This sub-program will also provide funding to other agencies such as educational institutions, research institutions, and private industry wishing to conduct studies which address this Agreement's objectives.

B.3 Forest Products Research and Marketing

Many Saskatchewan forest products, are a commodity type which are low in value added. Promotion, development and studies of higher valued added products and processes, and potential markets for these products will be addressed in this sub-program.

This sub-program will also support forest-related industries interested in diversifying to meet expanding market needs. Studies conducted under this sub-program will not be limited to traditional timber products and manufacturing, but will include other outputs of the forest including nuts, berries, mushrooms, maple syrup, waste fibre and other forest related products. These non-timber products can provide income alternatives and augmentation.

This sub-program will allow comprehensive study of Saskatchewan's forest product capabilities, the industry's social and economic impact, and related opportunity identification.

ii) Deliverables

Short Term (1-5 years)

Long Term (5 years and beyond)

iii) Significant Linkages:

Saskatchewan Forest Research Advisory Committee

13. Progress and Achievements

See Annual and Semi-annual Reports of the Saskatchewan Partnership Agreement in Forestry.

14. Goals and Accomplishments (1992-93)

A. Growth and Yield and Biometrics

1. *Work closely with SEMR and industry staff to assist in prioritized specific projects relating to the growth and yield data manipulation and analysis which could be proposed for funding by PAIF.*

The Biometrics and Site Classification Working Group reached consensus on a number of PAIF projects. However the consensus building progress has been slow due to extremely polarized views.

2. *Continue to contribute through technology transfer to the development and advancement of growth and yield data analysis procedures and growth projection systems.*

Technology transfer has occurred through dealings with the Biometrics and Site Classification Working Group and informal responses to requests for information.

3. *Maintain close liaison with the Western Boreal Growth and Yield Cooperative. (WESBOGY)*

Close liaison was maintained with WESBOGY chairman and the Saskatchewan members. A PAIF project for the installation of WESBOGY growth plots was approved and is proceeding.

4. *To work closely with SPRR industry and Northern Forestry Centre on specific projects relating to Geographic Information Systems and the advancement of GIS technology in Saskatchewan.*

B. Silviculture Investigations, Technology Transfer and other

1. *Coordinate the implementation of several silvicultural trials and technology transfer projects in cooperation and consultation with the Technology Development unit.*

Projects implemented were as follows:

8010 Grizzly Dev. Field - Sidders, Froc
 8021 Feric Rototiller - Sidders, Froc
 8025 Publication: Aspen - Laishley
 8042 Vegetation Management - Froc, Sidders
 8065 Development Forest Nursery Information - Nanka
 8066 Silviculture Development - Sidders, Bronstein
 8067 Forest Nursery Association Meeting - Begrand
 8068 Demo 92 DNR - Begrand
 8009 Art. Renewal Studies - Sidders, Froc
 8020 Saskatchewan White Spruce - Sidders
 8022 Rev. Old CFS Saskatchewan - Froc, Navratil
 8026 Aspen Sens. Rating Systems - Froc, Navratil
 5002 Subsoil Evaluation of Silviculture - Froc
 6013 Grizzly Development Field - Sidders, Froc
 6022 Vegetation Monitor Ft. A La Corne - Froc

5. *Coordinate the monitoring and implementation of more than 40 projects in the B1, B2, and B3 Sub-programs as required.*

8033 Enhance Large Fire Meeting - Hirsch
 8034 Prescribed Fire Research Technology Transfer - De Groot
 5003 Vegetation Management Prairie Parks - Begrand
 6004 Poplar Council of Canada - Siltan
 6044 Directory Second Wood - Bohning
 6052 Survey Primary Wood - Bohning
 8032 Fire Management Systems - B. Lee
 8040 Computerized Pest Management - Volney
 8041 Spruce Budworm Control - Volney
 8043 Measured Black Spruce - Klein
 8044 Assessment WGR - Hiratsuka
 8051 Measure Centre Brding - Klein
 8055 Support GIS Comp. Appl. - Yurach
 8056 Baseline Ecol. Study - Maynard
 8061 Diuranl Variation FFMC - Lee
 8062 Fire Occurrence Prediction - Lee
 8063 Wild Urban For. Fire Int. - Hirsch
 2002 Saskatchewan GIS Conference - Yurach
 3014 Jack Pine Propagation - Begrand
 3015 Cult. Heritage Predict - Begrand
 4013 Dev. Forest Pest Impact Net. - Volney
 5001 Cost Ben Environment Improvement - B. White
 5004 Determining Mol. Gen. Mkrs. - Hiratsuka
 5005 Early Genetic Evaluation - Hiratsuka

15. Information Activities

Not applicable

16. Goals 1993-94

A. Growth and Yield and Biometrics

1. To work closely with SERM and industry personnel to monitor the progress of biometrics related PAIF projects and to reach consensus on new projects to be funded by PAIF.
2. To contribute through technology to the development and advancement of growth and yield data analysis procedures and growth projection systems.
3. To maintain close liaison with the Western Boreal Growth and Yield Cooperative.

B. Silviculture Investigations and Others

1. Coordinate the monitoring and implementation of several projects in the B1, B2, and B3 sub-programs.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
			I. Bella I. Corns S. Navratil R. Bronstein B. Laishley B. Lee R. Bohning J. Volney J. Klein Y. Hiratsuka D. Maynard B. White

ii) External -

Establishment	ID#	Title	Contact name
Saskatchewan Department of Environment and Resource Management			
Weyerhaeuser Canada			
Mistik Management			
C.I.F.			
University of Saskatchewan			
University of Alberta			
PAMI			
SRC			
Poplar Council of Canada			
Forintek			
WESBOGY			

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 20, 1993

1. **STUDY TITLE:** Integrated Forest Management, Planning and Development
2. **Responsibility Centre:** Northwest Region (8251)
3. **Program:** Regional Development
4. **Project Title:** Canada/Saskatchewan Partnership Agreement in Forestry and Saskatchewan District Office
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Saskatchewan
7. **Study Staff:**

	Name
Study Leader	J. Doornbos
Team Members	

8. **Study Key Words:**
9. **Study Activity:** 3121
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
J. Doornbos	FO-02 (P)					
FTEs						

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>					
Salaries					
O&M					
Capital					
G & C		429			
TOTAL:		429			

STUDY TOTAL		429.00			
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11. Study Background and Problem Analysis

The objectives of the Canada-Saskatchewan Partnership Agreement in Forestry are:

- a) to ensure the availability of long-term economically accessible timber supplies in Saskatchewan through planning, forest management, applied research and technology transfer;
- b) to optimize management and utilization of Saskatchewan's forest resources including improved knowledge and understanding of non-timber forest values through planning, applied research, market development, technology transfer and public information; and
- c) to contribute to the economic diversification of the provincial forest sector, including the improvement of employment and human resource development through applied research, market development, technology transfer and public information.

12. Study Objectives:

i) Objectives

C.1 Park Vegetation Management

This Sub-program will fund Projects aimed at vegetation manipulation and management in provincial parks. Such management techniques can be beneficial in a variety of ways such as wildlife habitat enhancement, prevention of soil erosion or slope stabilization in sensitive areas, and site rehabilitation both for visual as well as environmental appeal.

C.2 Forest Wildlife Habitat Planning

This Sub-program will contribute towards the recognition of one non-timber value of the forest, viz. wildlife and its habitat. This Sub-program will fund wildlife

habitat inventory Projects and the development of plans designed to consider and/or enhance these areas during subsequent forestry activities.

C.3 Forest Watershed Harvest Planning

This Sub-program will provide for data collection and analysis and the testing, calibration and application of hydrological models to measure the effects of harvesting on watersheds. Projects conducted under this Sub-program will ultimately contribute towards the development of a watershed management component of an integrated resource management plan.

ii) Deliverables

Short Term (1-5 years)

Long Term (5 years and beyond)

iii) Significant Linkages:

13. Progress and Achievements

See Annual and Semi-annual Reports of the Saskatchewan Partnership Agreement in Forestry.

14. Goals and Accomplishments (1992-93)

C.1 The Parks Vegetation Management Plan project continued as planned.

C.2 The following seven forest wildfire projects were continued:

- 5006 - Forest Bird Ecology
- 7003 - Black Bear Logging Study
- 7004 - Forest Wildlife Information System
- 7005 - Woodland Caribou Habitat Management
- 7006 - Saskatchewan Forest Habitat Project
- 7008 - Elk Habitat Analysis
- 7011 - Moose Productivity Model

C.3 The Forest Watershed Harvest Planning Study continued.

15. Information Activities

Not applicable

16. Goals 1993-94

1. To continue implementing the projects listed above.

17. Major Co-operators:

Saskatchewan Department of Environment and Resource Management
University of Saskatchewan
Weyerhaeuser Canada Ltd.
Mistik Management
MacMillan Bloedel Ltd.
Rocky Mountain Elk Foundation
Saskatchewan Wildlife Federation
Prince Albert National Park
Canadian Wildlife Service

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 20, 1993

1. **STUDY TITLE:** Public Information, Education, Worker Training and Agreement Support
2. **Responsibility Centre:** Northwest Region (8251)
3. **Program:** Regional Development
4. **Project Title:** Canada/Saskatchewan Partnership Agreement in Forestry and Saskatchewan District Office
5. **Office Location(s):** Prince Albert, Saskatchewan
6. **Work Location:** Saskatchewan
7. **Study Staff:**

	Name
Study Leader	L. Worster
Team Members	K. Yurach

8. **Study Key Words:**
9. **Study Activity:**
10. **Study Resources:** 3121

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
L. Worster	IS-03 (A)					
K. Yurach	CS-02 (A)					
FTEs						

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>					
Salaries		49.40			
O&M		116.00			
Capital					
G & C		20.00			
TOTAL:		185.40			
<hr/>					
STUDY TOTAL		185.40			

11. Study Background and Problem Analysis

The objectives of the Canada-Saskatchewan Partnership Agreement in Forestry are:

- a) to ensure the availability of long-term economically accessible timber supplies in Saskatchewan through planning, forest management, applied research and technology transfer;
- b) to optimize management and utilization of Saskatchewan's forest resources including improved knowledge and understanding of non-timber forest values through planning, applied research, market development, technology transfer and public information; and
- c) to contribute to the economic diversification of the provincial forest sector, including the improvement of employment and human resource development through applied research, market development, technology transfer and public information.

12. Study Objectives:

i) Objectives

D.1. Public Information, Education and Worker Training

- a) demonstrate that there is full co-operation between the governments of Canada and Saskatchewan toward achievement of enhanced forest land management in Saskatchewan with concurrent co-operation from forest industry and other sectoral participants;
- b) ensure that Saskatchewan residents are informed and aware of this Agreement and its objectives and accomplishments;

- c) demonstrate to Saskatchewan residents the social and economic benefits of responsible management for all of the forest resources both fibre and non-fibre alike;
- d) educate Saskatchewan residents on forests and forestry matters through involvement in youth educational programming and by responding to issues raised by urban residents; and
- e) assist with the identification of forest worker training needs and in conjunction with industry and other clients, develop standards for silviculture training programs.

D.2 Administration, Monitoring, Agreement Support and Evaluation

This sub-program will provide for the administration and co-ordination of all Programs under this Agreement, and will ensure the involvement of all agencies and government departments with related responsibilities.

Activities will include the preparation of detailed proposals for Programs and Projects under this Agreement, the preparation of annual Work Plans and Program budgets and for the monitoring of Project progress and outputs. This Sub-program will also provide for the collection of data regarding the progress of implementation of all Programs and Projects on a required basis, and will permit compilation of that information into annual progress reports. A review and evaluation of Sub-programs and Projects will be carried out prior to the expiration of this Agreement to assess their effectiveness in meeting the stated objectives.

ii) Deliverables

Short Term (1-5 years)

Long Term (5 years and beyond)

iii) Significant Linkages:

Saskatchewan Department of Environment and Resource Management

13. Progress and Achievements

See Annual and Semi-annual Reports of the Saskatchewan Partnership Agreement in Forestry.

14. Goals and Accomplishments (1992-93)

D.1 Public Information:

1. *Coordinate and administer the planning and delivery of an effective forestry communications program in Saskatchewan.*

Coordinated and administered the planning, delivery and evaluation of the second-year phase of the agreement communications plan which included the following activities: distributing the legal agreement; producing an agreement brochure, display, report covers and other communication material; producing four fact sheets; monitoring and assisting communications/media relations activities involving agreement-funded projects such as the integrated long-term plan, the Saskatchewan Forest Habitat Project, and the Saskatchewan Christmas Tree Growers' education kit for teachers.

2. *Promote increased public awareness and understanding of Forestry Canada and PAIF initiatives in the forest sector, and inform targeted publics in Saskatchewan of the benefits of the forest resource.*

Continued to coordinate and implement public awareness activities through the following activities: developing and adapting Focus on Forests for use in Saskatchewan; setting up the PAIF display at 10 events resulting in 6,547 contacts (three more events still on schedule); distributing 8,000 seedlings to the public; working with educators, environmental groups and forestry-related organizations and assisting with their educational initiatives; writing newsletter articles for Forestry Canada and forestry related associations; responding to 122 requests from the public for publications.

3. *Develop and coordinate agreement-related media activities for Forestry Canada in Saskatchewan.*

Continued to develop and coordinate agreement related media activities including the following: writing and issuing five news releases (three in approval process) and two media advisories; coordinating promotions for Tree Trek '92, National Forest Week, and the reopening of the Homestead Heritage Forest Trail; distributing a photo depicting an agreement project to weekly papers; responding to media enquiries; and establishing a monitoring service of the weekly papers.

D.2 Administration - Accomplishments for this sub-program are listed below.

- prepared work plans for consideration by the PAIF Management Committee.
- ensured that federal direct projects were implemented, monitored and audited and that provincial direct projects were reviewed and monitored.
- prepared reports for the PAIF Management Committee as it required, including an annual report.

- facilitated the administration and delivery of all Forestry Canada's research and technology transfer programs in Saskatchewan.
- maintained regular contacts with representatives of federal, provincial and industrial agencies as well as interest groups.
- ensured the maintenance of regular contact between Northern Forestry Centre and Saskatchewan District Office staff to ensure cooperation, effective program delivery, information sharing and understanding of issues and concerns which may impact on Forestry Canada's operations in Saskatchewan.

GIS & Systems

- assisted in the installation of the new local area network ethernet and computer equipment at the Saskatchewan District Office (SDO).
- installed Unix System Software upgrades.
- set up and maintained Saskatchewan District Office Unix based office environment. Maintained computers and office equipment related to everyday operations at Saskatchewan District Office.
- provided end-user hardware/software support for the Saskatchewan District Office.
- assisted in user training in Unix and Unix based office software.
- began preparing Indian Lands information data base for Indian Reserves within Saskatchewan. Converted and corrected previously completed work. Began setting standards for GIS contractors preparing work in Saskatchewan reserves. Worked to ensure provincial data compatible with other Northern Forestry Centre databases.
- taught Introduction to GIS Course to Regional Development Personnel.
- taught intermediate GIS Course to Northern Forestry Centre personnel.
- prepared technical tender for installation of INTERNET at Saskatchewan District Office.
- chaired the GIS Sub-committee of the Prince Albert Model Forest, also sitting on the technical advisory committee of the PAMF.
- was Saskatchewan representative on Northern Forestry Centre GIS Steering Committee.

15. Information Activities

Manitoba Maple: an untapped resource. Edited, printed and distributed this report.

16. Goals 1993-94

D.1 Communications and Public Information

1. Coordinate, administer and evaluate the planning and delivery of an effective forestry communication program in Saskatchewan.
2. Promote increased public awareness and understanding of Forestry Canada and PAIF initiatives in the forest sector, inform and educate targeted publics in Saskatchewan of the benefits of the forest resource and sustainable forest management, and respond to forestry-related and environmental issues raised by target publics.
3. Develop and coordinate agreement-related media activities for Forestry Canada in Saskatchewan.

D.2 Administration

- prepare workplans for consideration by the PAIF Management Committee.
- ensure that federal direct projects are implemented, monitored and audited and provincial direct projects are reviewed and monitored.
- prepare reports for the PAIF Management Committee as it requires, including an annual report.
- facilitate the administration and delivery of all Forestry Canada's research and technology transfer programs in Saskatchewan.
- maintain regular contacts with representatives of federal, provincial and industrial agencies as well as interest groups.
- ensure the maintenance of regular contacts between Northern Forestry Centre and Saskatchewan District Office to ensure cooperation, effective program delivery, information sharing and understanding of issues and concerns which may impact on Forestry Canada's operations in Saskatchewan.

GIS & Systems

- maintain and upgrade Saskatchewan District Office computers and office equipment.
- assist Saskatchewan District Office staff in developing computer databases, programs and related geographically referenced information for upcoming field season.
- continue to participate on the Technical and GIS sub-committee of the Prince Albert Model Forest.
- complete Indian Lands Information Data Base for Saskatchewan to manage forestry interests in federal crown lands.

- prepare a GIS based information base tied to PSP plot locations in Saskatchewan.
- prepare a GIS database for provincial Forests Canada Projects. Relate DEVMIS information to geographically referenced information.
- participating in Saskatchewan Research Councils provincial Remote Sensing Project. The project will supply Forests Canada with two date Landsat Thematic Mapper Imagery for the entire provincial forest of Saskatchewan. The data can be applied to research in areas of FIRE, FIDS, National Forest Database, and private lands inventory within Saskatchewan.
- provides GIS technical assistance and expertise to Northern Forestry Centre from Saskatchewan District Office.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Northwest		Regional Development Finance Scientists Informatics	

ii) External -

Establishment	ID#	Title	Contact name
Saskatchewan Department of Environment and Resource Management			
University of Saskatchewan			
Saskatchewan Telephone			

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION

1. Title: Canada-Northwest Territories Cooperation Agreement in Forestry
2. Responsibility Centre: Northwest Region (8451)
3. Activity: 3121
4. Program: Regional Development
5. Status: Continuing
6. Last Evaluation: January 31, 1993
7. Next Evaluation:

B. KEYWORDS:

005 Development Agreements
 021 Sustainable Development
 024 Reforestation
 025 Forest productivity
 037 Research Support
 038 Forestry Services
 054 Public Information/awareness
 057 Negotiate New Forestry Agreements
 062 Aboriginal lands
 709 Technology Transfer

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	0.00	0.00	0.00	0.00	0.00
Salaries	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
O & M	\$0.0	\$0.0	\$252.3	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$139.7	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$160.0	\$0.0	\$0.0
Total	\$0.0	\$0.0	\$552.0	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS

Nor 48 is the Canada-Northwest Territories Cooperation Agreement in Forestry. The objectives of the agreement are:

- a) ensuring the availability of long-term economically accessible timber supplies in the Northwest Territories through forest inventory, planning, forest protection and management, applied research, and technology transfer.
- b) optimizing management and utilization of the Northwest Territories forest resources including improved knowledge and understanding of non-timber forest values through forest inventory, planning, applied research, market development, technology transfer, training, and public information; and
- c) contributing to the economic health of the Northwest Territories forest sector, through the improvement of employment and human resources, applied research, market development, technology transfer, and public information.

The agreement provides support for research activities. Project proposals are reviewed and approved based on the extent to which they fit the mandate of the Agreement.

1. Environment Assessment Review Process:

The NoFC Environmental Screening Committee has evaluated the proposed different studies within this project on the basis of information provided by the Agreement PAF or the study leader; there may be components of individual studies that need to be screened or assessed by the Environmental Screening Committee for specific activities, but as a whole the proposed activities and studies are not potentially detrimental to the environment.

2. Collaborators/Green Plan Resource Summary (\$s & PYs):

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary					
Secondary					
Total					
Green Plan					

3. Collaborators:

Secondary

- NWT Department of Renewable Resources
- Indian and Northern Affairs Canada
- NWT - Department of Economic Development and Trade
- Municipalities

Non-government organizations
Forestry Industry
Universities

4. Green Plan:

N/A

5. Milestones:

1993-94:

1. Develop, manage, implement and deliver the regional Partnership Agreements in Forestry.
2. Represent Forestry Canada interests throughout the region by participating in appropriate meetings, committees, workshops, etc.

6. Accomplishments:

1. The Canada-Northwest Territories Cooperation Agreement in Forestry was signed on 23 January 1992. Nineteen (19) Projects were implemented in 1992-93.
2. Forestry Canada was represented throughout the region by attendance at a large number of meetings, workshops, seminars and committee work.

7. Link to Strategic Plan:

National:

NOR 48 has direct linkages by providing Forest Sector Leadership, negotiating New Forestry Agreements, and developing programs for Demonstration Forests, forest workers, Private Woodlot Owners and Aboriginal Lands.

Regional/Institute:

NOR 48 is linked to resolving regional issues in economic forest use and regional development, federal and private lands and research, development and innovation.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 22, 1993

1. **STUDY TITLE:**
2. Responsibility Centre: Northwest Region
3. Program: Regional Development
4. Project Title: Canada-Northwest Territories Cooperation Agreement in Forestry
5. Office Location(s): Edmonton, Alberta
6. Work Location: Northwest Region
7. Study Staff:

	Name
Study Leader	S. Price
Team Members	D. Kiil
	M. Stephen
	L. Ross
	D. Boylen
	J. Samoil
Total	

8. Study Key Words:

Canada-Northwest Territories Cooperation Agreement in Forestry, reforestation, forestry research, marketing, demonstration, hardwood development, public information, administration, evaluation, job creation, economic development, agreement reports, integrated resource management, stand improvement, technology transfer, environmental impacts, Economic Development Agreement, forest inventory, management plans.

9. Study Activity: 3121

10. Study Resources:Personnel Information Not applicableFinancial Resources (\$000s)

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries		0.00	21.87			
O&M		180.67	250.11			
Capital		0.00	113.50			
G & C		110.00	160.00			
TOTAL:		290.67	705.48			
STUDY TOTAL		290.67	705.48			

11. Study Background and Problem Analysis

The importance of the land and other resources to the economic, social, environmental and spiritual well-being of northern Canadians has long been recognized by the governments of Canada and the NWT. With the adoption of "A National Forest Sector Strategy For Canada" and "A Framework for Forest Renewal" by the Government of Canada and with the implementation of "Building on Strengths: A Community-based Approach" and the "Forest Fire Management Policy" by the GNWT, both governments have been provided the opportunity to cooperatively ensure the socio-economic, long-term sustainability of the forest resource. The intent of the Canada-NWT Cooperation Agreement in Forestry is to building on these new principles and policies. Forestry Canada, through financial support and expertise will contribute to integrated resource management and long-term planning, research, development, technology transfer and improved forestry data.

12. Study Objectives:

1. To manage and coordinate the implementation of federally-funded initiatives and monitor the use of federal funds related to the Canada-Northwest Territories Cooperation Agreement in Forestry by:
 - a) ensuring the availability of long term economically accessible timber supplies in the NWT through forest inventory, planning, forest protection and management, applied research and technology transfer;
 - b) optimizing management and utilization of the NWT's forest resources including improved knowledge and understanding of non-timber forest values through forest

inventory, planning, applied research, market development, technology transfer, training and public information; and

- c) contributing to the economic health of the NWT forest sector, through the improvement of employment and human resources, applied research, market development, technology transfer and public information.
2. To review socio-economic events, regionally, nationally, and internationally and assess impacts in terms of ForCan mandate and programs in relation to regional development in the forestry sector.
 3. To coordinate the development, implementation and administration of forestry employment stimulation programs in the NWT as required.
 4. To provide regional liaison for all Forestry Canada activities related to the Canada-NWT Cooperation Agreement in Forestry, including Forestry Canada HQ and the Economic Development Agreement Administrative Directorate.

Significant Linkages:

Department of Indian and Northern Affairs Canada
 Government of Northwest Territories
 - Department of Renewable Resources
 - Department of Economic Development & Tourism

13. Progress and Achievements

1. The negotiations were completed and the Canada-NWT Cooperation Agreement in Forestry was signed on January 23, 1992.
2. The following projects were implemented under the Canada-NWT Cooperation Agreement in Forestry:

<u>Project Name</u>	<u>Implementation</u>
Site Preparation and Demonstration	Forestry Canada
National Silvicultural Conference	Forestry Canada
Intelligent Fire Management Information System	Forestry Canada
Spruce Budworm Collection/Survey	Forestry Canada
Technical Support	Renewable Resources, GNWT
Liard Integrated Resource Management Plan	Renewable Resources, GNWT
Fort McPherson Community Inventory	Renewable Resources, GNWT
Forest Management Policy	Renewable Resources, GNWT
National Forest Week Display	Renewable Resources, GNWT
Liard Integrated Management Plan-Newsletter	Renewable Resources, GNWT
EDA Administration	Forestry Canada

3. Several Canada-NWT Cooperation Agreement in Forestry Meeting were attended, as well as, Economic Development Agreement committee meetings.

14. Goals and Accomplishments (1992-93)

1. *Develop, manage, implement and deliver the Canada-NWT Cooperation Agreement In Forestry.*

The following projects have been implemented under the Canada-Northwest Territories Cooperation Agreement in Forestry:

<u>Project Name</u>	<u>Implementation</u>
Reforestation Project Coordinator	Renewable Resources, GNWT
Technology Transfer	Forestry Canada
Science Institute of NWT	Forestry Canada
Site Preparation - Silviculture Study in the Jean Marie Area	Forestry Canada
Assessment of Biological Responses to Mechanical Site Preparation	Forestry Canada
Initial Attack Productivity and Effectiveness Survey	Forestry Canada
Intelligent Fire Management Information System	Forestry Canada
Little Rate Lake Prescribed Burn	Forestry Canada
Porter Lake Regeneration Survey	Forestry Canada
Spruce Budworm Collection/Survey	Forestry Canada
B.3 Technical Support	Renewable Resources, GNWT
Liard Integrated Resource Management Plan	Forestry Canada & Renewable Resources, GNWT
Liard Valley IRM Committee Support	
South Slave Vegetation	Renewable Resources, GNWT
Liard Integrated Management Plan-Newsletter	Renewable Resources, GNWT
EDA Administration	Forestry Canada & Renewable Resources, GNWT

2. *Represent Forestry Canada interests in the NWT by participating in EDA Agreement Committees, such as, the Policy Committee, the Coordinating Committee, the Program Evaluation Committee, the Public Advisory Committee, the Public Relations Committee, the Communications Committee and the Administrative Services Management Committee. In addition, Forestry Canada's interests will be represented at other meetings, committees, workshops, etc. as required.*

Forestry Canada has participated in all meetings as required by both the Canada-Northwest Territories Cooperation Agreement in Forestry and Economic Development Agreement.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports

- EDA summary package of the Sub-Agreements and their Initiatives
- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer:

16. Goals 1993-94

1. Develop, manage, implement and deliver the Canada-NWT Cooperation Agreement In Forestry.
2. Represent Forestry Canada interests in the NWT by participating in EDA Agreement Committees, such as, the Policy Committee, the Coordinating Committee, the Program Evaluation Committee, the Public Advisory Committee, the Public Relations Committee, the Communications Committee and the Administrative Services Management Committee. In addition, Forestry Canada's interests will be represented at other meetings, committees, workshops, etc. as required.
3. Provide required documentation to the EDA Directorate and Forestry Canada HQ, eg. CARS.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name

ii) External -

Establishment	ID#	Title	Contact name
Department of Renewable Resources, GNWT		Assistant Deputy Minister	R. McLeod
		Director, Forest Mgmt. Division	R. Larson
Department of Economic Development and Tourism, GNWT		Manager, EDA	L. Hamblin-Cobb
Department of Indian and Northern Affairs Canada		Manager, EDA ??	H. Mckee H. Naik

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION

1. Title: Management of Northern Forestry Centre and Regional Operations
2. Responsibility Centre: Northwest Region
3. Activity: 2111
4. Program: Regional Director General, Northwest
5. Status: Ongoing
6. Last Evaluation: N/A
7. Next Evaluation:

B. KEYWORDS:

002 Management
100 Green Plan

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	0.00	6.00	6.00	0.00	0.00
Salaries	\$793.2	\$622.2	\$391.5	\$0.0	\$0.0
O & M	\$332.1	\$326.1	\$308.5	\$0.0	\$0.0
Capital	\$13.2	\$147.1	\$106.6	\$0.0	\$0.0
G & C	\$24.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$1,162.5	\$1,095.4	\$806.6	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS

The project provides overall direction and coordination of federal policies, programs and activities in the Northwest Region of Forestry Canada. This mandate is delivered under 8 programs: Forest Protection and Management, Forest Resources, Regional Development (including Prince Albert and Winnipeg District Offices), Management Services, Communications, Publications and Distribution and Human Resources Management and Policy, Planning and Evaluation. Management of the NoFC and District Offices involves a staff of about 150 scientists, professionals and support staff and an annual operating budget of about \$24 million. In addition to a significant forest management and environmental

research program, the Northwest Region administers four federal-provincial/territorial forestry partnership agreements (Alberta, Saskatchewan, Manitoba, Northwest Territories), three Model Forests (Foothills, Prince Albert, Manitoba), the Tree Plan program, and various R&D initiatives under Canada's Green Plan.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary (\$s & PYs):

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary					
Secondary					
Total					
Green Plan					

3. Collaborators:

Secondary

Provincial and territorial Forest Services in Alberta, Saskatchewan, Manitoba and Northwest Territories
 Forestry industry; universities
 research councils
 Municipalities
 non-government organizations
 private tree nurseries
 consultants
 other federal and provincial departments
 international research organizations
 environmental groups

4. Green Plan:

Three Model Forests (Foothills, Prince Albert, Manitoba)
 Tree Plan Canada
 Green Plan S/T program
 (forestry practises, decision-support systems, forest and climate change, fire management systems)

5. Milestones:1993-94:

1. Deliver policy and programs responsibilities under four federal-provincial/territorial forestry partnership agreements.
2. Continue implementation of Tree Plan Canada in Northwest Region by facilitating the planting of over 3 million seedlings.
3. Administer Forestry Canada's obligations in support of these Model Forests in Northwest Region.
4. Communicate Northwest Region/Forestry Canada programs, activities and achievements to forest community and the general public.
5. Implement regional programs under Partners in Sustainable Development of Forests Program, including enhanced S&T Initiatives as appropriate, and integrate with federal-provincial/territorial forestry agreements and A-base programs.
6. Develop a program to participate in National Forestry Week '94 activities to celebrate Edmonton's designation as National Forestry Capital.
7. Integrate program objectives and streamline implementation and delivery of Green Plan, partnership accords and A-base initiatives.
8. Develop Forestry Canada Policy on Aboriginal Forestry.

6. Accomplishments:

1. Continued implementation of programs and activities under four federal-provincial/Territorial forestry partnership agreements (Alberta, Saskatchewan, Manitoba, NWT).
2. Operationalized the Technology Development Unit and the Aspen Resource Center. Initiated new projects in Integrated Resource Management and Decision Support Systems.
3. Managed all budget resources within established targets.
4. Directed and coordinated Northwest Region role in Green Plan Partners S/T, Model Forests and Tree Plan Canada programs.
5. Delivered major forestry awareness program through participation at major exhibitions, trade fairs, forestry meetings, media coverage, etc.

7. Link to Strategic Plan:

National:

Leadership
Forest Sector Development
Forest Environmental Quality
Science and Technology

Regional/Institute:

Refer to "Toward the 21st Century Forest"
The Northwest Region
Strategic Plan 1990-95

PROJECT SUMMARY

A. GENERAL INFORMATION

1. Title: Management Services
2. Responsibility Centre: Northwest Region (8121)
3. Activity: 2251,2252,2253,1211,1111,1221
4. Program: Management Services
5. Status: Continuing
6. Last Evaluation: December 17, 1991
7. Next Evaluation:

B. KEYWORDS:

002 Management
 006 Finance and Administration
 037 Research Support
 111 Support
 150 Equipment
 151 Minor Construction
 100 Green Plan

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	20.85	20.50	21.00	0.00	0.00
Salaries	\$730.2	\$713.4	\$759.2	\$0.0	\$0.0
O & M	\$416.3	\$411.1	\$358.2	\$0.0	\$0.0
Capital	\$384.6	\$383.0	\$424.1	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$1,531.1	\$1,507.5	\$1,541.5	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS

This project provides support services to the Northwest Region. These services include Finance (reporting and accounts), Administration (wordprocessing, reception, records,

communication, personnel action initiation), Materiel Management (purchasing, inventory, stores, fleet management), Facilities Operation (building systems and maintenance, greenhouse and nursery, safety, camps).

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary (\$s & PYs):

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary					
Secondary					
Total					

Green Plan

3. Collaborators:

N/A

4. Green Plan:

Administrative assistance in Purchasing and Finance to help with incremental work load increase associated with Green Plan.

5. Milestones:

1993-94:

- | | |
|-----------------------------|---|
| Finance: | 1. Process all travel claims and invoices within 10 working days. |
| | 2. Provide monthly financial reports within 5 working days of month end. |
| | 3. Provide financial support and services to the region. |
| Material Management: | 1. Process requisitions within 24 hours of receipt. |
| | 2. Inventory equipment and stores items on a pre-arranged schedule. |
| | 3. Maintain vehicles per a written maintenance schedule. |
| | 4. Maintain vehicle records and charge back costs to studies monthly. |
| | 5. Implement plots in Northwest Region. |
| Administration: | 1. Complete wordprocessing jobs within 1 day(1-5 pages) or 3 days (5- 25 pages) |
| | 2. Distribute mail within one hour of receipt. |

3. Purge Records Storage Rooms
4. Bill tenants quarterly for communication charges.
5. Provide reception services to NoFC.
6. Prepare Conference Plan, Foreign Work Travel Plan, and Training Plan.
7. Install new Telephone System at NoFC.

**Facilities
Management:**

1. Provide general maintenance to the building and grounds.
2. Operate efficiently the heating, air conditioning and ventilation systems in the building.
3. Open and close the camps and perform preventive maintenance.
4. Reconstruct Parking Lot islands and lightning.

6. Accomplishments:

Finance:

1. Processed travel claims (1562) and invoices (3944). Turnaround was 8.4 and 10.6 days respectively.
2. Provided monthly financial reports within 5 working days of month end.
3. Provided financial support and services to the region.

**Material
Management:**

1. Processed requisitions (3258) within 0.75 days of receipt.
2. Maintained vehicles per a written maintenance schedule.
3. Maintained vehicle records and charged back costs to studies monthly.

Administration:

1. Completed wordprocessing jobs (1665 jobs and printed 21,287 pages) within 1 day (1-5 pages) or 3 days (5-25 pages).
2. Distributed mail (47,157 pieces) within one hour of receipt.
3. Implemented FROLIC.
4. Billed tenants quarterly for communication charges.
5. Provided reception services to NoFC. (51,828 telephone calls)
6. Prepared Conference Plan, Foreign Work Travel Plan, and Training Plan.

Facilities

Management:

1. Provided 478 general maintenance to the building and grounds. Issued
2. Operated efficiently the heating, air conditioning and ventilation systems in the building.
3. Opened and closed the camps and performed preventive maintenance.

7. Link to Strategic Plan:

National Regional/Institute: :

N/A

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 22, 1992

1. **STUDY TITLE:** Financial Services
2. **Responsibility Centre:** Northwest Region (8121)
3. **Program:** Regional Director General, Northwest Region
4. **Project Title:** Financial Services
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Edmonton, Alberta
7. **Study Staff:**

	Name
Study Leader	D. Benke
Team Members	R. Cooper
	J. Iskra
	K. Earl
	J. Gamlin
	C. Schimanke

8. **Study Key Words:** Finance
9. **Study Activity:**

1211

10. Study Resources:Personnel Information

		1992-93	Fiscal Year 1993-94			1994-95
Employee Name	Category	Previous	Budget	Revised	Forecast	1993/94
Benke, D.	FI-02 (A)	1.00	1.00	1.00	1.00	1.00
Cooper, R.	FI-01 (A)	1.00	1.00	1.00	1.00	1.00
Earl, K.	CR-04 (S)	1.00	1.00	1.00	1.00	1.00
Iskra, J.	CR-04 (S)	1.00	1.00	1.00	1.00	1.00
Gamlin, J.	CR-04 (S)	1.00	1.00	1.00	1.00	1.00
Schimanke, C.	CR-04 (S)	0.00	0.30	0.30	0.30	0.30
FTEs		5.00	5.30	5.30	5.30	5.30

Financial Resources (\$000s)

<u>A-Base</u>	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	1993/94
Salaries	0.00	0.00	0.00	0.00	
O&M	19.23	19.70			
Capital					
G & C					
TOTAL:		19.70			

STUDY TOTAL	19.23	19.70			
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11. Study Background and Problem Analysis

For the past six years, Finance has been able to achieve its goals. Finance goals focus mainly on services to our clients while attempting to meet external agency demands. Increased volumes of work and more complex systems are placing a strain on current resources and our attempt to maintain established standards. Computerized system integration will greatly enhance our ability to handle an increasing workload with current staff.

12. Study Objectives:

i) Objectives

To supply financial services and advice to NoFC, Saskatchewan District Office and Manitoba District Office.

ii) Long Term Deliverable

C.D.F.S. is a replacement to FINCON (our current computerized national financial system) and is capable of integration with other systems currently accessed by finance. Any piloting of this new system is currently planned for fiscal year 1993-94 and will possibly carry over into 94-95.

13. Progress and Achievements

For the last five years, the level of service delivered by Finance in the Northwest Region has continued to improve. Strict productivity standards have been established and met with admirable results. Externally, this has resulted in an improving business relationship with private sector suppliers. Internally, regional staff has received accurate and timely service/information in support of both scientific operations and management.

Due to the Financial project's efficiency and effectiveness, the Northwest Region Regional Finance project has been utilized annually as a pilot for new accounting and control systems that if implemented would have national applications, as well as site for new national systems. Some of the more prominent systems that have been piloted by Northwest Region Finance are as follows:

P.Y. System	1990-91
PIMS	1991-92
SIMS	1992-93
CDFS	1994-95

Our involvement in the improvement of these systems following acceptance and implementation has been on-going.

14. Goals and Accomplishments (1992-93)

- 1) *Process all invoices within 10 days of receipt in finance unless written evidence of problems is on the file, with the exception of major utilities which will be processed within two days of receipt in finance so no late payment charges are incurred.*

Late payment charges with major utilities have been eliminated. Average turn around time was 7.8 days. Total invoices processed at NoFC were 2395. (January 92 - December 92). District office statistics are: Sask. 588, Manitoba 520.

- 2) *Process all travel claims within 10 days of receipt in finance.*

Number of travel claims processed at NoFC were 979. Average turn around was 75. days. District office statistics are: Saskatchewan 254 and Manitoba 245.

- 3) *When it is not possible to travel with the use of individual travel cards, process all travel advances so that all requesters receive their advances at the latest on the day they require them.*

Number of advances issued at NoFC were 292.

- 4) *Maintain a monthly statistical record as required by the Manager, Management Services and provide this information to him by the fifth working day of the following month.*

Achieved in a timely and accurate manner for NoFC and the two districts.

- 5) *Using automation, process JV's for gas, stores, telephone and petty cash payments within 3 working days of having received them in Finance.*

Number of JV's processed at NoFC were 375. This statistic is grossly under assessed as actual time per JV has increased substantially due to amounts of coding. Green Plan and new agreements have required extensive expenditure JVing. Cutbacks (2.5%) and Operational Budgeting has also contributed to the high volume of journal vouchers.

- 6) *Maintain a commitment system. Commitments will be input to FINCON within two (2) days of receipt. A system which enables quick access to the actual document setting up the commitment will be maintained. Commitments will be analyzed monthly in finance to ensure only "good" commitments are in the system. All commitments must be based on written documentation.*

In addition to free balance, respective open and closed commitments by study are provided via computer to program directors/project leaders/study leaders weekly for their review. Number of commitments inputted at NoFC were 3186. Commitment descriptions have been incorporated into inquiries. Commitments are reviewed in detail monthly by management and finance to ensure their integrity.

- 7) *Continue to reconcile DSS statements, FINCON statements, Batch ledger and monthly financial statements monthly by TBA.*

Monthly reconciliations of DSS, FINCON and the batch log, are being conducted regularly, with the working papers being retained on file. Adjustments are up to date.

- 8) *Action requests for adjustments to the system within one (1) working day of the request.*

Achieved normally on a same day basis.

- 9) *Process within 24 hours or the deadline requested, if later, requests for information such as from Manager, Management Services, HQ, Program Directors, Project Leaders, study leaders.*

Achieved normally on a same day basis or within requested deadline.

- 10) *Provide accurate financial statements to Program Directors and HQ within five (5) working days of monthly close off, including statement of individual study status distributed via computerized budget system.*

Monthly financial report includes detail on budgets by study/project/program within T.B.A. and person year information. Study status info is now distributed via E-mail to all personnel (Program Directors/Project Leaders/Study Leaders) weekly. This service is provided to District Offices for all T.B.A.s excluding salaries.

- 11) *Coordinate and monitor use of Individual Travel Cards.*

Actioned with a turn around acceptable to users.

- 12) *Reconcile agreement reporting and systems to ensure proper control and integrity in numbers used and communicated.*

Achieved. New agreements are being reported on in the same manner as in the past. FINCON data is the basis for agreement financial reporting. Manual systems are reconciled to reports generated monthly.

- 13) *Perform agreement audits as requested by Regional Development personnel or as required.*

No Federal-Provincial Agreement requests to date, however preliminary discussion regarding the audit of Green Plan Model Forest administration has taken place.

- 14) *Know at all times, the total agreement funds by province and be able to reconcile all information (received from headquarters) on funding within this total.*

This requirement is essential to multi-year allotment control and is reported on monthly.

- 15) *Maintain DSS on-line pay as NoFC authorizer.*

Achieved with no delay to the process.

- 16) *Participate in the testing of Global Budgeting at N.W. Region. The participation will involve comprehensive control of financial resources for the Region while at the same time still supply Headquarters will allotment control analyses through monthly reporting.*

Results of this pilot have been extremely rewarding. All establishments in FORCAN as well as Headquarters have benefited from our role as pilot. In addition to conducting the pilot, we have participated in implementing Operational Budgeting in all other establishments. Systems developed to support the administration of Operational Budgeting have also been adopted by other establishments.

- 17) *Continue to participate as a test site for projects with national application. (e.g., PY system, CDFS, PIMS and Operating Budgeting).*

This goal is ongoing.

- 18) *Quarterly District Office visits will be conducted to assist in ensuring adequate support of the financial function to District Office staff and management. As well, these visits will audit systems in place.*

Telephone and monthly reporting are currently our main means of communications. Quarterly visits were not possible due to lack of funding. Communication and feed back mechanisms have tended to weaken with minimal contact, particularly now with the function of finance centralized to NoFC.

15. Information Activities

iii) Other reports

Monthly Financial Reports; Budget System

- 1) Providing financial advise as required to FORCAN personnel.
- 2) Ad hoc reports as requested.

iv) Lectures, courses, seminars and scientific addresses:

Lectures on Operational Budgeting to personnel representing other FORCAN regions.

v) Technology transfer:

- 1) Providing system DEMO's to FORCAN personnel outside the Northwest Region as well as to representative from other Government Departments.
- 2) Allotment Control Reports

Demonstrations to other Federal Government departments on the use of SIMS and its capabilities. Demonstrations to other Forestry Canada Regions on systems developed in the Northwest Region.

16. Goals: 1993-94

- 1) Process all invoices within 10 days of receipt in finance unless written evidence of problems is on the file, with the exception of major utilities which will be processed within two days of receipt in finance so no late payment charges are incurred.
- 2) Process all travel claims within 10 days of receipt in finance.
- 3) When it is not possible to travel with the use of individual travel cards, process all travel advances so all requesters receive their advances at the latest on the day they require them.
- 4) Maintain a monthly statistical record of financial activities as required by the Manager, Management Services and provide this information to him by the fifth working day of the following month.
- 5) Using automation, process JV's for gas, stores, telephone and petty cash payments within three (3) working days of having received them in Finance.

- 6) Maintain a timely and accurate commitment system. Commitments will be input to FINCON within two (2) days of receipt. A system which enables quick access to the actual document setting up the commitment will be maintained. Commitments will be analyzed monthly in finance to ensure only "good" commitments are in the system. All commitments must be based on written documentation.
- 7) Continue to reconcile SIMS system, DSS statements, FINCON statements, Batch ledger and monthly financial statements monthly by TBA.
- 8) Action requests for adjustments to the system within 1 working day of the request.
- 9) Process within 24 hours or the deadline requested, if later requests for information such as from Manager, Management Services, HQ, Program Directors, Project Leaders, study leaders.
- 10) Provide accurate financial statements to Program Directors and HQ within five (5) working days of monthly close off, including statement of individual study status distributed via computerized budget system.
- 11) Coordinate and monitor use of Individual Travel Cards.
- 12) Reconcile agreement reporting and systems to ensure proper control and integrity in numbers used and communicated.
- 13) Perform agreement audits as requested by appropriate FORCAN personnel or as required.
- 14) Know at all times, the total agreement funds by province and be able to reconcile all information (received from headquarters) on funding within this total.
- 15) Maintain DSS on-line pay as NoFC authorizer.
- 16) Continue to promote comprehensive control and weekly/monthly reporting of financial resources (including salaries) to the Northwest Region as required given Operational Budgeting, where at the same time still supply Headquarters will allotment control analyses through monthly reporting.
- 17) Continue to participate as a test site for projects with National application. (e.g., SIMS system, CDFS, PIMS and Operational Budgeting).
- 18) Quarterly District Office visits will be conducted to assist in ensuring adequate support of the financial function to D.O. staff and management. As well these visits will be meant to audit systems in place.
- 19) Implement a new commitment system that identifies major miscellaneous commitment/expenditures (e.g. telephone) separately.
- 20) Process in FINCON all signed P.A.F.s within 3 working days from the time received in finance (providing unencumbered funds are available in respective TBA's).

21) Maintain salary information management system (SIMS) using information processed through the DSS on line pay system.

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
Headquarters	1211	Manager, Financial Systems	Jacques Coté

ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement: Not Required
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 22, 1992

1. **STUDY TITLE:** Coordination and Direction of Management Services
2. **Responsibility Centre:** Northwest Region (8121)
3. **Program:** Regional Director General, Northwest Region
4. **Project Title:** Management Services
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Edmonton, Alberta
7. **Study Staff:**

	Name Current Study Utilization %
Study Leader	P. Stewart
Team Members	

8. **Study Key Words:**
Management Services
9. **Study Activity:** 1111
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Actual	Upcoming
P. Stewart	FI-03 (A)	1.00	1.00	1.00		1.00
FTEs		1.00	1.00	1.00		1.00

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries					
O&M	15.24	6.50			
Capital	22.59	3.00			
G & C					
TOTAL:	37.83	9.50			

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>Green Plan</u>					
Salaries					
O&M	1.48	3.89			
Capital					
G & C					
TOTAL:	1.48	3.89			
STUDY TOTAL	39.31	13.39			

11. Study Background and Problem Analysis:

Coordination of the financial, administrative, materiel management, facilities maintenance and greenhouse operation, vehicles and informatics functions in Northwest Region.

12. Study Objectives:

i) Objectives

To provide financial, material management, administrative, facilities support services and informatics to NWR Director General, Program Directors, Project Leaders, Study Leaders, District Offices, and employees.

ii) Deliverables

Short Term (1-5 years)

The upcoming year will emphasize:

1. Finalizing admin area air system upgrade and renovations;
2. Common Services review;
3. High quality service throughout the region.

The next five (5) years will continue to emphasize service. New Plans for the building will be prepared.

13. Progress and Achievements

Management Services in the last five (5) years has moved to greater automation. In Finance, all chargebacks are input to the financial system in bulk, the financial reports for managers are on the VAX and accessible from an individual's computer terminal. The Person year/salary budget system is operational. Northwest Region was the pilot for Operational Budgets in 92/93 and is prepared to continue its full implementation in 93/94. In Material Management the Material Management, Information System (MMIS) has been improved on an on-going basis. In Administration, the Conference and Training Plans have been automated as has been the long distance telephone chargebacks. In Facilities, the Preventative Maintenance program and the work order system are being automated.

In the last year, Management Services has stressed managing under an Operational Budget, reconstructing the lobby area, and preparing the Option Analysis and Regional Investment Plan for the Major Capital Investment Plan.

14. Goals and Accomplishments: (1992-93)

- 1) *Oversee financial, administrative, materiel management, vehicles and building operations (see other study statements work plans of NOR 51 and NOR 53).*

Oversaw financial, administrative, materiel management, vehicles, building operations and computing services(see other study work plans in 51 and 53).

- 2) *Collect monthly data on functions under Management Services.*

Collected monthly data on functions under Management Services; reviewed it and used as management tool to allocate work and resources.

- 3) *Participate in Management of NWR by attending Management Committee Meetings and advising on Management Services and Regional issues.*

Participated in Management of NWR by attending Management Committee Meetings and advising on Management Services and Regional issues.

- 4) *Monitor NWR resources on a monthly basis and draw attention to problem areas. Provide monthly financial statements by the fifth working day of the next month at the latest.*

NWR resources were monitored on a monthly basis and attention was drawn to problem areas. Provided monthly financial statements by the fifth working day of the next month at the latest.

1991/92 Year End Resource Status

	Budget	Expenditure
O&M -A-base -Salary	1474.3	1292.3
Capital-equip	600.9	548.1
Construction	295.0	294.4
O&M Agreements	2455.6	1802.9
Capital Agreements	400.0	396.1
Contributions	2892.0	2640.3
Green Plan - O&M	530.7	516.3
- capital	173.8	169.6
TOTAL	8,822.30	7,660.00

An expenditure freeze was announced by the Government on January 26, 1992. Consequently, funds lapsed at year end.

- 5) *Visit each District Office at least once during the year.*

Visited the Manitoba District Office in June and December, 1992 and Saskatchewan District Office in June, 1992.

- 6) *Attend two (2) meetings of Managers, Management Services.*

Attended the only scheduled meeting of Managers, Management Services; hosted this meeting at NoFC in June, 1992.

- 7) *Liaise with tenants in the building. Arrange for chargebacks as per the formula. Coordinate the removal of DFO from the building.*

Liaised with tenants in the building. Sent out invoices in November and coordinated the final removal of DFO from the building. Discussed the vacating of one office with EPS.

- 8) *Act as Secretary to the Project Leaders Meeting. Issue notice one week before meeting, issue agenda one day prior to meeting and circulate minutes within one week of the meeting.*

No Project Leaders Meeting were held in 1992.

- 9) *Attend Manager, Management Services meeting to discuss capital construction budget for 1993-94.*

Attend Manager, Management Services meeting to discuss capital construction budget for 1993-94 at Cornwall in January, 1993.

- 10) *Participate in Health and Safety Committee and LMCC.*

Participated in Health and Safety committees at NoFC. Acted as Management Chairman three (3) times during the year. Attended two (2) LMCC meetings.

- 11) *Finalize ordering and putting in place audiovisual equipment for enlarged Boardroom by May 15, 1992.*

Boardroom audiovisual equipment installed in August, 1992.

- 12) *Finalize ordering and putting in place audiovisual equipment and furniture for renovated conference room and meeting rooms in the basement by May 30, 1992.*

Conference Room completed. Equipment is functioning and it is very well used.

- 13) *Implement Operational Budgeting in the NWR and assess its success during the year.*

Operational Budgeting implemented. It is successful. Northwest Region advising Headquarters and other regions on full implementation for 1993/94.

- 14) *Oversee the lobby renovations during the summer, 1992.*

The lobby was fully renovated and completed in December, 1992. The Minister opened it on March 1, 1993.

- 15) *Coordinate the preparation of the Options Analysis for the Major Capital Plan for NWR in conjunction with the consultant provided by headquarters who will write that part.*

Option analysis data was collected and a consultant will finish the report by January, 1993.

- 16) *Assess service provided by Ryder Travel, the new Government Travel Group.*

Deficiencies in service were identified. Two (2) meetings were held with Ryder to correct problems. Service seems to have improved.

- 17) *Organize Northwest Region retreat.*

Chaired the Action Committee that put together the agenda and arranged the presenters for the Northwest Region at Nakoda Lodge, Morley in October, 1992.

- 18) *Develop a proposal for new telephone system for Northwest Region.*

Worked with J. Griffin (NOR 51-03) who prepared a proposal on a new telephone system.

- 19) *Staff Secretarial position for Program Directors, Development and Resources and Manager, Management Services.*

Hired M. Kreter who started work in July, 1992.

- 20) *Arrange regional staff meeting on contracting where Bob Kelly from Treasury Board will make a presentation.*

Drew up list, sent out letters of notification and organized the presentation on contracting.

- 21) *Proposed Northwest Region options for the 2% Government Restraint Program.*

Solutions were proposed and presented to Headquarters who accepted it after some revisions.

- 22) Participate in GE conversion exercise.

Attended Work Description Writing course and Evaluation course; wrote five (5) job descriptions and co-ordinated the remainder in Management Services; and participated on evaluation committees which evaluated approximately 25 work descriptions.

- 23) *Participate in Departmental Operational Budget Implementation Task Force.*

Was a member of the committee, did a report on Financial Reporting by region, made presentations at FORCAN-M, NeFC, and FPMI.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports
- iv) Lectures, courses, seminars and scientific addresses

Three (3) presentations on Operational Budgets at:

- 1) ForCan-M
- 2) FPMI
- 3) NoFC

- v) Technology transfer:

16. Goals: 1993-94

- 1) Oversee financial, administrative, materiel management, vehicles and building operations (see other study statements in Project 51 as well as 53-01).
- 2) Collect monthly data on functions under Management Services

- 3) Participate in Management of NWR by attending Management Committee Meetings and advising on Management Services and Regional.
 - 4) Monitor NWR resources on a monthly basis and draw attention to problem areas. Provide monthly financial statements by the fifth working day of the next month at the latest.
 - 5) Visit each District Office at least once during the year.
 - 6) Attend two (2) meetings of Managers, Management Services.
 - 7) Liaise with tenants in the building. Arrange for chargebacks per the formula.
 - 8) Attend Manager, Management Services meeting to discuss capital construction budget for 1994-95.
 - 9) Participate in Health and Safety Committee and LMCC.
 - 10) Finalize the installation of the ventilation system in the admin wing.
 - 11) Oversee the other minor construction projects approved for 1993/94.
17. Major Co-operators:
- Not applicable.
18. Environmental Implications:
- i) Environmental Impact/Assessment Review Statement
N/A
 - ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 22, 1992

1. **STUDY TITLE:** Administrative Services
2. **Responsibility Centre:** Northwest Region (8121)
3. **Program:** Regional Director General, Northwest Region
4. **Project Title:** Management Services
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Edmonton, Alberta
7. **Study Staff:**

	Name
Study Leader: Administration Officer	J. Griffin
Team Members: Records Office	S. Ratansi
	L. Hai
Word processing Centre	J. Simunkovic
Receptionist	A. Cardasilaris

8. **Study Key Words:**

Reception, Word Processing, Records Management, Mail Processing, Telecommunications, Administrative Services

9. **Study Activity:**

1221

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994/95
		Previous	Budget	Revised	Actual	Upcoming
J. Griffin	AS-04 (A)	1.00	1.00	1.00		
S. Ratansi	A/CR-04 (S)	1.00	1.00	1.00		
L. Hai	A/CR-03 (S)			1.00		
J. Simunkovic	ST-OCE-3 (S)	1.00	1.00	1.00		
A. Cardasilaris	CR-03 (S)	1.00	1.00	1.00		
FTEs		5.00	5.00	5.00		

Financial Resources (\$000s)

A-base	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
Salaries	0.00	0.00	0.00	0.00	
O&M	122.89	74.80			
Capital	22.59	76.00			
G & C					
TOTAL:	145.48	150.80			

STUDY TOTAL	145.48	150.80			
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11. Study Background and Problem Analysis

Provide administrative services for the research staff and other Forestry Canada employees, contributing to the operation of the organization. If we have more than one staff member away at the same time or if machinery breaks down, we can't provide the same level of service.

12. Study Objectives:

i) Objectives

To provide administrative services such as reception, word processing, records management, mail processing, telecommunications for all staff in the Northern Forestry Centre.

ii) Deliverables

Short Term (1-5 years)

Long Term (5 years and beyond)

iii) Significant Linkages:

We provide various reports and statistics for Forestry Canada Headquarters.

iv) Methodologies

13. Progress and Achievements

Administrative services of a consistently high quality have been provided to the Northern Forestry Centre. Postage equipment, photocopier, Fax machine, computers, etc. have been upgraded as required.

14. Goals and Accomplishments (1992-93)Word Processing:1) *Provide the following turn around time to clients:*

1 - 5 pages 1 working day
5 - 25 pages 3 working days

Provided the following turn around time to clients:

1 - 5 pages 1 working day
5 - 25 pages 3 working days

Department	Number of jobs	Number of pages
Regional Development	146	4,223
Finance & Administration	528	3,107
Information	280	4,083
Personnel	43	260
Protection	220	2,202
Resources	447	7,412
TOTAL	1,664	21,287

Average turnaround time was approximately 1/2 day.
Number of priority jobs 148

- 2) *Provide training to operators to ensure they understand and use the Wordperfect system to full capabilities. Training will be ongoing as new features and capabilities are brought on line.*

Provided training to operators to ensure they understood and used the Wordperfect system to full capabilities. Training is ongoing and more features are being used.

- 3) *Maintain a log of all word processing jobs and submit a monthly statistics report to the Administrative Officer.*

Maintained a log of all word processing jobs and did 12 monthly statistics reports.

- 4) *Provide switchboard relief, on a rotating basis, while Switchboard Operator is on daily breaks, sick or on annual leave.*

Provided switchboard relief, on a rotating basis, while Switchboard Operator was on breaks, sick or on annual leave.

- 5) *Purge sub-directories (workspaces) on VAX in order to maintain maximum space available.*

Twice yearly cleaned up workspaces (subdirectories) by deleting reports that are completed to maintain minimum space on the VAX.

- 6) *Provide help in central registry with mail when required.*

Provided help in central registry with mail when required.

- 7) *Input all the Study Workplans and Project Work Plans into the new Planning and Integrated Management Systems (PIMS) program.*

Put all the Study Workplans and Project Summaries into the new PIMS program. Input 66 Study Work Plan and 16 Project Summaries. Number of pages for Project Summaries, Study Work Plans 529 and for PIMS 598.

- 8) *Implement a new software program for producing Organization Charts.*

Implemented an upgrade to the Organization Chart Plus program.

- 9) *Implement and train Word Processor Operators on Word Perfect 5.1 windows.*

Implemented and trained Word Processor Operators on Word Perfect 5.1 windows.

- 10) *Implement Ventura software program and provide publishing support to Scientific and Technical Publications.*

Implemented the Ventura software program and provided publishing support to Scientific and Technical Publications.

Records Office:

- 1) *Open and record incoming mail, with the exception of advertisements, newspapers, magazines.*

Opened and recorded incoming mail, with the exception of advertisements, newspapers, magazines. Opened 18,762 pieces of mail.

- 2) *Distribute all incoming mail within one hour of receipt as per routing.*

Distributed all incoming mail within one hour of receipt as per routing. Number of pieces of incoming mail 47,157.

- 3) *Hand-deliver, upon receipt, to addressee's office or put in mail box, all facsimile and telex messages.*

Hand-delivered, upon receipt, to addressee's office or put in mail box, all facsimile messages. Number of incoming fax messages 8,167; Number of outgoing fax messages 6,540.

- 4) *Prepare and forward mail, by Priority Post, to the District Offices three (3) times a week, daily to Ottawa by Courier Service, and whenever necessary.*

Prepared and forwarded the mail, by Priority Post, to the District Offices three (3) times a week, daily to Ottawa by Courier Service and whenever necessary. Number of envelopes was 433.

- 5) *Prepare mail for pick-up each day by Canada Post and private courier.*

Prepared mail for pick-up each day by Canada Post and private courier. Number of pieces of outgoing mail 30,601.

- 6) *Ensure photocopier in mail room is working and properly supplied; call maintenance within one hour of machine being reported as mal-functioning.*

Ensured photocopier in mail room was working and properly supplied; called maintenance within 15 min. of machine being reported as mal-functioning. Number of copies on Xerox 1065 (Mail Room) was 678,109.

- 7) *Prepare workload counts and statistics for photocopies made and submit a monthly report to the Administrative Officer.*

Prepared workload counts and statistics for photocopies made and submitted a monthly report to the Administrative Officer.

- 8) *Maintain and operate a bring-forward (BF) system for subject files and material on circulation.*

Maintained and operated a BF system for subject files and material on circulation.

- 9) *Maintain scientific records room by clearing up returned scientific projects, pulling and listing housekeeping files for destruction, archiving applicable records, filing dormant records in allocated space.*

Approximately 1-2 days every month, sorted through records, closed volumes, moved them from upstairs down to the Scientific Records Room and disposed of other records according to the Retention and Disposal Schedule.

- 10) *Purge active files, de-classify documents and list files for storage.*

Purged active files, de-classified documents and listed files for storage.

- 11) *Maintain FROLIC File Classification system and implement any updates or amendments to the program.*

Maintained FROLIC File Classification system and implemented the changes and updates throughout the year.

- 12) *Rearrange mailboxes as new names are added, in order to keep them in alphabetical order for easy placement of mail in boxes.*

Re-organized 127 mailboxes, as required, to improve delivery of mail and faxes and provide a space for each employee.

- 13) *Purge active files on a regular basis and close dormant files.*

Purged all active files, closing 230 files which were no longer in use.

- 14) *Purge the two (2) large bulletin boards in the Photocopier Room weekly.*

Purged the two (2) large bulletin boards in the Photocopier Room weekly.

- 15) *Maintain adequate quantities of office supplies for access by NoFC staff during periods that Stores is closed.*

Maintained adequate quantities of office supplies for access by NoFC staff during periods that Stores is closed.

- 16) *Improve the aesthetics of the mailroom, make it more functional and make space available for the new Fax machine stand.*

Re-organized records office furniture and facilities to accommodate the new FAX machine and stand.

- 17) *Program new Fax machine using Speed Call numbers to the fullest extent.*

Programmed new Fax machine utilizing all Speed Call numbers available.

- 18) *Investigate a Records Management on Disc Program to electronically maintain information on files for implementation into our file classification system.*

Investigated a Records Management on Disc Program for ForCan but discovered that the features the program provided were inadequate for the maintenance of our file classification system.

- 18) *Train Administration staff in District Offices and NoFC Records Office, on the new FROLIC file classification system.*

Trained Administration staff in the District Offices and in Records Office, ensuring the FROLIC file classification system was fully implemented and understood.

Reception:

- 1) *Answer the telephone switchboard, in both official languages, take messages, forward calls and maintain monthly statistics.*

Answered the telephone switchboard, in both official languages took messages, forwarded calls and maintained monthly statistics. Number of calls answered January - December 31, 1992 was 51,828.

- 2) *Greet visitors, in both official languages refer to the appropriate employee in NoFC.*

Greeted visitors, in both official languages and referred them to the appropriate employee in NoFC.

- 3) *Prepare correspondence within 24 hours of receiving them.*

Prepared correspondence within 24 hours of receiving. Maintained a log of all typing. Number of jobs completed January - December 31, 1992 was 761 pages and 1,048 labels/envelopes.

- 4) *Maintain a log of all typing and provide a monthly statistics report to the Administrative Officer.*

Maintained a log of all typing and provided monthly statistics report.

- 5) *Maintain the Atari Message Board and update as required.*

Maintained the Atari Message Board and updated as required.

- 6) *Maintain a current list of employees absent from the office, publish and distribute list daily.*

Maintained a current list of employees absent from the office, published it and distributed the list daily. Some 479 lists published and distributed.

- 7) *Send telephone messages via E-Mail to those employees who wish to receive them electronically.*

Sent 2,784 telephone messages via E-mail to personnel throughout the building.

- 8) *Produce a telephone list, quarterly, of ForCan employees (including Saskatchewan and Manitoba) plus the two (2) tenants and distribute to all of the above.*

Produced a telephone list, quarterly, of all ForCan employees (including Saskatchewan and Manitoba) plus the two (2) tenants and distributed to all of the above.

- 9) *Translate letters from French to English or English to French for Program Managers, etc., when requested.*

Translated letters both from English to French and French to English throughout the year. The number of pages translated was approximately 20.

- 10) *Have Word Perfect 5.1 implemented and train incumbent.*

Implemented Word Perfect 5.1 and incumbent was trained.

Administration:

- 1) *Review telephone rental charges each month to ensure they are accurate and correct. Maintain monthly detail of rental costs.*

Reviewed telephone rental charges each month to ensure they were accurate and correct. Maintained monthly detail of rental costs.

- 2) *Place an order for telephone repair or installation within two (2) days of receiving the order or when economically feasible (if not urgent). Maintain numbered work-order system so individual jobs on bill can be identified to work done and charged back to applicable project or agency.*

Placed 110 orders for telephone repairs or installations within one day of receiving the order.

- 3) *On a monthly basis, provide finance with billings on each study for telephone long distance chargebacks.*

On a monthly basis, provided Finance with billings on each study for telephone long distance chargebacks.

- 4) *On a quarterly basis, provide Finance with billings for each non-NoFC user in the building, of the communications system for long distance chargebacks.*

On a quarterly basis, provided Finance with billings for each non-NoFC user in the building, of the communications system for long distance chargebacks.

- 5) *Submit the finalized 1991/92 Conference and Foreign Work Plan to HQ on 30 April 92.*

Submitted the finalized 1991-92 Conference and Foreign Work Travel Plan to HQ by 30 April 1992.

6) *Establish and monitor the 1992-93 Conference and Foreign Work Plan:*

- a. *to ensure approved attendee's know they are on the plan and make their arrangements;*
- b. *input data to conference file on VAX by April 30, 1992 and update within 2 days of changes occurring throughout 1992/93.*
- c. *to make changes and substitutions as necessary;*
- d. *to submit quarterly reports to HQ; and*
- e. *by submitting Foreign Work Travel Reports of completed trips to Headquarters monthly.*

Established and monitored the 1992-93 Conference and Foreign Work Travel Plan:

- a. *ensured the approved attendee's knew they were on the plan and made their own arrangements, processed 72 trips;*
 - d. *Conference and Foreign Work Travel plans were input on the VAX by April 30, 1992 and updated within 2 days of changes occurring throughout 1992/93.*
 - c. *made changes and substitutions as necessary;*
 - d. *submitted quarterly reports to HQ; and*
 - e. *compiled and forwarded 27 Foreign Work Travel Reports, of completed trips to Headquarters monthly.*
- 7) *Issue the call letter and prepare listing, for review by Management Committee, for the 1993-94 Conference and Foreign Work Plan to meet the deadline set by HQ.*

Issued the call letter and prepared listing for review by Management Committee for the 1993/94 Conference and Foreign Work Travel Plan to meet the deadline set by Headquarters.

8) *Submit the 1993-94 Conference and Foreign Work Travel Plan to HQ on the date requested.*

Submitted the 1993-94 Conference and Foreign Work Travel Plan to HQ on the date requested.

9) *Action classification and staffing requests, within two (2) days of receiving them, as long as there are no extenuating circumstances. Ensure all packages forwarded to Personnel are complete. Keep record of actions completed.*

Actioned classification and staffing requests within two (2) days of receiving them, as long as there were no extenuating circumstances. Ensured all packages forwarded to Personnel were complete. Number of completed packages to Personnel 133 (764 of completed forms).

- 10) *Submit a finalized copy of the 1991-92 Training Plan to Management Committee including complete training expenditures.*

Submitted a finalized copy of the 1991-92 Training Plan to Management Committee including complete training expenditure.

- 11) *Establish and monitor the 1992-93 Training Plan by:*
- a. *informing attendees of approvals, ensuring training forms are filled out and necessary signatures obtained.*
 - b. *input data to Training file on VAX by April 30, 1992 and update within 2 days of receiving final course costs throughout 1992-93.*
 - c. *ensuring documentation is completed to have course pre-paid when applicable; and*
 - d. *ensuring all necessary documentation is completed, forwarded and filed within 2 weeks of the course completion.*

Established and monitored 1992/93 Training Plan by:

- a. *informed 50 attendees of approvals, ensuring training forms were filled out and necessary signatures obtained;*
 - b. *put Training Plan approvals on VAX by April 30, 1992 and updated within two (2) days of changes occurring throughout 1992/93;*
 - c. *ensuring documentation was completed to have courses pre-paid when applicable; and*
 - d. *ensuring all necessary documentation was completed, forwarded and filed within 2 weeks of the course completion. Number of Training forms processed was 421.*
- 12) *Issue call letter for the 1993-94 Training Plan, prepare the Training Plan, and submit it to Management Committee by 31 December 1992.*

Issued call letter for 1993/94 Training Plan, prepared the Training Plan and submitted it to Management Committee by 31 December 1992.

- 13) *Prepare, monitor, and do not exceed the budget for administration without specific approval from Manager, Management Services. Do expenditure reviews by July 31, Sept. 30 and December 31, 1992.*

Prepared, monitored, and did not exceed budget for administration. Did expenditure reviews by July 31, September 31 and December 31, 1991.

- 14) *Compile monthly statistics and provide to Manager, Management Services by fifth working day of the following month.*

Compiled monthly statistics and provided them to the Manager, Management Services by fifth working day of the following month.

- 15) *Prepare, monitor and maintain organization charts for region. Provide updated charts for April 1 and October 30 and, as requested.*

Prepared, monitored and maintained organization charts for region on an ongoing basis. Issued updated charts for April 1 and October 1, 1992 and, in addition to this, as requested.

- 16) *Submit to Finance, within five (5) working days of June 30, September 30, December 31, and March 31, the details of amounts to bill non-NoFC users in the building, of the photocopier.*

Submitted to Finance within five (5) working days of June 30, September 30, December 31, March 31 the details of amounts to bill non-NoFC users in the building, of the photocopier.

- 17) *Ensure all employees in northwest region have a current ID Card. Maintain log and BF system for ID cards.*

Maintained ID card system, updated cards and issued new cards as required. Input all information to ID card file on VAX. Some 24 ID cards were processed.

- 18) *Update Office/Lab Occupant list after renovations and staff moves.*

Updated the Office/Lab Occupant list on the computer 53 times (each time someone moved or changed telephone numbers).

- 19) *Provide reception duties, word processing, mail and records services for the building at all times.*

Provided Reception duties, Word Processing, Mail and Records services for the building at all times, staffed a term in the Records Office while the CR-4 was on sick leave.

- 20) *Re-write all position Descriptions for Reception, the Records Office and the Word Processing Centre, converting them to the new format for the GE conversions.*

All Position Descriptions for the Records Office, Word Processing Centre and Reception were rewritten and converted to the new GE format. Nine (9) Position Description Records were revised.

- 21) *Evaluate present communications system and streamline costs.*

Reviewed the computer report of long distance telephone calls to determine Centrex usage. Liaised with all NoFC Staff to encourage them to use Centrex. Implemented the AGT Advantage Plus program to further save on long distance calls.

- 22) *Investigate types of communications systems and cost, prepare specifications for a new communications system for the Northern Forestry Centre and arrange a demonstration of the system for NoFC staff.*

Investigated telephone systems and features available, prepared specifications for the type of system required at the Northern Forestry Centre and arranged a demonstration for all staff.

- 23) *Review workload requirements in Word Processing Centre and allocate person years accordingly.*

Reviewed workload requirements in Word Processing Centre and allocated 1 PY to the Records Office full time.

- 24) *Install a new Fax machine that uses single sheet paper, has increased memory and transmission speed and a larger capacity for speed dial numbers.*

Installed a new Fax machine that uses single sheet, recycled paper, has increased memory and transmission speed and a larger capacity for speed dial numbers.

- 25) *Update procedures manual for new employees.*

Manual partially updated, project not completed yet.

- 26) *Have a computer program set up for BF on Medical Examinations.*

Set up a plan, had it programmed into the computer by Al Irwin, (NOR 53-01) input the necessary information and actioned BF.

- 27) *Investigate and if approved, set up a system and obtain necessary equipment to do chargebacks to projects and agencies for long distance calls made on Centrex.*

The telephone computer was programmed to print out a report of both Centrex and long distance calls each month and the total cost of the two was charged back to the applicable project or agency.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports

Wrote the specifications for the new telephone system required for the Northern Forestry Centre.

Wrote an evaluation of the Canofile Records Management on Disc Program for maintaining information on file electronically.

- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer:

16. Goals 1993-94Word Processing (WPC):

- 1) Provide the following turn around time to clients:
1 - 5 pages 1 working day
5 - 25 pages 3 working days
- 2) Provide training to operators to ensure they understand and use the Wordperfect system to its full capabilities. Training will be ongoing as new features and capabilities are brought on line.
- 3) Maintain a log of all Word Processing jobs and do a monthly statistical report from this log.
- 4) Provide switchboard relief, on a rotating basis, while Switchboard Operator is on daily breaks, sick or on leave.
- 5) Input all the 93/94 Study Work Plans and Project Summaries in a Word Perfect file as well as into the PIMs program on the computer. Some 84 Study Work Plans and 25 Project Summaries are to be done.
- 6) Purge sub-directories (workspaces) on the VAX in order to maintain maximum space available.

Records Office:

- 1) Open and record incoming mail, with the exception of advertisements, newspapers, magazines.
- 2) Distribute all incoming mail within one hour of receipt as per routing.
- 3) Hand-deliver, upon receipt, to addressee's office or put in mail box, all facsimile messages.
- 4) Prepare and forward mail, by Priority Post, to the District Offices three (3) times a week and daily to Ottawa by Courier Service, and whenever necessary.
- 5) Prepare mail for pick-up each day by Canada Post and private courier.
- 6) Ensure photocopier in mail room is working and properly supplied; call maintenance within 15 minutes of machine being reported as mal-functioning.
- 7) Prepare workload counts and statistics for photocopies made and submit a monthly report to the Administrative Officer.
- 8) Maintain and operate a BF system for subject files and material on circulation.

- 9) Maintain scientific records room by clearing up returned MS projects, pulling and listing housekeeping files for destruction, archiving applicable records, filing dormant records in allocated space.
- 10) Purge active files, de-classify documents and list files for storage.
- 11) Maintain the FROLIC File Classification system and implement any changes or updates throughout the year.
- 12) Rearrange mailboxes as new names are added, in order to keep them in alphabetical order for easy placement of mail in boxes.
- 13) Purge active files on a regular basis and close dormant files.
- 14) Purge the two (2) large bulletin boards in the Photocopier Room weekly.
- 15) Maintain adequate quantities of office supplies for access by NoFC staff during periods when Stores is closed.

Reception:

- 1) Answer the telephone switchboard, in both official languages, take messages, forward calls and maintain monthly statistics.
- 2) Greet visitors, in both official languages, and refer them to the appropriate employee in NoFC.
- 3) Prepare correspondence within 24 hours of receiving them.
- 4) Maintain a log of all typing and provide monthly statistics.
- 5) Maintain the Atari Message Board and update as required.
- 6) Maintain a current list of employees absent from the office and publish and distribute list daily.
- 7) Produce a telephone list, quarterly, of ForCan employees (including Saskatchewan and Manitoba) plus the two (2) NoFC tenants and distribute to all of the above.
- 8) Send telephone messages via E-mail to those that wish to receive them electronically.

Administration:

- 1) Review telephone rental charges each month to ensure they are accurate and correct. Maintain monthly detail of rental costs.
- 2) Place an order for telephone repair or installations within one day of receiving the order or when economically feasible (if not urgent). Maintain numbered work-order

system so individual jobs on bill can be identified to work done and charged back to the applicable project or agency.

- 3) On a monthly basis, provide finance with billings on each study for telephone long distance chargeback.
- 4) On a quarterly basis, provide Finance with billings for each non-NoFC user in the building, of the communications system for long distance chargebacks.
- 5) Submit the finalized 92-93 Conference and Foreign Work Plan to HQ by 30 April 1993.
- 6) Establish and monitor the 1993-94 Conference and Foreign Work Plans:
 - a. by ensuring approved attendee's know they are on the plan and make their own arrangements;
 - b. by inputting data to Conference and Foreign Work Travel Plans file on VAX by April 1, 1993 and update within two (2) days of changes occurring throughout 1993/94;
 - c. by making changes and substitutions to the Plans as trips are cancelled or changed;
 - d. by submitting quarterly reports of cancellations and changes to Headquarters; and
 - e. by submitting Foreign Work Travel Reports of completed trips to Headquarters monthly.
- 7) Issue a call letter and prepare a list of all Conference and Foreign Work Travel requested, for review by Management Committee for the 1994-95 Conference and Foreign Work Travel Plans, to meet the deadline set by HQ.
- 8) Submit the 1994-95 Conference and Foreign Work Travel Plan to Headquarters on the date requested.
- 9) Action classification and staffing requests within two (2) days of receiving them, as long as there are no extenuating circumstances. Ensure all packages forwarded to Personnel are complete. Keep record of actions completed.
- 10) Submit a finalized copy of the 1992-93 Training Plan to Management Committee including complete training expenditures.
- 11) Establish and monitor 1993-94 Training Plan by:
 - a. informing attendees of approvals, ensuring training forms are filled out and necessary signatures obtained.

- b. inputting data to training plan on VAX by 1 April 93 and update within two (2) days of receiving final course costs throughout 1993/94;
 - c. ensuring documentation is completed to have course pre paid when applicable; and
 - d. ensuring all necessary documentation is completed, forwarded and filed within two (2) weeks of the course completion.
- 12) Issue a call letter and prepare a list of all requested training, for review by Management Committee, for the 1994-95 Training Plan by December 1993.
 - 13) Prepare, monitor, and do not exceed budget for administration without specific approval from Manager, Management Services. Do expenditure review by July 31, Sept. 30 and December 31, 1991.
 - 14) Compile monthly statistics and provide to Manager, Management Services by fifth working day of the following month.
 - 15) Prepare, monitor and maintain organization charts for region. Provide updated charts for April 1 and October 30 and, in addition to this, as requested.
 - 16) Submit to Finance, within five (5) working days of June 30, September 30, December 31, March 31, the details of amounts to bill non-NoFC users in the building. Charges are for FAX, telephone long distance and equipment charges, copier, etc.
 - 17) Ensure all employees in northwest region have a current ID Card. Maintain log and BF system for ID cards.
 - 18) Update Office/Lab occupant list after renovations and staff moves.
 - 19) Provide reception duties, word processing, mail and records service for the building at all times.
 - 20) Update procedures manual for new employees.
 - 21) Investigate postage expenditures, analyze cost, make proposals to decrease cost.
17. Major Co-operators:
- Not applicable
18. Environmental Implications:
- i) Environmental Impact/Assessment Review Statement:
- Not required.

Large quantities of paper are used each day by the photocopiers, Fax machine and computer printer. This impacts directly on the number of trees that are cut down to make paper and the amount of paper that is recycled. Use re-cycled paper in all photostat machines and the FAX machine in the Records Office.

ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 22, 1992

1. **STUDY TITLE:** Material Management - Purchasing
2. Responsibility Centre: Northwest Region (8121)
3. Program: Regional Director General, Northwest Region
4. Project Title: Management Services
5. Office Location(s): Edmonton, Edmonton.
6. Work Location: Northwest Region
7. Study Staff:

	Name
Study Leader	G. Fawcett
Team Members	(Vice Moir)
	M. Keryliuk

8. Study Key Words: Research Support, equipment
9. Study Activity: 2251
10. Study Resources:

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
G. Fawcett	PG-03 (A)	0.50	0.50	0.75		
M. Keryliuk	GS-ST5-05 (O)	0.50	0.50	0.65		
FTEs		2.00	2.00	2.40		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	0.00
O&M	16.67	22.40			
Capital	0.00	14.00			
G & C					
TOTAL:	16.67	36.40			
STUDY TOTAL	16.67	36.40			

11. Study Background and Problem Analysis:

Purchasing is responsible for quick and effective turnaround on all Internal Requisitions. The store operations ensure the availability of frequently used office and field supplies and the efficient use of assets by storage, disposal and tracking.

12. Study Objectives:

i) Objectives

To provide purchasing, removal, stores, inventory and Materiel Management Services to NoFC including functional guidance to the District Offices.

ii) Deliverables

Short Term (1-5 years)

In the upcoming year, the Materiel Management section will strive to maintain the same high level of service in requisition processing and stores stocked items. A trip to Winnipeg, in the fall of the year, will bring the district office on line with MMIS.

Long Term (5 years and beyond)

Long term goals for Materiel Management foresee even greater levels of automation through the introduction of ECOTS in SSC allowing electronic transmission of requisitions directly from our MMIS to SSC without the current double entry required. Some link between MMIS and the new financial control system will be investigated to reduce the flow of paper. The introduction of an electronic internal requisition system will also be attempted.

13. Progress and Achievements

Over the past five years, Materiel Management has extensively automated several manual systems. The new systems included the Materiel Management Information System (MMIS) to track purchasing, stores items, furniture, assets and allow printing of requisitions; PASS allowing electronic transmission and query of requisitions for goods and services processed through Supply and Services Canada (SSC); a barcode system for speeding up stocked item inventory was also introduced along with automated downloading of stores charge backs and petty cash statements.

The past year saw MMIS upgraded and the inhouse barcode system modified to allow continued compatibility. Levels of service were maintained and allowed a average turn around time for purchasing requests of less than 24 hours. Stores served close to 2500 consumers and processed one hundred thousand dollars of worth of surplus equipment.

14. Goals and Accomplishments: (1992-93)

Purchasing

- 1) *Provide a 24 hour turnaround time on all requisitions so that end document is issued within one (1) day of receipt in purchasing as long as all information is supplied. This turnaround time will be documented and given to the Manager, Management Services each month.*

Purchasing processed 3,258 requisition and petty cash vouchers with an average turn around time of 0.75 days during the calendar year 1992.

- 2) *Ensure proper signing authority is on each requisition before actioning. Code all requisitions including line objects.*

This was done for all requisitions processed during 1992.

- 3) *Follow up on all documents issued:*

a. within 10 working days of issuing if delivery date is not known (PASS requisitions).

b. within 2 working days if good/services are not received on delivery date. Written documentation will be placed on each file of this follow-up.

Purchasing recorded 85 followups during the 1992 calendar year.

- 4) *Records will be maintained of all documents issued and received.*

MMIS data files were maintained up to date during 1992.

- 5) *Monthly reports will be prepared on the above.*

Activity, Sole Source, and Personal Service Contract reports were generated on a monthly basis.

- 6) *Necessary documentation will be kept on file for all exceptional purchasing (e.g., emergencies).*

1780 Purchasing files were maintained fully during 1992. This is an increase of 591 over 91-92.

- 7) *Attend Forestry Canada's departmental Materiel Managers meeting sometime in January/February of 1992.*

The meeting was held in late May of 1992 and was attended by the Materiel Manager.

- 8) *After the new Sun computer system is fully intergraded with the Vax system travel to the Manitoba District office and activate MMIS5.*

During September, 1992, version 6 of MMIS was successfully implemented. Trip to Winnipeg was cancelled while waiting for personnel situation to settle.

Stores

- 1) *An inventory of all stores items will be maintained. An inventory of expendables and stationary will be performed on April 30, July 30, Oct. 30, and Jan. 30. A report will be written. The aim is to achieve 10% or less error rate.*

Inventories were performed on April 30th and July 30th. The inventory scheduled for October can not be completed until the inhouse computer program is adapted to operate with version 6 of MMIS.

- 2) *G. Fawcett and M. Keryliuk will review items for charge back and produce a revised list of chargeable items.*

Assessments are made on an intermittent basis throughout the year.

- 3) *Items requested will be available. If not available, it will be acquired or at least ordered within 24 hours of a request if it is a stores issue item. A record of the number of issues will be maintained and reported monthly.*

Stores responded to 2,489 over the counter requests for stores stocked items and most items were available through out the year or ordered when low. The MMIS stores issues database was maintained.

- 4) *A minimum/maximum system will be maintained and stores supply will be within these limits the budget allowing.*

This part of MMIS was reviewed during year and updated when necessary.

- 5) *The budget will not be exceeded without specific permission from the Manager, Management Services.*

The 92/93 budget of \$25,500 is projected to be completely utilized.

- 6) *Monthly costs for receivable items will be provided to Finance by the second (2) working day of the following month for JVing back to projects.*

Except during system change overs (MMIS5 to MMIS6) this was done.

- 7) *The individual bar code card system will be maintained.*

Except during system change overs (MMIS5 to MMIS6) this was done.

- 8) *Ensure proper warehousing of all parts of the storage shed so space is used most efficiently and assigned areas are clearly marked. Perform general clean-ups in stores and the shed once every three months.*

This was done whenever time allowed.

- 9) *Purchase and co-ordinate installation of new pallet racking and storage bins and reorganization of equipment to maximize use of available space in the warehouse.*

Deferred to 1993/94.

- 10) *Provide stores service from 08:30 TO 09:30 and from 13:00 TO 14:00.*

Stores was always open during these time periods.

Inventory

- 1) *All equipment and attractive items will be tagged and furniture, equipment and attractive items entered into the inventory before the item is released from stores. Assigned holders will sign for all equipment issued.*

This was preformed for all new equipment received.

- 2) *Arrange disposal of surplus equipment.*

Stores processed 31 CADDC disposal forms disposing of 242 items valued at \$111,155 during the 1992 calendar year.

- 3) *Conduct an inventory of all furniture located at the Northern Forestry Centre in August of 1992.*

After deciding that furniture will be integrated into the asset inventory, this count will be verified during asset inventories rather than as a separate inventory.

15. Information Activities:

N/A

16. Goals: 1993-94

Purchasing

- 1) Provide a 24 hour turnaround time on all requisitions so that the end document is issued within one (1) day of receipt in purchasing as long as all information is supplied. This turnaround time will be documented and given to the Manager, Management Services each month.
- 2) Ensure proper signing authority is on each requisition before actioning. Code all requisitions including line objects.
- 3) Follow up on all documents issued:
 - a. within 10 working days of issuing if delivery date is not known (PASS requisitions).
 - b. within 2 working days if good/services are not received on delivery date. Written documentation will be placed on each file of this follow-up.
- 4) Records will be maintained of all documents issued and received.
- 5) Monthly reports will be prepared on the above.
- 6) Necessary documentation will be kept on file for all exceptional purchasing (e.g., emergencies).
- 7) Attend Forestry Canada's departmental Materiel Managers meeting sometime in May/June of 1993.
- 8) Activate the Manitoba District office's MMIS6 during the physical inventory trip.
- 9) Act as a pilot region for the introduction of MMIS version 7 (ECOTS interface) when available.

Stores

- 1) An inventory of all stores items will be maintained. An inventory of expendables and stationary will be performed on April 30, July 30, Oct. 30, and Jan. 30. A report will be written. The aim is to achieve 10% or less error rate.
- 2) G. Fawcett and M. Keryliuk will review items for charge back and produce a revised list of chargeable items.
- 3) Items requested will be available. If not available, it will be acquired or at least ordered within 24 hours of a request if it is a stores issue item. A record of the number of issues will be maintained and reported monthly.
- 4) A minimum/maximum system will be maintained and stores supply will be within these limits as the budget allows.
- 5) The budget will not be exceeded without specific permission from the Manager, Management Services.

- 6) Monthly costs for receivable items will be provided to Finance by the second (2) working day of the following month for J'ving back to projects.
- 7) The individual bar code card system will be maintained.
- 8) Ensure proper warehousing of all parts of the storage shed so space is used most efficiently and assigned areas are clearly marked. Perform general clean-ups in stores and the shed once every three months.
- 9) Purchase and co-ordinate installation of new pallet racking and storage bins and reorganization of equipment to maximize use of available space in the warehouse.
- 10) Provide stores service from 08:30 TO 09:30 and from 13:00 TO 14:00.

Inventory

- 1) All equipment and attractive items will be tagged and furniture, equipment and attractive items entered into the inventory before the item is released from stores. Assigned holders will sign for all equipment issued.
- 2) Arrange disposal of surplus equipment.
- 3) Integrate furniture into the asset inventory by December 31, 1993.
- 5) Complete a physical inventory check of all items held by the Winnipeg District office in either May or October 1993.

17. Major Co-operators:

- i) Internal - FC

Region	ID#	Title	Contact name

- ii) External -

Establishment	ID#	Title	Contact name

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 22, 1992

1. **STUDY TITLE:** Building Maintenance
2. Responsibility Centre: Northwest Reion (8121)
3. Program: Regional Director General, Northwest Region
4. Project Title: Management Services
5. Office Location(s): Edmonton, Alberta
6. Work Location: Edmonton, Alberta
7. Study Staff:

	Name
Study Leader	H. Schoendube
Team Members	P. Thibodeau
	G. Burton
	G. Schmidt

8. Study Key Words: Research support
9. Study Activity:

2252

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
H. Schoendube	GL-MAM-12 (O)	0.50	0.50	0.50		
P. Thibodeau	GL-MAM-09 (O)	0.90	0.90	0.90		
G. Burton	GL-MAM-08 (O)	1.00	1.00	1.00		
G. Schmidt	GL-MAM-06 (O)	1.00	1.00	0.98		
FTEs		4.00	4.00	4.37		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Actual	Upcoming
<u>A-Base</u>					
Salaries	0.00	0.00	0.00	0.00	0.00
O&M	39.85	35.10			
Capital	4.43	0.00			
Construction	311.00	155.00			
TOTAL:	355.28	190.10			
STUDY TOTAL	355.28	190.10			

11. Study Background and Problem Analysis

Northern Forestry Centre is a one hundred and fifty three thousand square feet facility. There are at least three hundred pieces of equipment to maintain and keep in running order. We do this with a preventative maintenance program that controls the frequency and type of maintenance task that is required by the equipment manufacturer. We also setup the conference rooms, refinish furniture when required, coordinate the electrical work and minor construction projects through public works. A building this size also requires that some painting and maintenance and renovations get done.

12. Study Objectives:

To conduct maintenance and repairs to the NoFC facilities to ensure that they are in a superior state of upkeep and repair, supervise the construction and/or renovation of facilities at NoFC.

ii) Deliverables

Short Term (1-5 years)

The parking lot plug in islands will be removed and replaced with curb stops. The electrical plug-ins and the lighting will be upgraded. The north stairs will be relevelled and repaved.

Public Works Canada will survey our facilities and redo all of our building blueprints to an as built and include all the renovations that we had in the past on these drawings.

Replace the dirt behind the boiler room with a concrete pad properly sloped so the rain water escapes towards the vehicle compound.

Replace the cooling coils on number two supply air fan.

Repair the south wall on the three greenhouses.

Long Term (5 years and beyond)

13. Progress and Achievements

Our past achievements include the building of a storage shed on the northwest corner of our lot. Dr. Langor requested that we build him an insect rearing facility so we undertook to build this facility for him just north of the storage shed. Some of our other achievements include the expansion of the main floor boardroom, the conference centre in the basement.

14. Goals and Accomplishments: (1992-93)

1. *Provide general & preventative maintenance in the building (i.e., repair furniture, paint desks, walls, move the chairs and tables around in conference room etc.).*

Provided general maintenance in the building. Continued regular preventative maintenance program as outlined in the work schedule and the respective work orders issued for this proposal.

2. *Clear snow from driveways, parking lots and sidewalks, as required the day following a storm.*

Cleared snow from sidewalks and parking lots as required the day after the storm.

3. *Maintain the grounds during the summer, including cutting the grass, planting flowers, maintaining flower beds and shrubs, replacing damaged trees and keeping the weeds controlled on the berm.*

Maintained the grounds during the summer including cutting the grass, planting flowers, maintaining flowers and shrubs, replacing dead or damaged trees on the berm and keeping the weeds under control.

- 4 *Finalize the realignment and levelling of the northwest fence and raise posts to the proper level.*

We could not raise the fence posts to realign the fence. The posts are too deep and cemented in. It will have to be dug up and reinstalled.

- 5 *Install new wooden enclosures for the shrubs at the south lawn area.*

We cancelled this project. We were able to water that area more and keep it green.

- 6 *Replace our 1964 Massey Ferguson tractor with a new skid steer tractor.*

We replaced the Massey Ferguson tractor with a new RAMROD skidsteer equipped with a snowblower attachment.

- 7 *Live within the budget provided, unless overexpenditure specifically approved by the Manager, Management Services. Forecast expenditures monthly, starting July 1992.*

Overspent my budget as approved by Manager, Management Services. Forecasts were provided for the month of July 1991 throughout the month of December 1991.

- 8 *Continue the utilization of the computerized maintenance program to produce work orders and monitor necessary maintenance projects.*

Continued the utilization of the computerized maintenance program to produce work orders and monitor necessary maintenance projects.

- 9 *Oversee the electrical work done by Public Works Canada.*

Oversaw the electrical work done by Public Works Canada.

- 10 *Replace broken and worn out tools. Replenish our stock of parts and electric motors.*

Replaced worn out tools. Replenished our stock of parts and electric motors.

- 11 *Replace all the vinyl in the elevator lobby and main stairwell.*

We decided to paint all the vinyl next year. Replacing was too costly.

- 12 *Recalk around fixtures in all washrooms and install handicap accessories and waste paper baskets in the newly renovated washrooms in the basement.*

We installed handicap accessories and supplied wastepaper baskets in the new basement washroom facilities. The caulking will be completed in the next year (1993/94).

- 13 *Complete the necessary changes to the elevators and water fountains to meet the Handicap access guidelines.*

Oversaw the upgrades to the elevators completed by Schindler in September 1992. We completed the installation of six new "accessible" water fountains in October 1992.

- 14 *Coordinate and oversee the lobby renovations.*

Oversaw the completion of the lobby renovations in the last week of December.

- 15 *Oversee the installation of a separate air conditioning system for the administration wing.*

This project to date has not been completed. The design is in progress by Public Works .We foresee the completion date in early '93.

- 16 *Renovate the office space now occupied by Department of Fisheries and Oceans (DFO).*

Completed renovations to this area including the creation of two offices out of one big storage room.

- 17 *Replace all fire extinguishers in the building with new ABC type. Produce and install sixteen (16) signs to indicate the location of the fire hose cabinets from a distance and install evacuation plans on every floor as per recommendations form our Safety and Security Officer from HQ.*

This task was completed by June 1992.

- 18 *Repair the parking lot on the north side. Replace the parking plug-in medians and resurface the whole parking lot.*

We did not received funding for this project. It is being postponed till 1993/94.

The following accomplishments are from extra work orders.

- 19 With the assistance of a term employee, we were able to fill the planters in the atrium with new top soil. We also pruned and removed all the weeds from area.
- 20 Cleaned and painted all areas of the penthouse that required it.
- 21 Fabricated four tree measurement tools for Cam Rentz (NOR 10-08) and Stan Lux (NOR 4-02).
- 22 Painted a total of ten offices throughout the building.
- 23 Painted the back corridor leading to the greenhouse and the headerhouse floor including sealing a portion of the headerhouse floor between number 1 and 2 greenhouses.

- 24 Removed one section of boot racks at the back entrance, painted that wall and installed a display rack to store a variety of forms for personnel.
- 25 Fabricated a long extension cord for TDU (NOR 37-01).
- 26 Supplied and installed new float valves for the two steam tables in the Kitchen.
- 27 Repaired the coffee machine in the kitchen. Replaced the float control and the solenoid switch.
- 28 Repaired some hinges on display stands for publications.
- 29 Repaired and refinished a table for Administration area (M025).
- 30 Tested smoke and fire alarms twice this year.
- 31 Called City to install water meter for nursery watering.
- 32 Rekeyed locks from photo labs at the request of Stores.
- 33 Installed two safety mirrors; one on the first floor and a second one in the basement.
- 34 Fabricated wooden boxes for L. Lywak's study (NOR 7-07).
- 35 Fabricated eight measurement gauges for the fire research lab.
- 36 Checked and repaired meat cutter in the kitchen.
- 37 Sharpened all kitchen carving knives twice a month.
- 38 Spent many hours installing or removing bookcases or shelves throughout the building.
- 39 Installed a door lock for office no. 2002.
- 40 Installed a projection screen in room no. 3053.
- 41 Mounted two corkboards in the SW hall on the 3rd floor.
- 42 Fabricated a book protection in room 2086, because some water had come in through the ceiling and damaged some books.
- 43 Installed a shower in the women's locker room B035.
- 45 Installed a Makeup Air system in the storage facility.
- 46 Erected some additional shelves in the library annex.
- 47 Renovated from a lab to an office rooms no. 3075 and 3077.

15. Information Activities

N/A

16. Goals: 1993-94

- 1 Provide general and preventative maintenance in the building.
- 2 Clear snow from driveways, parking lots and sidewalks, as required the day following a storm.
- 3 Maintain the grounds during the summer, including cutting the grass, planting flowers, maintaining flower beds and shrubs, replacing damaged trees and keeping the weeds controlled on the berm.
- 4 Live within the budget provided, unless overexpenditure specifically approved by the Manager, Management Services. Forecast expenditures monthly, starting July 1992.
- 5 Continue the utilization of the computerized maintenance program to produce work orders and monitor necessary maintenance projects.
- 6 Oversee the electrical work done by Public Works Canada.
- 7 Repair the parking lot on the north side. Replace the parking plug-in medians and resurface the whole parking lot.
- 8 Recaulk around fixtures in all washrooms .
- 9 Install new sinks counters and soap dispensers in washrooms no. B061,M066,2040 and 3033 .
- 10 Replace pitted fumehood ductwork for lab no. M111 and M115.
- 11 Oversee installation of MYLAR finish on windows of the building.
- 12 Overhaul vacuum pump.
- 13 Repair or replace chemical feed pumps.
- 14 Replace all the worn out ropes on the green houses shutters.

17. Major Co-operators:

N/A

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement: Not required
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 22, 1992

1. **STUDY TITLE:** Building Operations
2. **Responsibility Centre:** Northwest Region (8121)
3. **Program:** Regional Director-General, Northwest Region
4. **Project Title:** Management Services
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Edmonton, Alberta
7. **Study Staff:**

	Name
Study Leader	H. Schoendube
Team Members	J. Fisher
	A. DeCosta
	vacant

8. **Study Key Words:** Research Support
9. **Study Activity:** 2252
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
H. Schoendube	GL-MAM-12 (O)	0.40	0.40	0.40		
J. Fisher	HP-05 (O)	0.80	0.80	0.75		
A. DeCosta	GL-MAM-08 (O)	1.00	1.00	1.00		
FTEs		3.10	3.10	2.15		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					177.7
Salaries					
O&M	249.48	152.70			
Capital	1.08	0.00			
G & C					
TOTAL:	250.56	152.70			

STUDY TOTAL	250.56	152.70			
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11. Study Background and Problem Analysis:

Not applicable.

12. Study Objectives:

i) Objectives:

To provide controlled climatic conditions, and all necessary systems and equipment, to ensure safe efficient operations at NoFC.

ii) Deliverables:

Short Term: (1-5 years)

Maintain equipment and systems in good working order to ensure all objectives and customer requirements are met in a cost effective, safe and efficient manner.

Replace old worn out existing equipment and systems with modern, energy efficient, and cost effective replacements.

Replace demineralizer with RO unit of 1000 gallon/day capacity instead of overhaul as recommended by the Safety Committee.

Ultrasound unfired pressure vessels.

Overhaul vacuum pumps.

Overhaul chiller pumps if required. (\$15.0 k)
1994-95

Replace "Bailey Meter" equipment if funds are available.

Overhaul cooling water pumps for chillers.

Overhaul/replace control air compressors. (\$7.0 k)

Replace water softeners. (\$15.0 k)

1995-96

Overhaul/replace #31 air compressor. (\$7.0 k)

Purchase new vacuum pump for chillers.

Recalibrate boiler safety valves.

1996-97

Replace all chart recording devices as charts will no longer be available and equipment will no longer be repairable because of no parts. (\$ 15.0 k)

1997-98

Overhaul/replace # 32 air compressor.

1998-99

Replace boiler feed pumps, and radiation system pumps.

1999-2000

The overhaul of emergency power generator will not be required at this time as the inspection indicated it will likely last up to 5 years.

Long Term: (5 years and beyond)

Replace all walk-in coldroom equipment presently using non-environment friendly substances such as Freon with environmentally friendly substances.

13. Progress and Achievements:

Carried out inspection of emergency generator and decided that the overhaul expected to be carried out in the F/Y 93-94 can be put off until F/Y 99/2000 when another inspection will have to be done.

Unable to replace "Bailey Meter " equipment because of high costs at this time.

14. Goals and Accomplishments: (1992-93)

1. *Monitor energy savings and effect cost savings in relation to laboratory operations with respect to air quality and heat distribution.*

Monitored energy savings and effected cost savings in relation to laboratory operations for heat and air distribution. Dollar amounts are not available due to Bailey Meter equipment not accurate for readings.

2. *Daily monitor the operation of the boilers and equipment to ensure safe and efficient operation.*

Monitored the operation of boilers and equipment daily to ensure safe efficient operations. They were maintained above 81%.

3. *Daily check the greenhouses and adjust temperatures, air, etc. to meet specifications set out by the greenhouse users and similarly for the chemical storage rooms. Keep records of numbers of daily checks.*

Checked greenhouses and chemical storage rooms daily, adjusted temperatures, humidistats, to meet the specifications set out by users of greenhouses and chemical storage rooms. Performed 15,875 readings from 1 Jan 92 to Dec. 31 1992.

4. *Carry out daily building checks and make adjustments as required to the heating, ventilating, air conditioning, and safety system to ensure safe and efficient operations.*

Carried out daily building checks and made the required adjustments to ensure heating, ventilating, air conditioning, and safety systems were working in a safe and efficient manner.

5. *Provide heat, light, natural gas, water, compressed air, and air conditioning services to the building.*

Provided heat, light, power, natural gas, water, compressed air, and air conditioning for the building.

6. *Carry out preventative maintenance on boilers and associated equipment as required.*

Carried out preventative maintenance on boilers and associated equipment. In 1992 this involved dismantling each piece of equipment, gauging the wire, replacing worn or defective pieces and assembling the equipment again. It also included cleaning and testing.

7. *Control work and material by issuing work orders for all projects undertaken.*

Controlled work and materials for all projects and repairs undertaken. Issued 275 work orders in 1992.

8. *Supervise cleaning, waste management, elevator maintenance, and commissionaire's contracts to ensure a high quality of services. Update content of specifications and retender as required.*

Supervised contracts for cleaning, waste management, elevator maintenance, commissionaires, and ensured high quality of services was maintained, updated content of contract specifications and submitted for tender.

9. *Operate hot water boiler and equipment to conserve energy from May to October.*

Operated hot water boiler and equipment to conserve energy from May 92 to September 92.

10. *Test fire alarms and smoke detectors twice yearly.*

Tested fire alarms and smoke detectors twice. All tested OK.

11. *Reclean and paint boiler room by December of 1992.*

Cleaned boiler room, but unable to complete this task again this year. Contractors and work load makes this job an on going and seemingly impossible task. Will reschedule this job again for next year.

12. *Reclean and paint penthouse by December 1992.*

Started cleaning penthouse but had to stop as another project interfered with these plans again.

13. *Replace "Bailey Meter" equipment in boiler room.*

Unable to replace "Bailey Meter" monitoring equipment because existing equipment is obsolete and parts are not available. Have called a number of suppliers to give us estimates; however, costs are extremely high.

14. *Replace / recalibrate safety valves on unfired pressure vessels.*

Provincial Boilers Branch inspector did not require item be replaced this year but it will likely be required 93/94.

15. *Overhaul condensate transfer pump in basement.*

Inspection indicated equipment could last at least until next year.

16. *Install capacitors in switching gear if it proves to be cost effective and funds available for this task.*

This project has also been placed on hold for the time being. It will be reactivated when and if funds become available.

17. *Replace emergency power generator gaskets and carry out inspection by "Pamco". The manufacture's company representative will determine if total overhaul is required.*

Pamco replaced the leaking gaskets and carried out the inspection. It was decided to not overhaul this generator, as the cost of a complete overhaul would exceed our previous estimates and could go as high as 50-70% of a new generator. The engineers expect to be able to keep this equipment operational with little expense for a few more years.

18. *Replace / repair boiler room floor.*

This project is also placed on the list of upgrading at a later date, if funding is available, and an engineering guess as to which is happening, the wall going down or the floor coming up! The floor drains are all high and the water stands in puddles making it slippery to walk on. Funds will have to be set aside for extending hook ups to the equipment if it continues to move.

- 19 *Replace valve diaphragms or complete valves, as recommended by company representative, on chillers before cooling season.*

Replaced valve diaphragms or installed new valves on chillers before the cooling season started.

- 20 *Replace humidifier sprayers and piping to units 1 to 4.*

Purchased materials, but was not able to start this task, because of other priorities at this time. This will be scheduled for the new year if manpower is available.

ii) Added accomplishments covered by special workorders issued during the year.

- 21 Cleaned electrostatic filters and replaced Rolo-Filters on air handling units (twice)
- 22 Acid cleaned cooling coils and cleaned preheat coils.
- 23 Checked, cleaned and tested HVAC on roof of administration and stores twelve times.
- 24 Repaired or replaced 43 electrical motors of various sizes.
- 25 Replaced 8 pumps for swamp coolers.
- 26 Tuned up one weed eater for greenhouse use and repaired International tractor for nursery users.
- 27 Repaired John Deere equipment for greenhouse staff and winterized both tractors used by greenhouse staff.
- 28 Replaced five aspirator motors for greenhouses.
- 29 Replaced/repared 15 electrical switches of various voltages from 24 to 600 volts.

- 30 Overhauled radiation heat converter.
- 31 Carried out various repairs or adjustments for greenhouse or nursery staff of one hour or less, 22 times.
- 32 Supervised contractors for adding new insulation and coverings to both main boilers and both chillers in the boiler room.
- 33 Plugged two fire tubes on # 2 boiler.

16. Goals 1993-94

1. Monitor energy savings and effective cost savings in relation to laboratory operations with respect to air quality and heat distribution.
2. Monitor the daily operation of boilers and equipment to ensure a safe and efficient operation.
3. Daily check the chemical storage rooms, coldrooms, greenhouses and adjust temperatures, air, etc. to meet the specifications set out by users.
4. Carry out daily building checks and make adjustments as required to the heating, ventilating, and safety systems to ensure safe and efficient operation.
5. Provide heat, light, natural gas, water, vacuum, and air conditioning services to the building.
6. Carry out preventative maintenance on boilers and associated equipment as required.
7. Control work and materials by issuing work orders for all projects undertaken.
8. Supervise cleaning, waste management, elevator maintenance and commissionaire's contracts and ensure a high quality of service is maintained. Meet monthly with cleaning contractor to discuss performance and problems. Document all meetings. Renew and re-tender contracts so no lapses in service occur.
9. Operate hot water boiler and equipment to conserve energy from May to October.
10. Test fire alarms and smoke detectors twice yearly.
11. Replace/repair chiller controls.
12. Retube # 2 boiler.

17. Major Co-operators:

N/A

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement: Not applicable
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 22, 1993

1. **STUDY TITLE:** Camps
2. **Responsibility Centre:** Northwest Region (8121)
3. **Program:** Regional Director General, Northwest Region
4. **Project Title:** Management Services
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Hinton, Chip Lake (Alberta); Candle Lake (Saskatchewan).
7. **Study Staff:**

	Name
Study Leader	H. Schoendube
Team Members	P. Thibodeau
	J. Fisher
	G. Schmidt
	G. Burton

8. **Study Key Words:** Camps,
9. **Study Activity:** 2252

10. Study Resources:Personnel Information

		1992-93	Fiscal Year 1993-94			1994-95
Employee Name	Category	Previous	Budget	Revised	Forecast	Upcoming
H. Schoendube	GL-MAM-12 (O)	0.10	0.10	0.10		
P. Thibodeau	GL-MAM-09 (O)	0.10	0.10	0.10		
J. Fisher	HP-05 (O)	0.00	0.00	0.02		
G. Schmidt	GL-MAN-06 (O)	0.00	0.00	0.02		
G. Burton	GL-MAM-08 (O)	0.00	0.00	0.01		
FTEs		0.20	0.20	0.25		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Actual	1993/94
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	0.00
O&M	5.11	7.50			
Capital	0.00	0.00			
G & C					
TOTAL:	5.11	7.50			
STUDY TOTAL	5.11	7.50			

11. Study Background and Problem Analysis:

Not applicable

12. Study Objectives:

i) Objectives

To maintain the Physical Facilities of the NWR camps at Hinton, Candle Lake, Chip Lake.

ii) Deliverables

Short Term (1-5 years)

1993/96 Keep trailers and cabins in good state of repair.

1996/97 Replace the well pump at Hinton.

Repaint cabins at Candle Lake site.

1997/98 Pump out septic tank and check condition.

Clean out hot water heaters.

Long Term (5 years and beyond)

The trailers at Hinton should be removed and sold. They are going to be beyond their life expectancy and state of repair. We could build a motel style building with ten or twelve small rooms with a main kitchen, washroom and laundry facilities. This type of building would be more economical to maintain and repair. Instead of having ten hot water heaters and kitchen appliances you would only have one of each.

13. Progress and Achievements

We are continually striving to keep all field stations in this region at an acceptable living and working environment.

Hinton is a field station that was opened in the late sixties to accommodate the scientists while they were performing their forestry research in that area.

Candle lake was opened in the early seventies for the same reasons. We are committed in keeping these field stations in good working order.

14. Goals and Accomplishments (1992-93)

1. *Open and close camps in the spring and fall respectively; 1992.*

Opened the Hinton campsite in May and closed it in October. The province opens and closes the Candle Lake site for us every year.

2. *Arrange for electricity, propane and water at the Hinton and Candle Lake field stations.*

Arranged for electricity, propane and water at the Hinton and Candle Lake field stations.

3. *Replace the copper lines under two trailers with black iron pipe at Hinton camp.*

This was not completed. Time did not permit. We decided to cancel this project.

4. *Arrange for cutting the grass at Hinton with Cam Rentz.*

Arranged for the cutting of grass at Hinton field station with C. Rentz.

5. *Revarnish trailer doors where required at the Hinton camp.*

We completed the revarnishing of doors that required it.

6. *Block and level two trailers brought in from Chip Lake to Hinton and arrange for the cleaning of these two trailers .*

Blocked and levelled the two trailers that were transferred from Chip Lake field station.

7. *Revarnish the log cabin and paint the eaves at the Hinton station.*

Revarnished log cabin and painted eaves at the Hinton field station.

8. *Revarnish eaves, interior window frames and exterior of log cabin in Candle Lake, Saskatchewan.*

Did not complete this goal due to lack of time.

9. *Arrange to have the Chip Lake site cleaned up; dispose of the two remaining trailers, a metal storage shed and move the propane tank and water trailer to Edmonton.*

This project was postponed to a later date.

10. *Arrange to have the septic tank pumped out at Hinton camp.*

This project was completed.

15. Information Activities

N/A

16. Goals 1993-94

1. Open and close Hinton Camp in spring and fall of 1993 respectively.
2. Arrange for electricity, propane and water at Hinton and Candle Lake field stations.
3. Arrange for the cutting of the grass at the Hinton field station through C. Rentz.
4. Arrange to have the two relocated trailers from Chip Lake cleaned up.
5. Repair the same two trailers to have them ready for occupancy.
6. Revarnish interior window frames, exterior of cabin and install new eavestroughs at the Candle Lake field station.
7. Arrange to have the Chip Lake site cleaned up; dispose of two remaining trailers, a metal storage shed , move the propane tank and water trailer to NoFC for disposal.

17. Major Co-operators:

N/A

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement: Not required
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 22, 1992

1. **STUDY TITLE:** Materiel Management - Vehicles
2. **Responsibility Centre:** Northwest Region (8121)
3. **Program:** Regional Director General, Northwest Region
4. **Project Title:** Management Services
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	Guy Fawcett
Team Members	Marion Keryliuk

8. **Study Key Words:** Research Support (2251)
9. **Study Activity:** 2251
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
G. Fawcett	PG-03 (A)	0.50	0.50	0.25		
M. Keryliuk	GS-ST5-05 (O)	0.50	0.50	0.35		
FTEs		1.00	1.00	0.60		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	0.00
O&M	5.8	3.7			
Capital	39.94	80.50			
G & C					
TOTAL:					
STUDY TOTAL		45.79	83.57		

11. Study Background and Problem Analysis

The upcoming year does not hold any anticipated significant change in fleet operations. Vehicle services will be maintained at their current high level but this year may be an extremely difficult one: the availability of four wheel drive vehicles may not meet the increasing demand.

12. Study Objectives:

i) Objectives

To properly maintain and monitor the Northwest Region's vehicle fleet in order to provide safe, reliable and economical vehicles to the scientific studies.

ii) Deliverables

Short Term (1-5 years)

Efficient fleet management and constant assessment of changing needs in the organization.

Long Term (5 years and beyond)

Long term goals in the management of the Northwest region's Fleet include a possible change in the FMIS to an Ingress based application to make the tool more flexible. Further investigation into the makeup and size of the fleet will be undertaken as an on going task.

13. Progress and Achievements

Over the past five years, the Vehicles section has automated the fleet management of the Northwest Region. This capability was initially developed to provide the information necessary to print monthly reports for the Supply and Services Canada's (SSC) Fleet Management Information System (FMIS). With Forestry Canada's withdrawal from SSC's management program, the inhouse system has become of paramount importance for fleet management. A recent addition to the capabilities of our FMIS has allowed automated downloading of vehicle chargebacks to the financial control system. Also instituted in the Northwest region has been a gradual reduction in overall fleet strength in order to tailor the size to operational requirements and has resulted in the elimination of five (5) excess vehicles.

The past year has seen the integration of nine (9) placement vehicles within the regions fleet and five (5) more units have been ordered for the upcoming year. The fleet vehicles have all been redecated with Forestry Canada markings.

14. Goals and Accomplishments (1992-93)

- 1) *Assign vehicles for the 1992 field season by May 1, 1992.*

Vehicles were assigned in April of 1992.

- 2) *Integrate 4 1992/93 replacement vehicles into the fleet. Dispose of the vehicles the new ones are replacing.*

Two (2) vehicles arrived early being received in March 1992. Two (2) Vehicles were received on July 14 of 1992. Disposal of eight (8) vehicles is scheduled to occur in December 1992.

- 3) *Order 1993/94 replacement vehicles in October 1991.*

Ordered five (5) vehicles in September of 1992 and two (2) more in October of 1992. During the 1992/93 fiscal year the following special orders occurred: one (1) vehicle was ordered for the Winnipeg office on May 8th and delivered on June 22nd, two (2) vehicles were ordered for the P.A. office the first on May 8th and delivered on July 23rd and the second on June 17th and delivered on August 8th.

- 4) *Ensure all vehicles in the fleet have the required maintenance performed on them per a written maintenance schedule. Perform scheduled safety maintenance requirements.*

Vehicles were maintained on regular basis during 1992/93.

- 5) *Provide monthly the required FMIS information by the 10th of the following month using the computerized system.*

Data was entered on a regular basis during 1992/93.

- 6) *Develop by April 30, 1992, the kilometre charges which includes both gasoline and repairs for 1992/93. By the tenth (10) working day of the following month provide to Finance the charges by study for the previous month.*

Rates were established in March of 1992.

- 7) *Within reason, satisfy all requests for vehicles during the fiscal year.*

During 1992/93 a shortage of 4X4 suburbans developed but most needs were met during the year.

- 8) *Do not exceed the budget provided without permission from the Manager, Management Services.*

Budget was exceeded by \$182.00.

- 9) *Ensure proper safety and winter emergency kits are available in vehicles stores.*

Winter emergency kits are maintained in stores to accommodate requests by vehicle users.

- 10) *Contract for a special interior cleaning of all pool vehicles in the spring of 1992.*

Due to fiscal restraints this project has not been completed.

15. Information Activities

N/A

16. Goals 1993-94

- 1) Assign vehicles for the 1993 field season by May 1, 1993.
- 2) Integrate seven (7) 1993/94 replacement vehicles into the fleet. Dispose of the vehicles which the new ones are replacing.
- 3) Order 1994/95 replacement vehicles in October 1992.
- 4) Ensure all vehicles in the fleet have the required maintenance performed on them as per a written maintenance schedule. Perform scheduled safety maintenance requirements.
- 5) Enter monthly the required FMIS information by the tenth (10) of the following month using the computerized system.
- 6) Develop by April 30, 1993 the kilometre charges which include both gasoline and repairs for 1993/94. By the tenth (10) working day of the following month provide to Finance the charges by study for the previous month.

- 7) Within reason, satisfy all requests for vehicles during the fiscal year.
- 8) Do not exceed the budget provided without permission from the Manager, Management Services.
- 9) Ensure proper safety and winter emergency kits are available in vehicles stores.

17. Major Co-operators:

Not applicable

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement

N/A

- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 22, 1993

1. **STUDY TITLE:** Safety
2. **Responsibility Centre:** Northwest Region (8121)
3. **Program:** Regional Director General, Northwest Region
4. **Project Title:** Management Services
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Edmonton, Alberta
7. **Study Staff:**

	Name
Study Leader	H. Schoendube
Team Members	J. Fisher

8. **Study Key Words:** safety training
9. **Study Activity:** 2251
10. **Study Resources:**

Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
H. Schoendube	GL-MAM-12 (O)					
J. Fisher	HP-5 (O)	0.20	0.20	0.23		
FTEs		0.20	0.20	0.23		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	0.00
O&M	4.49	3.80			
Capital					
G & C					
TOTAL:	4.49	3.80			

STUDY TOTAL	4.49	3.80			
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11. Study Background and Problem Analysis12. Study Objectives:

i) Objectives:

To provide safety updating, First Aid, CPR courses and Emergency Evacuation Team training to personnel at NoFC to ensure "SAFETY" continues to be the number one priority.

ii) Deliverables:

Short Term (1-5 years)

To provide safety training to NoFC employees.

Long Term (5 years and beyond)

iii) Significant Linkages:

13. Progress and Achievements

For 6 years, we have provided First Aid and CPR training to our staff at Northern Forestry Centre. We also have in effect the Student Orientation Program which gives the students some basic First Aid training, as well as some on the job ideas as to how and why and you must fill in the accident log when one injures oneself. Government agencies other than Forestry still use us to train their staff when ever space is available. The Emergency Evacuation Team meets once a month and has proven very successful over the past year.

Safety videos have been shown to staff members during ten lunch periods and six afternoons just to keep the awareness concept of safety high.

14. Goals and Accomplishments (1992-93)

- 1) *Conduct two [2] First Aid requalification courses.*

Conducted one requalification course. Staff felt that they should take a full course as students did not study on their own time.

2. *Conduct three [3] First Aid courses.*

Conducted six (6) First Aid courses.

3. *Conduct two (2) CPR courses.*

Conducted four (4) CPR courses.

4. *Requalify First Aid and CPR instructors.*

Requalified one First Aid and CPR instructor.

5. *Provide training and demonstrations with self contained breathing apparatus SCBA and fire extinguishers.*

Provided demonstrations and training in fire extinguisher and SCBA use.

6. *Provide two [2] Student Orientation Programs during Spring '92.*

Provided one Student Orientation Program which all students attended.

7. *Carry out twelve [12] safety inspections of building, equipment and grounds.*

Carried out 12 inspections on building safety and equipment.

8. *Select and send several members on safety and WHMIS training courses.*

Training courses were held for the Emergency Evacuation Team plus WHMIS training.

9. *Purchase updating supplies for safety, First Aid and CPR.*

Ten (10) safety video's were purchased and have been shown to some of the staff at lunch hours. It is expected that more staff will view these films in the next year.

10. *Carry out safety inspections with Labour Canada personnel.*

Carried out safety inspections with Labour Canada and the Department of Health and Safety. We also had other agents come to inspect our location.

11 Updated mailing lists for Safety Meeting and Emergency Evacuation Meeting minutes.

12 Trained over 50 staff members in First Aid.

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports
- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer:

16. Goals 1993-94

- 1. Conduct one (1) First Aid requalification course, if sufficient employees request it.
- 2. Conduct four (4) First Aid Courses.
- 3. Conduct two (2) CPR courses.
- 4. Requalify one (1) First Aid instructor.
- 5. Provide SCBA and fire extinguisher training and demonstration.
- 6. Provide one (1) "Student Orientation Programs" during the spring of '93.
- 7. Carry out twelve (12) safety inspections of building, equipment, and grounds.
- 8. Select and send several staff members on safety and W.H.M.I.S. upgrading courses.
- 9. Purchase up-dating supplies for safety, First Aid, and CPR.
- 10 Continue to show videos on safety to employees.

17. Major Co-operators:

N/A

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement: Not required
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: December 22, 1992

1. **STUDY TITLE:** Greenhouse and nursery operations
2. **Responsibility Centre:** Northwest Region (8121)
3. **Program:** Management Services
4. **Project Title:** Management Services
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Edmonton, Alberta
7. **Study Staff:**

	Name
Study Leader	P.J. Maruyama
Team Members	

8. **Study Key Words:** NoFC greenhouse and nursery, facilities maintenance, management and planning
9. **Study Activity:** 2252
10. **Study Resources:**

Personnel Information

		1992-93	Fiscal Year 1993-94			1994-95
Employee Name	Category	Previous	Budget	Revised	Forecast	Upcoming
P.J. Maruyama	EG-6 (T)					
FTEs		0.00	0.00	0.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00	0.00	0.00
O&M	2.03	2.00			
Capital					
G & C					
TOTAL:	2.03	2.00			

STUDY TOTAL	2.03	2.00			
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11. Study Background and Problem Analysis

N/A

12. Study Objectives:

i) Objectives

1. To administer NoFC greenhouse and nursery facilities.
2. To provide advice on rearing bareroot and container stock to NoFC staff.

ii) Deliverables

This study provides an on-going inspection services to the greenhouse to detect possible problems which are turned over to maintenance for correction. It also provides limited supplies to people who do not use large volumes. In the summer it supervises the weeding of the nursery. This study does not take care of plants individual scientists have in the Greenhouses or nursery. That is the scientist's responsibility. The co-ordination in this study calls meetings of and chairs the Greenhouse Nursery Committee one time a year.

iii) Significant Linkages:

NOR 11-06	Y. Hiratsuka
NOR 11-09	K. Mallett
NOR 10-13	I.K. Edwards
NOR 22-01	J. DeFranceschi

13. Progress and Achievements14. Goals and Accomplishments (1992-93)

- 1.
- Administer and maintain the NoFC greenhouse and nursery facility.*

Administered and maintained the NoFC greenhouse and nursery facility.

- 2.
- Evaluate the present stock in the nursery, move or disperse of unwanted trees and maintain the nursery area by weeding, rototilling and other cultivation methods.*

Evaluated the present stock in the nursery, moved and dispersed unwanted trees to Tree Plan Canada clients:

Group	White Spruce	Lodgepole Pine	Jack Pine
City of Edmonton	0	1170	372
Slave Lake AFA	150	0	0
Peace River AFA	50	0	0
Spray Lakes	0	50	0
Economy Landscape	0	50	50
Total	200	1270	534

Maintained the nursery area by weeding, rototilling and other cultivation methods.

- 3.
- Call and chair meetings of the Greenhouse/Nursery committees and implement its discussions*

Meetings were held. P.J. Maruyama will be the Greenhouse Manager from April 1, 1992 to March 31, 1993. A summer student was hired and kept till the middle of August 1992 and two temporary term positions were established from September 25 to October 23, 1992. Tree Plan Canada to use greenhouse # 1 and available space in the nursery.

15. Information Activities:

N/A

16. Goals: 1993-94

- Administer and maintain the NoFC greenhouse and nursery facility.
- Maintain the nursery area by weeding, rototiling and other cultivation methods.
- Have two meetings of Greenhouse Committee during the fiscal year.
- Interact with Tree Plan Canada activities in the greenhouse and nursery.

17. Major Co-operators:

N/A

18. Environmental Implications:

i) Environmental Impact/Assessment Review Statement

N/A

ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY
1993-94

A. GENERAL INFORMATION

1. Title: Informatics
2. Responsibility Centre: Northwest Region (8121)
3. Activity: 1241
4. Program: Management Services
5. Status: Continuing
6. Last Evaluation: January 28, 1993
7. Next Evaluation:

B. KEYWORDS

010 Informatics
 111 Support
 122 Network (Pathworks, Ethernet)
 606 Computer services
 707 Informatics

C. RESOURCES

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	5.00	5.00	3.00	0.00	0.00
Salaries	\$219.3	\$219.3	\$146.2	\$0.0	\$0.0
O & M	\$130.0	\$133.6	\$100.4	\$0.0	\$0.0
Capital	\$242.7	\$200.0	\$150.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$592.0	\$552.9	\$396.6	\$0.0	\$0.0

D. PROJECT DESCRIPTION

To provide Informatics services to the Northwest Region - System Management for the VAX, UNIX workstations and PCs; full support for CSs in other projects and the district offices; programming and consulting support; coordinating the EDP capital, GIS and Computer Users committees; acting as a test site for various systems being prepared by Headquarters; provide Informatics training and assistance to users of multi-media audio-visual equipment.

3. Collaborators:

N/A.

5. Goals:

To provide Informatics services to the NW Region.

6. Accomplishments:

Provided programming, systems management, Informatics training for the NW region. Installed network lines and workstations, PCs and terminals. Coordination of Informatics and GIS capital purchases and advice on software purchases was carried out during the year.

Acted as a test site for various HQ systems and sat on Informatics and GIS committees.

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: January 21, 1992

1. **STUDY TITLE:** Informatics (formerly Computing and Data Processing Services)
2. **Responsibility Centre:** Northwest Region (8121)
3. **Program:** Regional Director General, Northwest Region
4. **Project Title:** Informatics (formerly Computing and Data Processing Services)
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	B. Chow
Team Members	A. Irwin
	D. Carrigan
	A. Yasinski
	L. Hai
	K. Petkau

8. **Study Key Words:** Informatics, EDP Training, Systems Management, Programming, GIS, Statistics
9. **Study Activity:**

1241

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
B. Chow	CS-3 (A)	1.00	1.00	1.00		
A. Irwin	CS-2 (A)	1.00	1.00	1.00		
D. Carrigan	CS-2 (A)	1.00	1.00	1.00		
A. Yasinski	CS-2 (A)	1.00	1.00	1.00		
L. Hai	DA-PRO-3 (S)	1.00	1.00	0.00		
FTEs		5.00	5.00	3.00		

Financial Resources (\$000s)

A-base	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
Salaries	0.00	0.00			
O&M	158.91	95.40			
Capital	221.44	150.00			
G & C	0.00	0.00			
TOTAL:	380.85	245.40			

STUDY TOTAL	380.85	245.40			
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11. Study Background and Problem Analysis

This study evolved from a need to provide EDP programming to Northwest Region staff in 1969 to the present where programming, systems management, EDP training, statistical system support, local area networks, wide area network and international communications are the norm. Systems have evolved from a time-sharing an IBM 360 to the elaborate arrangement of VAX's, PC's, workstations and x-terminals we now have. We also use communications networks to access other computers such as the University of Alberta and other regional computers.

12. Study Objectives:

i) Objectives

- a) To manage Informatics and provide computer network and electronic data processing (EDP) services to Northwest Region personnel and to provide EDP consulting services using the Northwest Regions Systems. To provide EDP planning for the Northwest Region. To provide functional supervision of the CS's in the District Offices and the CS's in other projects at NoFC.
- b) To provide programming services to the Northwest Region. To advise on statistical procedures and packages available. To NoFC staff, other agencies or outside users who are working on joint projects with the Northwest Region.
- c) To provide systems management, network and communications management of the VAXs, workstations and X-terminals at Northwest Region and the workstation networks in the District Offices. To install new systems, trouble-shoot hardware problems and assist with software problems; maintain all EDP software and assist with diagnosing hardware problems. Provide backup assistance to CS's in the District Offices and other CS's who are working with other projects at Northwest Region.
- d) To provide training on various software packages used on the VAX's, SUN workstations and PC's, consulting and programming assistance on the usage of the in-house computer, work stations, personal computers, plotters, printers and graphics terminals. Prepare forms and macros for users to assist with various reports. Prepare and update user handouts which reflect the information in the training sessions.

ii) Deliverables

Short Term (1-5 years)

The upcoming year will likely see a continuation of the move towards more "open" computing systems and towards a client-server framework. Informatics will be working with headquarters and other regions on this thrust; and will continue to maintain high quality service to the entire Northwest Region. We are working on an EDP operational review committee and should finalize recommendations about centres of expertise, joint purchasing servers, communications, networking and service and maintenance by the end of the fiscal year.

Long Term (5 years and beyond)

Implementation of the results of the EDP operational review will be spread over several years. We will be installing new versions of the Finance, Material Management and Personnel systems. We will be downsizing the VAX's and putting more emphasis on work stations, UNIX and PC systems and networking. Inter-regional networking to servers will be in place for some systems.

iii) Significant Linkages:

N/A

iv) Methodologies

N/A

13. Progress and Achievements

In the last several years, computing in the Northwest Region has seen a dramatic change. The proliferation of PCs and workstations, along with the increasing skill level of the users has resulted in a more diverse Informatics department. In addition, this various equipment had to be integrated into the existing network, and foresight was needed to ensure its compatibility with future changes. The mix of VMS-UNIX-DOS-OS/2 has been handled effectively and efficiently, and will be the foundation for future expansion.

14. Goals and Accomplishments (1992-93)

- 1) *Prepare reports on computer usage by program and project - monthly summaries and yearly reports. Provide statistics to the Manager, Management Services, within five (5) working days of month-end. Provide a monthly statistical report to the Manager, Management Services on the operation completed by the Computer Centre. (Chow)*

Reports for the first half of the year were completed within five working days of month-end. Reports for the second half of the year were put on hold while the format and content of the new reports were worked out.

- 2) *Continue to assist with the P&IMS system to meet NWR and HQ needs. Develop or assist in the development of download from Wordperfect to P&IMS by the page - test the feasibility of the systems to do this. (Chow, Yasinski)*

Assistance was given with the P&IMS system at both the user and the system level. Members of Informatics were involved with handling user-support questions and training; as well as working with Jim Banks to ensure the system functioned properly and that upgrades were installed correctly.

- 3) *Assist with PC, workstation and software purchase justifications, and with the purchase and/or selection of EDP products. (Yasinski, others)*

Assisted with PC justifications, with purchases of other EDP equipment (laser printers, scanners, expansion boards, etc.), and with various software packages (WordPerfect, DrawPerfect, Harvard Graphics, Ventura Publisher, CorelDraw, Windows 3.1, Pathworks, PC-NFS, etc.) by going over features of products and reviewing tenders.

- 4) *Maintain contact with HQ EDP personnel. (All)*

Kept in contact with Forest Canada EDP coordinator—Scott Burrell—and the Director of Forest Canada EDP—Pierre Maltais. All staff of Informatics was involved in several teleconferences on EDP-related issues (e.g., telecommunications, operational review). In addition, a site visit was made.

- 5) *Continue to work with the publishing section with their scanner, slide-maker, other equipment and software.* (Carrigan, Yasinski)

Assisted with the publishing section as required; installing new versions of software and debugging problems as they arose.

- 6) *Prepare the annual study and project plans, including budget estimates by January 31, 1993; prepare the annual EDP requirement plans for the Computing Centre and correlate and integrate EDP plans for the rest of the Northwest Region, by February 25, 1993.* (Yasinski, Chow)

Prepared the annual study-work and project plans, including the budget estimates for 1993/94, by January 28, 1993; and the EDP capital acquisition plans for Informatics for 1993/94 by January 28, 1993.

- 7) *Prepare the annual Computing Centre staff appraisals for 1992/93 by March 15, 1993.* (Chow)

Prepared annual Computing Centre staff appraisals for 1992/93 by March 15, 1993.

- 8) *Write, modify or adapt programs and systems and provide documentation, as required by users and the Computer Centre.* (Irwin, Carrigan, Yasinski)

Wrote (w), modified (m), or adapted (a) programs and systems, and other work including the following major projects (over 5 days):

- Linear programming on workstation for Fire (a)
- ABase reporting system for Finance (w)
- Agreement reporting system for Finance (w)
- Budget system (a)
- Utility programs for financial systems (w)
- DAP programming for Mixedwood Silviculture (m)
- Licence Plate database program for Administration (w)
- Work Order system for Maintenance/Engineering (w)
- TimeLog system for Computer Centre ported to Unix (a)
- Company database system for Development (w)
- Continued development on DevMIS (on Unix) for Development (a)
- Installed workstations (7) in Winnipeg (MDO)
- Developed comprehensive Site Manager's guide
- Maintained and documented VAX Automated Backup Facility (a)

- 9) *Install new and updated software and systems as received.* (Carrigan, Yasinski)

Installed the following software, plus aided users in installations of various PC-based software packages:

UNIX:

- grass, TeX, GNU software, USENET software, emacs, Xarchie, xv, elm, xgen
- SunOS, OpenWindows 3, XVT, ARC/Info, Nexpert, Aster*x, WordPerfect 5.1
- Wingz, Codebase, PC-NFS, SAS, Answerbook, SunNet Manager, SunPC
- Lotus 1-2-3, S-Plus

VAX/VMS:

- Ingress 6, WordPerfect 5.1, DCLFast, Multinet, Lotus 1-2-3, Diskeeper, SAS 6.07

OTHER:

- Installed and configured the Internet router

- 10) *Continue to backup the District Offices with their workstation systems, by site visits, by signing on their systems and by telephone. Set up at least two site visits to the district offices during 1992/93 and continue with assistance to them on EDP, workstation systems and GIS selection and installation. (Carrigan, Yasinski, Chow)*

Extensive help was given to both district offices in the form of electronic conversations, telephone conversations, and site visits. Five visits were made to Saskatchewan, and three visits were made to Manitoba.

- 11) *Develop, expand and maintain programs and systems, such as the MLIST system and BUDGET programs, as well as assist Development with DEV MIS. (Irwin, Yasinski)*

The MLIST program has been adapted for several individual user's needs, along with undergoing regular updates to handle changes in equipment. The BUDGET program has been improved dramatically, and other regions (MRC, PNFI, SOO) will soon be on the system. After extensive consultation with Regional Development, the District Offices, and Provincial governments, DevMIS has been revamped and is functioning on the UNIX workstations. Modifications are continuing, including a tie-in with the FINCON system for expenditures information.

- 12) *Prepare a detailed updated list of PC software, including serial number, version, serial number of the PC which has the software loaded on it, owner of the software and PC; prepare a list for record keeping by PC and have the owner sign the list to verify the legality of the software; the list will be updated each time the owner buys new software or upgrades or transfers the software to another user - in which case the old version must be erased from the former PC; by so doing, we hope to protect the Computer Centre from any trouble with the R.C.M.P., who may or may not be doing a site inspection for illegal software. Further to this, we will be doing a virus check on all PC's, cleaning the disks, and scanning all diskettes which are being used for viruses and will then certify that a given PC is virus free; we will also offer a virus check on any diskettes brought from home or other sources, before they will be allowed on a NoFC PC. The scanning will be carried out once a year or more frequently if a virus should appear. (Yasinski, students, term)*

A detailed software database was developed to keep track of the information. However, due to other commitments and priorities, Informatics staff was unable to prepare the detailed list. The project will be completed when resources are available.

A building-wide virus scan was conducted early in the year, after the Michelangelo virus-scare (of March 6). Two viruses were uncovered which were collected and sent to Ottawa, and removed. In addition, disks are scanned on demand by Informatics staff and the latest version of the MacAfee virus scanning program is distributed upon receipt.

- 13) *Give in-house courses and provide other training and assistance with the VAX, PC and workstation software products. Give courses and prepare new courses, as needed, to NoFC and District office personnel, including the following, when there are enough requests: (Yasinski)*

- *Introduction to Wordperfect*
 - *Intermediate Wordperfect*
 - *Advanced Wordperfect*
 - *Introduction to Planperfect*
 - *Introduction to SAS*
 - *Introduction to Lotus 1-2-3*
 - *Introduction to Quattro Pro*
 - *Introduction to Harvard Graphics*
 - *Introduction to PC's and DOS*
 - *Introduction SUN - UNIX & vi*
 - *Introduction to Ventura*
 - *How to use E-mail*
 - *VAX editor EDT*
- *Other courses will be prepared and presented, if requested.*

Conducted eight (8) courses on different occasions with a total of 85 attendees. Total time spent training was in excess of 65 hours, not including preparation time.

Courses included:

WordPerfect (Introduction and Intermediate)	5 attendees
Unix and vi (Introduction)	12 attendees
VAX/VMS (Introduction)	19 attendees
SAS (Introduction)	4 attendees
IBM PC/MS-DOS (Introduction)	1 attendee
Microsoft Windows (Introduction)	2 attendees
Unix and OpenWindows (Introduction)	42 attendees

- 14) *Continue to trouble-shoot problems with terminals, workstations, PC's, VAX software, programmes and other software, printers and plotters, etc.. (All)*

Assistance was given to users in areas of trouble-shooting, program design, and program assistance. Over 3600 individual calls were handled, ranging in time from 10 minutes to several hours.

- 15) *Continue to prepare, modify and upgrade Computer Centre handouts and manuals for users, such as Quattro-Pro handout, more on UNIX, VAX Wordperfect 5.1. (Yasinski)*

A couple of handouts were modified, and several others created including:

- Student Orientation Handbook
- Introduction to Unix/vi
- Internet Basics

Also created for Informatics personnel is a comprehensive Site Manager's Guide.

- 16) *Assist with the software packages for the various personal computers. Assist users with INGRESS, MINTAB, SAS, LOTUS 123, OFFICE and WORDPERFECT systems for data bases, statistics and document editing. Help users with C and FORTRAN. Assist with the plotting system, slide and overhead presentations. Continue to act as the consultant for using the audio-visual systems in the conference room. (Yasinski, Irwin)*

User assistance given on a demand basis. Help given in all areas of computing, ranging from simple VMS (DCL) questions, to assisting with program debugging. Informal presentations were given on the use of the audio/visual equipment, and assistance was given in areas related to slide production.

- 17) *Provide data entry services and backup and restore services as required by various projects; provide various other operator services.*

Requests for file restorations and backups were handled within one day; most often within the hour. With Linda Hai moving to Administrative Services in the last half of the year, data entry services have been eliminated for the time being. (Hai, Carrigan)

- 18) *Attempt to keep current with all aspects of computing, word processors, personal computers and telecommunications by attending workshops, trade shows and reading trade magazines and literature, by attending meetings of the local computer groups (CIPS & EARLUG-DECUS) and by attending courses as appropriate on the VAX. Attend the U.S. DECUS meeting to obtain the very latest news in DEC and DEC compatible hardware and software and attend meetings dealing with VAX problems. Attendance at the DECUS-Canada bi-annually and the GIS symposia bi-annually alternately is also an on-going source of information. (All)*

Tried to keep current with computing, but due to time constraints, very little time was afforded this goal over the last year.

- 19) *Continue to expand ethernet LAN and terminal server network so all offices and labs can be hooked into the networks. Continue to work on full integration of the PC's, VAX, workstations, printers, plotters, micro-VAXes, word processing and document preparation (publishing) systems. Maintain DECNET and DATAPAC network between HQ, NoFC, and other regions. Finish a networking study on Internet so we can have contact with other R & D and educational sites around the world. (Yasinski, Carrigan, Term)*

Installed and upgraded both terminal and ethernet wiring as required. This included rewiring much of the third floor (with the departure of Fisheries and Oceans) and the administration wing. A full scale upgrade was performed on the ethernet wiring on each floor to facilitate future expansion and to reduce the length of the segments. An 8-port ethernet repeater was installed on the second floor.

The DECNET and DATAPAC networks were maintained. In addition, a full Internet connection was established via the Alberta Research Council to NoFC.

- 20) *Hire four students to provide programming and EDP consulting assistance to various projects, to fill in when Computer Centre staff is on holidays and to help with trouble-shooting and hardware maintenance. (Chow, Yasinski)*

Three students were hired this year. They were involved on programming tasks and filled in for other Informatics staff when on holidays.

- 21) *Continue to functionally supervise all CS's other than those working in the Computing Centre. (Chow)*

Functionally supervised six CSs—one in each of the District Offices, one in Regional Development, one in Fire, and two in Decision Support.

- 22) *Assist with the finance section's upgrades to hardware and software. (Irwin, Yasinski)*

Assisted with Finance as required, including installation and assistance on SIMS (Salary Information Management System). Attended a course on SIMS, and met with representatives from Ottawa to discuss system concerns. Set up a Finance network complete with 6 PCs and 1 server.

- 23) *Attend courses as approved such as computing science courses, UNIX courses, VAX and SUN systems courses. (Carrigan, Yasinski, Chow)*

Attended a UNIX Systems and Network course in Ottawa, as well as two University computing courses and GIS course.

- 24) *Attend various seminars put on by personnel, PSC and others. (All)*

Attended various seminars put on by personnel and PSC.

- 25) *Attend ITAC annual meeting and other special ITAC meetings if called. (Chow)*

Attended the ITAC annual meeting in Ottawa, and one in Fredericton. Also involved in numerous ITAC teleconferences throughout the year.

- 26) *Continue to coordinate EDP purchases for NoFC and the District offices. (Chow, others)*

Coordinated EDP purchases by providing recommendations, looking over requisitions, and answering questions.

- 27) *Continue with the Computer Centre newsletter on a monthly basis. (Yasinski)*

Completed five issues of the Computer Centre newsletter, but due to time constraints had to put off completion of the others.

- 28) *Hold two meetings of the computer users' committee in June, 1992 and February 1993 to assess EDP service needs and capital requirements. Minutes to be taken and distributed. (Chow, Others)*

Held one meeting of the computer users' committee in February, 1993 to assess EDP service needs and capital requirements.

- 29) *Continue to support FROLIC by trouble-shooting and installation of upgrades as received. (Chow, Yasinski)*

Continued to support Central Registry staff with the FROLIC system by troubleshooting and performing upgrades. Upgraded PC to a 386-based system to improve response time.

- 30) *Work with ARC/INFO for FIDS. (Yasinski, Carrigan, Yurach)*

Helped FIDS with the setup of their UNIX workstation, as well as provided basic assistance with UNIX and ARC/Info. Additional assistance provided by Ken Yurach of the Saskatchewan District Office.

- 31) *Develop a 'lights-out' (no operator required after regular hours) backup strategy for all PC's, workstations and the VAX. (Carrigan)*

Successfully implemented an effective "lights-out" backup strategy. Also incorporated on-line listings of backups to reduce on paper consumption, and to provide users a quick, efficient way to find files.

- 32) *Add Winnipeg and Prince Albert DO's to the network as full members so communications, file transfers, e-mail will work both ways, through the use of routers, Multinet and Datapac and possibly Internet. (Carrigan)*

Proceeding with the installation and configuration of the District Offices on Internet. Assisted with fine-tuning each system as well as addressing security issues.

- 33) *Complete debugging and documenting of the tree ring analysis programs to get ready for publication. (Irwin)*

Ongoing.

- 34) *Continue with DAP programming for various projects; special request has been received from FIDS for extensive DAP programming during the coming year and will probable require some field trips. (Irwin)*

Programmed the DAP field recorders as required and as specified.

- 35) *Continue with linear programming for the Fire project. (Irwin)*

Continued with assistance for the Fire project on linear programming.

- 36) *Act as a test site for the new approach to HRIS. (Chow, Yasinski)*

Anticipating "black box" in the near future and the completion of testing of the HRIS.

- 37) Participated in the GE evaluation. (Chow)
- 40) Conducted two information sessions: MicroVAX Introduction, and Internet Basics. (Yasinski)
- 41) Installed and integrated the Solbourne 7000 Unix-based workstation onto the network. Transferred various software packages and user accounts to the new system. (Carrigan)

15. Information Activities

- i) Journal Publications
- ii) Information Reports
- iii) Other reports
- iv) Lectures, courses, seminars and scientific addresses
- v) Technology transfer:

16. Goals 1993-94

- 1) Continue to assist with the P&IMS system to meet NWR and HQ needs. Develop or assist in the development of download from Wordperfect to P&IMS by the page - test the feasibility of the systems to do this. (Chow, Yasinski)
- 2) Assist with PC, workstation and software purchase justifications, and with the purchase and/or selection of EDP products. (All)
- 3) Maintain contact with HQ EDP personnel. (All)
- 4) Continue to work with the publishing section with their scanner, slide-maker, other equipment and software. (Carrigan, Yasinski)
- 5) Prepare the annual study and project plans, including budget estimates by January 31, 1994; prepare the annual EDP requirement plans for the Computing Centre and correlate and integrate EDP plans for the rest of the Northwest Region, by February 28, 1994. (Chow)
- 6) Prepare the annual Computing Centre staff appraisals for 1993/94 by March 15, 1994. (Chow)
- 7) Write, modify or adapt programs and systems and provide documentation, as required by users and the Computer Centre. (Irwin)
- 8) Install new and updated software and systems as received. (Carrigan, Yasinski)
- 9) Continue to backup the District Offices with their workstation systems, by at least two site visits and by signing on their systems and by telephone. (Carrigan, Others)

- 10) Develop, expand and maintain programs and systems, such as the MLIST system and BUDGET programs and assist Development with DEVMIS. (Yasinski, Term)
- 11) Prepare a detailed updated list of PC software, including serial number, version, serial number of the PC which has the software loaded on it, owner of the software and PC; prepare a list for record keeping by PC and have the owner sign the list to verify the legality of the software; the list will be updated each time the owner buys new software or upgrades or transfers the software to another user - in which case the old version must be erased from the former PC; by so doing, we hope to protect the Computer Centre from any trouble with the R.C.M.P., who may or may not be doing a site inspection for illegal software. Further to this, we will be doing a virus check on all PC's, cleaning the disks, and scanning all diskettes which are being used for viruses and will then certify that a given PC is virus free; we will also offer a virus check on any diskettes brought from home or other sources, before they will be allowed on a NoFC PC. The scanning will be carried out once a year or more frequently if a virus should appear. (Yasinski, Chow, term)
- 12) Give in-house courses and provide other training and assistance with the VAX, PC and workstation software products. Give courses and prepare new courses, as needed, to NoFC and District office personnel, including the following, when there are enough requests: (Yasinski)
 - Introduction to Wordperfect
 - Intermediate Wordperfect
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 - Introduction to Harvard Graphics
 - Introduction to PC's and DOS
 - Introduction SUN - UNIX & vi
 - Introduction to Ventura
 - Introduction to MINTTAB
 - How to use E-mail
 - VAX editor EDT
 - Other courses will be prepared and presented, if requested.
- 13) Continue to trouble-shoot problems with terminals, workstations, PC's, VAX software, programmes and other software, printers and plotters, etc.. (All)
- 14) Continue to prepare, modify and upgrade Computer Centre handouts and manuals for users, such as Quattro-Pro handout, more on UNIX, VAX Wordperfect 5.1. (Yasinski)
- 15) Assist with the software packages for the various personal computers. Assist users with INGRESS, SAS, Lotus 123, OFFICE and WORDPERFECT systems for data bases, statistics and document editing. Help users with C and FORTRAN. Assist with the plotting system, slide and overhead presentations. Continue to act as the consultant for using the audio-visual systems in the conference room. (Carrigan, Irwin, Others)

- 16) Provide backup and restore services as required by various projects; provide various other operator services. (Carrigan, others)
- 17) Attempt to keep current with all aspects of computing, word processors, personal computers and telecommunications by attending workshops, trade shows and reading trade magazines and literature, by attending meetings of the local computer groups (SAS & EARLUG-DECUS). Attend the U.S. DECUS meeting to obtain the very latest news in DEC and DEC compatible hardware and software and attend meetings dealing with VAX problems. Attendance at the DECUS-Canada bi-annually and the GIS symposia bi-annually alternately is also an on-going source of information. (All)
- 18) Continue to expand ethernet LAN and terminal server network so all offices and labs can be hooked into the networks. Continue to work on full integration of the PC's, VAX, workstations, printers, plotters, micro-VAXes, word processing and document preparation (publishing) systems. Maintain DECNET, DATAPAC and Internet networks between HQ, NoFC, and other regions. (Carrigan)
- 19) Hire students to provide programming and EDP consulting assistance to various projects, to fill in when Computer Centre staff is on holidays and to help with trouble-shooting and hardware maintenance. (Chow)
- 20) Continue to functionally supervise all CS's other than those working in the Computing Centre. (Chow)
- 21) Assist with the finance section's upgrades to hardware and software. (Yasinski, Irwin)
- 22) Attend courses as approved such as computing science courses, UNIX courses, VAX and SUN systems courses. (All)
- 23) Attend various seminars put on by personnel, PSC and others. (All)
- 24) Attend ITAC annual meeting and other special ITAC meetings if called. (Chow)
- 25) Continue to coordinate EDP purchases for NoFC and the District offices. (Chow)
- 26) Continue with the Computer Centre newsletter on a regular basis. (Yasinski)
- 27) Provide a monthly statistical report to the Manager, Management Services on the operation completed by the Computer Centre. (Chow)
- 28) Hold two meetings of the computer users' committee in June, 1993 and February 1994 to assess EDP service needs and capital requirements. Minutes to be taken and distributed. (All)
- 29) Continue to support FROLIC by trouble-shooting and installation of upgrades as received. (Chow, Yasinski)
- 30) Work with ARC/INFO for FIDS. (Yasinski, others)

- 31) Complete debugging and documenting of the tree ring analysis programs to get ready for publication. (Irwin)
- 32) Continue with DAP programming for various projects; special request has been received from FIDS for DAP programming during the coming year. (Irwin)
- 33) Continue with linear programming for the Fire project. (Irwin)
- 34) Act as a test site for the new approach to Human Resources Information Systems (HRIS).

17. Major Co-operators:

i) Internal - FC

Region	ID#	Title	Contact name
PFC	VMS,networking	Carrigan,Yasinski	Moncrief,Gondor
PNFI	Budget,Comm's.	Irwin, Carrigan	Thompson
NeFC	Budget	Irwin	Galloway
SOO	Budget,various	Irwin, Chow	Beilhartz
NCR	Var'us,SIMS,SE	Yasinski	Carmichael,Cote
MDO,SDO	Training,Devms	Yasinski, Petkau	CS's,Mgrs.
NCR	P&IMS	Chow, Carrigan	Ellis, Banks

ii) External -

Establishment	ID#	Title	Contact name
ARC	INTERNET	Carrigan,Yasinski	Tse, Penno
U of A	Bitnet,Usenet	Carrigan	Thierman
AFS	DEVMIS	Yasinski,Petkau	McLoughlin

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement: Not Applicable
- ii) FC-NWR EARP Committee Approval Date: March 31, 1993

PROJECT SUMMARY

A. GENERAL INFORMATION:

1. Title: Personnel Administration
2. Responsibility Centre: Northwest Region (8111)
3. Activity: 1231
4. Program: Regional Director General
5. Status: Continuing
6. Last Evaluation: January 18, 1993
7. Next Evaluation:

B. KEY WORDS

008 Human Resources
 074 Human Res./Scientists and Technologists
 108 Project Leader
 109 Coordinator/advisor

C. RESOURCES

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	4.25	4.25	4.00	0.00	0.00
Salaries	\$151.8	\$151.8	\$145.6	\$0.0	\$0.0
O & M	\$20.3	\$20.3	\$25.0	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$172.1	\$172.1	\$170.6	\$0.0	\$0.0

D. PROJECT DESCRIPTION

The Personnel Unit for the Northwest Region provides ongoing service to the management and staff of NoFC and two district offices located in Edmonton, Alberta; Prince Albert, Saskatchewan; and Winnipeg, Manitoba. Specific services are provided in the following

specialty areas: Classification, Staffing, Staff Relations, Pay and Benefits, Training, Human Resource Planning, Employment Equity, Official Languages, and in part Health and Safety. The Personnel unit provides a generalist service and has expertise in all of the areas listed above. The experience of the unit members does cover the specialty requirements extensively.

The Regional Personnel Manager is a member of the Regional Management team. This relationship creates many opportunities for the incumbent to be involved in special projects which are outside of the personnel field.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary (\$s & PYs):

	<u>Previous</u>	<u>Budget</u>	<u>Revised</u> \$000s	<u>Upcoming</u>	<u>Planning 1</u>
Primary					
Secondary					
Total					
Green Plan					

3. Collaborators:

Secondary:

Public Service Commission of Canada (PSC)
 Forestry Canada Personnel - HQ's/Regions
 Other Federal Government Departments - Personnel Units
 Public Service Alliance, Environment Component - Regional (PSAC)
 Professional Institute of the Public Service of Canada (PIPSC)
 General Public
 Human Resource Managers of Alberta - Northern Chapter
 Alberta Classification Officers - Federal
 Alberta Chiefs of Staffing - Federal
 Treasury Board
 National Joint Council
 Public Service Staff Relations Board
 Human Resource Managers of Alberta - Southern Chapter
 Economists', Sociologists' and Statisticians' Association (ESSA)
 Association of Public Service Financial Administrators (APSFA)
 Aboriginal Workforce Participation Initiative - Working Group
 Edmonton Common Services (Personnel) Working Group

4. Green Plan:

There were no personnel related activities tied to Green Plan funding for the year 1993/94.

5. Milestones:1993-94:

1. Classification - Focus this year will be in two major areas. The GE Conversion exercise will move into the second phase of evaluation when the new Universal Job Evaluation Plan (UJEP) is finalized and the regional cyclical review of approximately one third of our positions will take up the rest of our time.
2. Staffing - Changes caused by the introduction of Bill C-26 will bring in many changes over the coming year. Managers and staff will be briefed on the changes and the effects they will have on day to day operations.
3. Staff Relations - The local PSAC component for the N.W.R. is once again functional and consultations have taken place. We look forward to increased communication with the union as a result.
4. Training - Training in the coming year will focus on the changing atmosphere everyone is exposed to. Internal regional courses are being looked at for the fall of 1993 (eg.: APPLE, Dealing with Change, Managing Your Interpersonal Actions, TQM, Team Building, Retirement Planning).
5. Human Resource Planning - There is an expectation that the changes caused by government cuts and restructuring, will put greater emphasis on our regional need to review our organization and plan more effectively for the future (eg.: Retirements, Reorganization, Work Force Adjustment). Communication will increase with employees and the bargaining agents over the coming year.
6. Employment Equity - These programs have been used continually over the past four to five years in this region and this usage will continue in the coming year.
7. Pay and Benefits - Many changes are expected in the coming year which will have major impacts on this specialty area (eg.: introduction of the PRI to replace the SIN, Pension Reform, Classification Conversion impacts, Term employee changes, etc.)

6. Accomplishments:1992-93:

1. Classification - Our region piloted the GE Conversion exercise for the department. As a result of the combined efforts of all employees involved in this process, we managed to complete the exercise on time, so that other regions of the department could benefit from the output.

2. Staffing - We faced a record year for hiring summer students with a total of 82 students hired. In the process we utilized the Employment Equity Programs of the PSC. There was also an increase in our turnaround time on average of 42 days for the processing of staffing actions in the region.
3. Staff Relations - No grievances were lodged by employees in the past year. Individual guidance to employees who are experiencing difficulty with change has increased continuously over the past three to four years. LMCC's are alive and well in the region once again.
4. Training - Training was provided by HQ's personnel in the new work description format associated with the UJEP. Supervisors and managers were also trained in the evaluation process as well. A one day staffing course was coordinated by HQ in cooperation with PSC. Three Time Management sessions were put on in the region each lasting one day. A fifth session of Managing Your Interpersonal Actions was coordinated.
5. Human Resources Planning - The new PREA was introduced to staff and is being used for this year. More emphasis has been placed on our future needs to identify training and career planning for our employees. A summer student orientation handbook was updated and steps to finalize the NWR Employee handbook are nearing completion.
6. Employment Equity - Regionally, we have used this program on several occasions over the past year. The most noticeable usage has been in the COSEP hiring that has taken place for the 1993 summer period.
7. Pay and Benefits - Manual records were created to compensate for the problems we were experiencing with the HRIS. Now that the HRIS is functioning better, the records created will serve as a verification point. A total of eighty-two (82) students were processed by our pay unit for the 1993 summer season.
8. Official Languages - A plan was prepared and submitted to HQ outlining how we as a region are approaching the introduction of the new Official Languages Act. To date in our region, we are able to provide the services required in both official languages.

7. Link to Strategic Plan:

National:

As a service oriented unit, personnel is tied in directly to the national and the regional strategic plans of the department. Our role has been changing over the past few years to one of full participation in concert with management.

Regional/Institute:

8. Establishment/Institute Specific Information:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: 93/01/18

1. **STUDY TITLE:** Personnel Administration
2. **Responsibility Centre:** Northwest Region (8111)
3. **Program:** Regional Director General
4. **Project Title:** Personnel Administration
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Edmonton, Alberta
7. **Study Staff:**

	Name
Study Leader	R. Czuj
Team Members	B. Grauman
	G. Peacock
	C. Grbavec

8. **Study Key Words:** Personnel; Classification; Staffing; Employment Equity; Pay and Benefits; Staff Relations; Training; Official Languages; Human Resources Planning; Health and Safety.
9. **Study Activity:** 1231

10. Study Resources:Personnel Information

Employee Name	Category	1992-93	Fiscal Year 1993-94			1994-95
		Previous	Budget	Revised	Forecast	Upcoming
R. Czuj	PE-04 (A)	1.00	1.00	1.00		
B. Grauman	AS-02 (A)	1.00	1.00	1.00		
G. Peacock	CR-05 (S)	1.00	1.00	1.00		
C. Grbavec	CR-04 (S)	1.00	1.00	1.00		
H. Howson	CR					
FTEs		4.25	4.25	4.00		

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00	0.00		
O&M	25.49	25.00			
Capital					
G & C					
TOTAL:	25.49	25.00			

STUDY TOTAL	25.49	25.00			
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11. Study Background and Problem Analysis

The Personnel Administration Project is not broken down into individual studies even though personnel in itself is made up of various specializations. The major task associated with the delivery of personnel services to the N.W. Region is the delivery of service on a generalist platform in order to meet the needs of the region. This requires that individual services be provided as required in the specialty area of choice or as deemed necessary by the individual demand. In terms of specialties, Staffing and Pay and Benefits each have a specialist on site and the remainder of the specialties are covered off by the Regional Personnel Manager.

12. Study Objectives:

i) Objectives

Provide ongoing services to managers and staff of the N.W. Region in Personnel which is broken down into the following specialty areas: Staffing, Pay and Benefits, Classification, Staff Relations, Training, Human Resources Planning, Official Languages, Employment Equity, and Health and Safety.

Coordinate regional concerns with external agencies (ie: Public Service Commission) in order to ensure that guidelines and directives are adhered to on an ongoing basis.

Ensure that changes to policy and procedure or changes to acts and regulations are implemented in the proper manner and within the appropriate time frames.

Coordinate training of staff affected by change to ensure the smooth transition of the workforce.

Coordinate special projects on behalf the Northwest Region which are normally associated with the personnel function.

ii) Deliverables

Short Term (1-5 years)

Improve communications between the personnel unit and our clients by reviewing the level of service being provided and discussing changes with our clients.

Provide a better level of service to our clients by increasing our turnaround time on inquiries for all specialty areas.

Short Term (1-5 years) cont.

Complete classification rationales, review Staffing files, update training profiles for employees of the N.W. Region and attempt to put more focus on good Time Management practices in our unit.

Work with a computerized system (eg.: HRIS) that is fully functional and will save us time in over all service and production of information.

Long Term (5 years and beyond)

Prepare and adapt to changes associated with PS2000 all of which are going to impact in some way on the personnel community.

Develop a Human Resource Planning system for the N.W. Region to look after expected changes (ie: retirement of Baby Boomers, working at home, reorganizations, etc.).

iii) Significant Linkages:

N/A

iv) Methodologies

N/A

13. Progress and Achievements

The personnel unit in this region has undergone some changes over the past couple of years which has led to a better understanding of the problems and the requirements of the department and of the region. Some of the changes we have seen over the past few years have helped the members of the personnel unit feel more a part of the family atmosphere which is so evident in this region.

Some of the significant and successful changes include: EG Conversion exercise, introduction of an automated pay system and a departmental leave system, greater emphasis on Employment Equity placements, the introduction of the Aboriginal Work Force Participation Initiative, involvement in pilot projects such as the GE Conversion exercise, greater involvement with other government departments from a networking perspective and a strong working relationship among other personnel units within the department, especially our own Headquarters.

All of this and more has led to a better appreciation of the our needs and our clients needs and has aided us in delivering a better level of service.

14. Goals and Accomplishments (1992-93)

- 1) *Classification: Complete the GE Conversion Exercise as the pilot region for the department and ensure the exercise is completed by December 31, 1992.*

With the assistance of HQ's personnel, we were able to provide training to fifteen managers and supervisors involved in the GE Conversion exercise in the areas of Work Description writing and position evaluation. We were able to prepare a schedule for the completion of this exercise and managed to complete it on time.

- 2) *Classification: Complete the 1992/93 cyclical review for those positions affected in the N.W. Region by December 31, 1992.*

This goal was only partially completed due to the precedence set by the GE Conversion exercise. Time permitting, this goal for 1992/93 will be completed by March 31, 1993.

- 3) *Staff Relations: Provision of advice and service to managers and staff of the N.W. Region for the fiscal year 1992/93.*

Ongoing advice and service is provided on a daily basis. In addition, the new departmental Instrument of delegation was distributed, the Harassment Policy was distributed, one Union Management Consultation Committee (UMCC) meeting was conducted, one grievance was handled, and a presentation by CANCARE representatives was organized. These represent a few examples for the past year of operation.

- 4) *Training: Coordinate a number of training activities for the N.W. Region in 1992/93.*

Coordinated courses in Managing Your Interpersonal Actions (Dec. 2-3, 1992); Time Management (Nov. 18-20, 1992); and GE Conversion Training, Work Description Writing (Sept. 21-23, 1992), and Evaluation of Universal Job Evaluation Plan (UJEP) (Oct. 20-22, 1992; Oct. 26-30, 1992; and Nov. 24-26, 1992).

- 5) *Official Languages: Monitor and coordinate the regional implementation of the New Official Languages Act.*

Prepared and submitted a plan to cover the regional strategy for meeting the requirements of the new Official Languages Act and implemented the initial steps to meet the requirements outlined in the plan.

- 6) *Human Resource Planning: Work towards the computerization of the departmental Performance Review and Employee Appraisal (PREA) form for 1992/93.*

With the help and assistance of the N.W. Region Informatics unit, specifically Arthur Yasinski (NOR 53-01), this goal was achieved.

- 7) *Human Resource Planning: Develop a new Student Orientation Handbook the 1992/93, COSEP.*

Once again with the assistance of the Arthur Yasinski, this goal was achieved and in addition, copies of the final product were distributed to all regions for review and information.

- 8) *Staffing: Provide a better level of service to our clients for the coming year.*

Average completion time for open competitions is now at 42 days for the region and a full time position has been dedicated to the staffing function in this region to accommodate needs. In addition, priorities are reviewed regularly for all staffing actions in the region.

- 9) *Staffing: Hiring of summer students for the 1992/93 fiscal year within the appropriate time periods.*

We conducted our own advertising campaign this year in Alberta and Saskatchewan and liaised with Canada Employment in Manitoba. We utilized all the Employment Equity programs during this time period and managed to bring double the number of students on strength for this summer period compared to the 1991/92 figures.

- 10) *Staffing: Have the new Staffing Officer complete the required training modules leading up to certification in Staffing including the passing of the Public Service Exam before the end of June 1992.*

The modules were completed on time and the exam was written with success. At present the incumbent is working on phase two of the certification process.

- 11) *Employment Equity: Utilize the program and increase our regional compliment of employees in these programs by the end of 1992/93.*

We utilized all four programs throughout the year and hired our first indeterminate Aboriginal employee for which recognition was received from HQ's. In addition, we participated in the first Aboriginal Youth Conference sponsored by the Yellowhead Tribal Council.

- 12) *Pay and Benefits: Continue to input data into the Human Resource Information System and generate reports which will assist management on various leave related issues.*

Despite problems with the input of data into the HRIS, we continued our input and with the assistance of HQ's generated two reports over the course of the year outlining the status of the leave system.

- 13) *Pay and Benefits: Ensure that all pay revisions are properly processed and submitted on time for this fiscal year.*

All revisions were completed on schedule and increment cheques were issued on time.

- 14) *Pay and Benefits: Process the summer students (COSEP) for the fiscal year 1992/93.*

The number of COSEP's for this year doubled and all were processed in the pay function on time. In addition, a great deal of work was spent on developing the P&B portion of the Student Orientation Handbook.

- 15) *Pay and Benefits: Increase the level of service provided to staff of the N.W. Region and increase the response time for inquiries.*

More time was spent on responding to personnel related inquiries than any time in the past. Employees are given very quick responses to inquiries where research of case history is not vital. Hours of office operation have been tailored to a more routine schedule.

- 16) *General: Participate as a committee member or chairperson on various committees for the 1992/93 fiscal year.*

The Regional Personnel Manager sat on three committees over the past year, the Northwest Region Achievement Awards Committee as past Chairperson; the Aboriginal Work Force Participation Initiative Sub-committee as a member; and the Alberta Human Resource Managers of Alberta as a member. In addition, sat as a member on the Alberta/NWT PE Workshop Committee for the 1992 workshop.

15. Information Activities

i) Journal Publications

N/A

ii) Information Reports

N/A

iii) Other reports.

Completed Official Languages Regional Report for 1992.

iv) Lectures, courses, seminars and scientific addresses

N/A

v) Technology transfer:

N/A

16. Goals 1993-94

- 1) Classification: Complete Phase Two of the GE Conversion exercise by December 31, 1993. [Czuj]
- 2) Classification: Prepare for the implementation of other groups towards the new Universal Job Evaluation Plan (UJEP). [Czuj]
- 3) Classification: Complete the cyclical review for the 1993/94 fiscal year by March 31, 1994. [Czuj/Grbavec]
- 4) Classification: Finish a small backlog of position rationales and review position files for completeness by June 30, 1993. [Czuj]
- 5) Staff Relations: Provide training to employees of the N.W. Region, Pacific Region and the Great Lakes Region in the Staff Relations specialty by March 31, 1994. [Czuj]
- 6) Staff Relations: Re-establish Union-Management Consultation Committee (UMCC) meetings in the N.W. Region based on former scheduling practises now that PSAC is represented again as a local for 1993. [Czuj]

- 7) **Staff Relations:** Provide regional information sessions respecting the new departmental Harassment Policy by June 30, 1993. [Czuj]
 - 8) **Training:** Coordinate training for the N.W. Region in a number of areas over the 1993/94 fiscal year including the following: Staff Relations training in light of Bill C-26; APPLE training for managers; MMOP and SOP for 1993; training for the regional Harassment Officers; update on the PREA system and the new format. [Czuj]
 - 9) **Official Languages:** Monitor the progress of the change associated with regional positions and the new legislation which came into effect on December 16, 1992. [Czuj]
 - 10) **Human Resource Planning:** Coordinate the regional input into the new Career Management Program; the introduction of the new PREA form; presentations to staff on various PS2000 issues such as Team Building. [Czuj]
 - 11) **Staffing:** Introduce the changes to employees of the region with respect to new legislation (Bill C-26 "Reform Act") by providing training, implementing change and giving information sessions. [Czuj]
 - 12) **Staffing:** Continue our quest to increase the population of Employment Equity target groups for the 1993/94 fiscal year. [Czuj]
 - 13) **Staffing:** Concentrate on providing a better service to our managers and staff on service and turnaround. [Czuj, Grbavec, Grauman, Peacock]
 - 14) **Staffing:** Complete the requirements leading up to certification in Staffing and attendance at the Staffing Consultant Course for 1993. [Grauman]
 - 15) **Pay and Benefits:** Prepare for any pay related issues associated with the GE Conversion exercise. [Grauman, Peacock]
 - 16) **Pay and Benefits:** On a regional basis implement and coordinate the introduction of the Personnel Record Identifier (PRI) for this fiscal year. [Peacock, Grauman]
 - 17) **Pay and Benefits:** Review the impacts of Pension Reform and update services to all affected by the change. [Peacock, Grauman]
 - 18) **Pay and Benefits:** Coordinate a Retirement Seminar for the employees of the N.W. Region this fiscal year. [Grauman, Peacock]
 - 19) **Pay and Benefits:** Review at least 10% of all employee personnel files in the region for accuracy by the end of this fiscal year. [Grauman, Peacock]
17. Major Co-operators:
- i) Internal - FC

Region	ID#	Title	Contact name
Headquarters		Personnel	All employees
All Regions		Regional Personnel Managers	

ii) External -

Establishment	ID#	Title	Contact name
Public Service Commission		Resourcing Officers	various
Federal Government Departments		Regional Personnel Managers	various
Supply and Services Canada		Pay Clerks	various
Dental Care Plan		Assistants/Officers	various
Provincial Health Care		Assistants/Officers	various
Public Service Health Care Plan		Assistants/Officers	various

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement
- ii) FC-NWR EARP Committee Approval Date:

PROJECT SUMMARY

A. GENERAL INFORMATION

1. Title: Policy, Planning and Evaluation
2. Responsibility Centre: Northwest Region (8111)
3. Activity: 1311
4. Program: Regional Director General
5. Status: Continuing
6. Last Evaluation: February 8, 1993
7. Next Evaluation:

B. KEYWORDS:

004 Policy issues
 005 Development agreements
 007 economics
 016 research review and assessment
 021 Sustainable development
 041 evaluation
 056 Industry and Trade Advice; Forest Management
 100 Green Plan
 115 Research policy and planning
 240 multiple use
 721 Advisory services

C. RESOURCES:

Fiscal Year	Previous 1992-93	Budget 1993-94	Revised 1993-94	Upcoming 1994-95	Planning 1 1995-96
FTEs	0.00	0.00	1.00	0.00	0.00
Salaries	\$0.0	\$0.0	\$73.0	\$0.0	\$0.0
O & M	\$0.0	\$0.0	\$5.0	\$0.0	\$0.0
Capital	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
G & C	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total	\$0.0	\$0.0	\$78.0	\$0.0	\$0.0

D. PROJECT DESCRIPTIONS

This project provides coordination and monitoring of strategic and operational planning processes, including documentation, for regional programs in forestry research, development, technology transfer and administration. It develops and co-ordinates evaluation systems as an integral part of the planning and management processes in the region, whether A-base, Agreements, Green Plan or integrated forest resource management projects. It provides socio-economic/statistical data/policy analyses and documentation for policy and program development of regional and national forestry research, development and technology transfer programs.

1. Environment Assessment Review Process:

The Northwest Region Environmental Screening Committee has done a preliminary screening of studies within this project. Any comments or requirements for format screening are contained within the specific study workplan.

2. Collaborators/Green Plan Resource Summary (\$s & PYs): \$000s

	Previous	Budget	Revised	Upcoming	Planning 1
Primary					
Secondary					
Total					
Green Plan					

3. Collaborators:

Primary

N/A

Secondary

DIAND

Manitoba Natural Resources

Saskatchewan Department of Environment and Natural Resources

Alberta Environmental Protection

Government of Northwest Territories

Economic Development and Tourism

Renewable Resources

4. Green Plan:

This project is currently linked to the Model Forests initiative through development of regional evaluation frameworks for the Model Forests (Foothills, Prince Albert, Manitou Abi) in this region.

5. Milestones:

1. Coordinate the annual regional planning process.
2. Propose options for planning and management to address the targets of the Regional Strategic Plan, based on interim analyses.
3. Coordinate the development of strategic implementation/action plans for four (4) of the new thrusts in the 1990-95 Regional Strategic Plan.
4. Investigate options for a more regional utilization of the departmental P&IMS.
5. Continue to provide policy and planning analysis and documentation for Northwest Regional PAIFs, Green Plan initiatives, other new initiatives as requested.
6. Finalize evaluation frameworks and plans for Manitoba, Saskatchewan, Alberta PAIFs.
7. Serve on the Evaluation and Evaluation Management Committees of the Canada-GNWT Economic Development Framework Agreement.
8. Develop an evaluation framework for the regional Model Forests.
9. Act as ForCan authority and Steering Committee member for the Saskatchewan and Manitoba Long Term Integrated Forest Resource Management Plans.
10. Monitor the development of long term integrated resource management plans in Alberta and Northwest Territories.
11. Serve as Chair, Regional Integrated Forest Resource Management Technical Committee. Organize and implement an annual meeting of the Regional Committee.
12. Continue to provide reviews/comments of policy and program reports, journal articles, research proposals as well as briefings.
13. Continue project development and committee representation.

6. Accomplishments:

1. Not applicable, as this is a new project. Related accomplishments can be found in the terminating study NOR-03.

7. Link to Strategic Plan:

National:

This project links to several elements of the National Strategic Plan which include industry and trade; forest management and new forestry agreements.

Regional/Institute:

This project links to the Regional Strategic Plan issues to stimulate economic use of the forest resource and regional development through the forest sector as well as to multiple use forest management. It is also involved in the new program thrust to develop research programs for integrating and applying forest management activities in support of the sustainable developments of nontimber forest resource and values.

8. Establishment/Institute Specific Information:

**FORESTRY CANADA
NORTHWEST REGION
STUDY WORK PLAN
1993-94**

Project Review Date: February 6, 1993

1. **STUDY TITLE:** Policy, Planning and Evaluation
2. **Responsibility Centre:** Northwest Region (8111)
3. **Program:** Regional Director General
4. **Project Title:** Policy, Planning and Evaluation
5. **Office Location(s):** Edmonton, Alberta
6. **Work Location:** Northwest Region
7. **Study Staff:**

	Name
Study Leader	D. Boylen
Team Members	Technician (vacant)
	NWR Management Committee
	D. Benke
	B. Chow
	J. Simunkovic

8. **Study Key Words:** strategic planning, regional operational planning systems, integrated resource management planning, evaluation, performance indicators, total quality management
9. **Study Activity:** 1311

10. Study Resources:Personnel Information

		1992-93	Fiscal Year 1993-94			1994-95
Employee Name	Category	Previous	Budget	Revised	Forecast	Upcoming
D. Boylen	ES-6	0.00	1.00			
FTEs		0.00	1.00			

Financial Resources (\$000s)

	1992-93	Fiscal Year 1993-94			1994-95
	Previous	Budget	Revised	Forecast	Upcoming
<u>A-base</u>					
Salaries	0.00	0.00			
O&M	0.00	5.00			
Capital					
G & C					
TOTAL:	0.00	5.00			

		1992-93	Fiscal Year 1993-94			1994-95
	ID #	Previous	Budget	Revised	Forecast	Upcoming
<u>Agreements</u>						
Salaries		0.00	0.00			
O&M						
Capital						
G & C:						
Man.	M	175.00				
Sask.	S7010	176.70				
	S8001	40.00				
TOTAL:		391.70				

STUDY TOTAL	0.00	396.70				
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11. Study Background and Problem Analysis

Forestry Canada in the Northwest Region requires co-ordinated policy and program development in order to deliver strategic programs in forestry research, development and technology transfer.

The Northwest Region and Northern Forestry Centre have had in place a system of operational planning since 1970, which resulted in the production of annual project and study work plans and 5 year operational plans.

Beginning in 1985, Regional management teams became committed to utilizing strategic planning processes to better target the development and utilization of all resources for delivering the Forestry Canada mandate in this region.

In 1990-91, a second regional strategic plan - *Toward the 21st century forest* - was developed to guide us to 1995. At the same time, national forest strategies of both Forestry Canada and the country, through the Canadian Council of Forest Ministers, were developed.

New planning processes are needed to allow us to accomplish our strategic plans. A more dynamic, flexible, client responsive state of operational planning must be achieved, both corporately and regionally in Forestry Canada. Additionally, the planning processes need to be better coordinated, streamlined and monitored.

Evaluation, including also monitoring and audit, needs to become more of an integral, on-going part of the planning process as Agreements, Green Plan activities, various joint initiatives increasingly must account for their utilization of resources.

12. Study Objectives:

i) Objectives

1. To coordinate and monitor strategic and operational planning processes, including documentation, for regional programs in forestry research, development, technology transfer and administration.
2. To develop and coordinate evaluation systems as an integral part of the planning and management processes in the region.
3. To provide socio-economic/statistical data/policy analyses and documentation for policy and program development of regional and national forestry research, development and technology transfer programs.

ii) Deliverables

Short Term (1-5 years)

1. Develop and implement an effective planning process in Northwest Region.
2. Link the annual operational work planning process with strategic plans (national and regional) and with longer term work goals.
3. Monitor performance and evaluate achievements against program priorities. Prepare an evaluation/assessment of the 1990-95 Regional Strategic Plan.

4. participate in the development and implementation of integrated resource management plans and processes.
5. Develop and coordinate the evaluations of partnership/cooperation agreements, as well as regional components of the Green Plan.
6. Prepare a Northwest Region strategic plan for 1995-2000.

Long Term (5 years and beyond)

1. Develop an open process for strategic planning.
2. Assess linkages between policy, planning and evaluation activities and integrate results into regional management.

iii) Significant Linkages:

Northwest Region Management Committee

NOR-51 - Management Services

NOR-53 - Informatics

NOR-42 - Canada-Manitoba Partnership Agreement in Forestry/District Office

NOR-44 - Canada-Alberta Partnership Agreement in Forestry

NOR-46 - Canada-Saskatchewan Partnership Agreement in Forestry/District Office

NOR-48 - Canada-Northwest Territories Cooperation Agreement in Forestry

DIAND - Evaluation Directorate

FORCAN - Headquarters - Policy, Planning and Evaluation

13. Progress and Achievements

Project was created in late year. Accomplishments and achievements are reported in NOR 03-01.

14. Goals and Accomplishments (1992-93)

New Project - not applicable.

15. Information Activities

Not applicable

16. Goals 1993-94

Planning:

1. Coordinate the annual regional planning process.

2. Propose options for planning and management to address the targets of the Regional Strategic Plan, based on interim analyses.
3. Coordinate the development of strategic implementation/action plans for 4 of the new thrusts in the 1990-95 Regional Strategic Plan.
4. Assist Regional Communications personnel in development of a strategic plan.
5. Investigate options for a more regional utilization of the departmental P&IMS.
6. Continue to provide policy and planning analysis and documentation for Northwest Regional PAIFs, Green Plan initiatives, other new initiatives as requested.

Evaluation:

7. Finalize evaluation frameworks and plans for Manitoba, Saskatchewan, Alberta PAIFs.
8. Serve on the Evaluation and Evaluation Management Committees of the Canada-Government Northwest Territories Economic Development Framework Agreement.
9. Develop an evaluation framework for the regional Model Forests.

Integrated Resource Management:

10. Act as ForCan project authority and Steering Committee member for the Saskatchewan and Manitoba Long Term Integrated Forest Resource Management Plans.
11. Monitor the development of long term integrated resource management plans in Alberta and Northwest Territories.
12. Serve as Chair, Regional Integrated Forest Resource Management Technical Committee. Organize and implement two meetings of the Regional Committee.

Policy and Program Development:

13. Continue to provide reviews/comments of policy and program reports, journal articles, research proposals as well as briefings.
14. Continue project development and committee representation.

17. Major Co-operators:

- i) Internal - FC

Region	ID#	Title	Contact name
ForCan - Head-quarters		Planning	T. Bezanson T. Ellis

ii) External -

Establishment	ID#	Title	Contact name
MNR - Forestry			R. Lamont R. Westwood
Saskatchewan - DNR			A. Atkinson L. Stanley
AEP - Alberta Forest Service			R. Simpson
GNWT - Renew- able Resources			R. Larson
DIAND			B. Myers K. Boudreault

18. Environmental Implications:

- i) Environmental Impact/Assessment Review Statement - Not applicable
- ii) FC-NWR EARP Committee Approval Date: 29 January 1993

APPENDIX I

SUMMARY OF ACTIVE THINNING, SPACING AND YIELD STUDIES IN ALBERTA

Location	Soil and site	Stand age at establishment	Date of establishment	Remeasurement date	No. of plots	Plot size	Treatment and measurement
Alberta	Varied	Varied	1951,52,53	1961 1974 1984 (1994)	100	0.1 0.5	Growth and yield
Big Horn Alberta	Three site types	7	1964	1966 1971 1976 1981 1986 1991,(1996A)	30	Varied	100 trees in a 10x10 at densities of 200, 800, 1600, and 3200 stems/acre.
Big Horn	Three site types	27	1984	1984 1989 (1994)s	24	varied	100 trees in a 10x10 at densities 400, 800 and 1600 stems/acre
Peace Alberta	Three site types	25	1967	1972 1977 1982 1987 (1992)A (1997A)	30	variable	100 trees in a 10x10 at densities 200, 400, 1600, and 3200 stems/acre
Rocky Alberta	Silt loam to sandy loam	22	1954	1960 1969 1979 1989 (1999)a	16	.20-.75	Selection thinning control 1.5M spacing 1.8M spacing 1.8M spacing 2.4M spacing 3.7M spacing

SUMMARY OF ACTIVE THINNING, SPACING AND YIELD STUDIES IN MANITOBA

Location	Soil and site	Stand age at establishment	Date of establishment	Remeasurement date	No. of plots	Plot size	Treatment and method	Comments
Littleton, For. Reserve	non-Telluric mesic Clay loam till	11	1948	1953,60,65,76,81,86,91,(1996a)	5	0.2 acres	Regular spacing and alternate strips	con this 20' 1
King Mountain National Park	Non-telluric mesic clay loam till	14	1950	1960,65,71,76,81,86,91,(96a)	4	0.1 acres	Regular spacing	con this 10' 1 p
	Telluric mesic silty clay loam	23	1950	1960,65,71,76,81,86,91,(96a)	8	0.2 acres	Regular spacing	con this 12' ea
Maner	Non-telluric mesic clay loam till	15	1964	1969,85s, and 1989a	24	0.1 Acres	Thinning to regular spacing and pruning	con this 12' wi tre
Lyonsk.	Till Sandy to Clay Loam	14	1951	1951,57,14,62,67,72,78,83,88 (1935)	14	0.2 acres	Control Thinned to 120 SD1 Thinned to 100 SD1 Thinned to 80 SD1 Thinned to 70 SD1 Thinned to 60 SD1 Thinned to 50 SD1	2 p 2 p 2 p 2 p 2 p 2 p
dilands	Sand fresh	03	1963	1973,78,83,88 (1993a)	48	Variable	49 trees in a 7x7 matrix 10'x10', spacing plus a 2 four replications.	
dilands	N\A	N/A	1980	1985a,91s,(96s)	24	Variable	Control;20x20m, 6 plots 8x8 6 plots, 10x10 6 plots 12x12 6 plots.	
air	N/A	N/A	1981	1985,91s,(96s)	4	10x10 m 20x20 m	Control 2 plots, Treated	

SUMMARY OF ACTIVE THINNING, SPACING AND YIELD STUDIES IN MANITOBA

Location	Soil and site	Stand age at establishment	Date of establishment	Remeasurement date	No. of plots	Plot size	Treatment and method
Wash	N/A	N/A	1981	1985,1991 (1996S)	6	20X20M	3 Control and 3 Treatments
Wilands 154	Stratified sand and gravel outwash moist	15	1952	1957,62,67,71, 77,82,87, 92, (1997A)	16	0.1 acres	Low selection thinning to specified stand density index every 5 years except 71 and later
Wilands 189	Medium sand; fresh	40	1958	1963,68,73,78 83,88,(1993A)	20	0.1 acres	Merchantable selection thinning, low and crown only trees with dbh>4"
Wilands (gas R)	Sand fresh	9	1964	1965,68,73,78 83,87A,92 (97A)	15	.002 to .007	Mechanical strip Thinning
Widridge	Sand, fresh	11	1967	1969,76,81,86 1991s.(1996S)	5	.002 to .007	Mechanical thinning
Wilands 1	Sand moist	9	1964	1965,68,73,78, 83,87a,92 (1997A)	15	.002 to .007	Mechanical strip thinning