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Compendium II

Projects Approved under
Natural Resources Canada, Canadian Forest Service's
Requests for Proposals under the
Applied Research,
Technology Development and Transfer,
Decision Support,
and
Socio-economic Analysis Components

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ABSTRACT

This report is the sequel to the first *Compendium of Projects* (Macnaughton, 1993) and contains descriptive summaries of an additional 38 projects under the Applied Research, Technology Development and Transfer, and Decision Support sub-programs and three Socio-economic Analysis projects. These projects are funded by Natural Resources Canada, Canadian Forest Service (CFS) under the Canada-Ontario Northern Ontario Development Agreement, Northern Forestry Program. Some of the projects reported here were approved under the first request for proposals but were not included in the first *Compendium of Projects*. Most of the projects were selected from over 130 proposals received under the second request for proposals, and the activities focus on specific issues of forestry/wildlife interface, smaller scale harvesting and silvicultural systems, and forest-based ecotourism opportunities. As in the first *Compendium of Projects*, each project summary describes the objectives, methodology, expected results, and implications of the research.

RÉSUMÉ

Ce rapport fait suite au premier *Recueil des projets* (Macnaughton, 1993) et contient les résumés descriptifs de 38 autres projets menés dans le cadre des sous-programmes Recherche appliquée, Développement et transfert de technologies et Systèmes d'aide à la décision ainsi que de trois projets relevant de l'Analyse socio-économique. Les projets sont financés par le Service canadien des forêts, Ressources naturelles Canada, dans le cadre du Programme de foresterie du Nord réalisé en vertu de l'Entente auxiliaire Canada-Ontario sur le développement du nord de l'Ontario. Certains ont été approuvés lors de la première demande de propositions, mais n'ont pas été inclus dans le premier *Recueil des projets*. La plupart ont été choisis parmi les plus de 130 propositions reçues lors de la deuxième demande de propositions, et les activités sont axées sur des questions particulières concernant les rapports entre la foresterie et la faune, l'exploitation forestière à petite échelle et les systèmes sylvicoles, ainsi que les possibilités d'écotourisme basé sur la forêt. Comme dans le premier *Recueil des projets*, chaque résumé de projet fait état des objectifs, de la méthode et des résultats escomptés ainsi que des incidences de la recherche.

ACKNOWLEDGMENTS

My appreciation and thanks go to the principal investigators for submitting top-notch proposals to the Northern Forestry Program. Special appreciation and thanks also go to Sandy Burt, Don Reeves and Theresa Glover for their work in editing and transforming this work into the final product. Thanks also to Jim Farrell, Program Director, Forestry Development and Liaison Division and the staff of the Forestry Development Unit, namely Brian Sykes, Diana Callaghan, Harry Jääskeläinen and Gilbert Richir for helping to write many of the articles and reviewing the manuscript. Their suggestions were most appreciated.

Lastly, my thanks to you, the reader, for your continued interest in the Northern Forestry Program of NODA. As with the first Compendium of Projects, I hope these articles will provide additional information on current research and continue to build linkages between the field and forest research.

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INTRODUCTION

Compendium II provides a summary of the objectives and anticipated results of an additional 38 applied research, technology development and transfer, and decision support projects funded by Natural Resources Canada, Canadian Forest Service (CFS) under the Canada–Ontario Northern Ontario Development Agreement, Northern Forestry Program (NODA/NFP). These projects focus on evolving forest management issues and opportunities surrounding the forestry/wildlife interface, the move towards smaller-scale harvesting and silvicultural systems, and the identification of opportunities to involve a broad range of forest users in sustainable forestry through forest resource-based ecotourism¹. Additionally, projects approved under the Socio-economic Analysis component have been incorporated. This component includes three projects: the development of a community-based economic development planning tool, an analysis of the economic benefits of forestry research, and the economic value of canoeing in relation to forest and park management.

Over the next three years project results will be published and transferred to users. Information reports, technical notes, field guides, software, videos and workshops will ensure the rapid transfer of these research results to the field manager, and will hopefully provide more information on decision support tools to solve some of the complex management issues.

Compendium II has been organized in a similar manner to the first *Compendium of Projects* (Macnaughton 1993)². The same five research themes have been retained: Integrated Resource Management, Silvicultural Practices, Forest Protection, Environmental Impacts and Planning and Forest Resource Management. A sixth category, for the Socio-economic Analysis projects, has been created. Again, many of the projects will fall into more than one priority area; however, they have been categorized by their primary focus. The projects

within each priority have been sorted numerically by the four NODA/NFP subprograms:

- Applied Research – 40XX
- Technology Development and Transfer – 41XX
- Decision Support – 42XX
- Socio-economic Analysis – 43XX

To ensure there is no confusion about two terms used in this *Compendium*, I am providing an explanation of their definition. "Principal Investigator" refers to the contractor with the responsibility for completion of the project and its technical content. This includes producing the deliverables as provided for in the project agreement. A "Scientific Authority" is designated by the Canadian Forest Service – Ontario to ensure the scientific quality of the project's implementation and outputs. (Scientific Authorities are not assigned to projects undertaken by CFS – O, for which other control and review mechanisms are in place.)

Several acronyms are used throughout the project articles, and are defined here for clarity:

- NRCan = Natural Resources Canada
(formerly Forestry Canada)
CFS–O = Canadian Forest Service – Ontario
FPMI = Forest Pest Management Institute
OMNR = Ontario Ministry of Natural Resources
OFRI = Ontario Forest Research Institute

¹Anon, 1993. Request for Proposals – II. Canada–Ontario Northern Ontario Development Agreement, Forestry Canada, unpublished.

²Macnaughton, R.L. 1993. Northern Ontario Development Agreement, Northern Forestry Program: *Compendium of Projects*. For. Can., Ont. Reg., Sault Ste. Marie, Ont. NODA/NFP Tech. Rep. TR–1. 74 p.

For readers who may not have received the first *Compendium of Projects* (NODA/NFP Technical Report TR-1), copies may be obtained from:

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R.L. Macnaughton, R.P.F.
Forestry Development
Natural Resources Canada
Canadian Forest Service – Ontario
May, 1994

INTEGRATED MANAGEMENT

Integrated Modeling of Moose Habitat and Population

Duration: 01 September 1993 to 31 August 1994

Contract Value: \$93,732

Principal Investigator: P. Duinker
Lakehead University, Thunder Bay

Scientific Authority: A. Rodgers
Centre for Northern Forest Ecosystem Research, Thunder Bay

OBJECTIVE:

To develop and test a preliminary set of integrated simulation models that will forecast potential effects of forest and moose population management.

DESCRIPTION:

The moose is a species of high ecological, economic, and social importance in Ontario's boreal forest. Few attempts have been made to translate simulated effects on habitat to effects on populations. The project will produce first-approximation models linking these effects by building on past modelling efforts and making use of expertise and advice from Ontario biologists.

The work plan will involve the following phases:

1. Literature review;
2. Advisory group workshop;
3. Data collection;
4. Model development and programming;
5. Scenario building;
6. Preliminary projections;
7. Advisory group meeting;
8. Validation/sensitivity analysis;
9. Reporting; and,
10. Technology transfer seminars/training.

EXPECTED RESULTS:

First-approximation, integrated moose habitat and population models for exploring the potential effects of forest management and moose population management on a regional moose population will be produced. A final report and two seminars on the development of the model and its potential use and one training session will be completed.

IMPLICATIONS:

The models produced will be useful for guiding applied research and in preliminary exploration of the effects of long-term forest management plans on moose populations. Some of the pitfalls of linking wildlife habitat and population simulators will also be identified.

COLLABORATORS:

E. Turk, Lake Abitibi Model Forest, Iroquois Falls; R. Watt, Northeast Science and Technology, OMNR, Timmins; C. Wedeles and C. Daniel, ESSA Technologies Ltd., Richmond Hill.

Trade-off Analysis in Protecting Caribou in Multiple-use Forestry in Northwestern Ontario

Duration: 27 September 1993 to 31 March 1995

Contract Value: \$37,560

Principal Investigator: G. Fox
University of Guelph, Guelph

Scientific Authority: H. Cumming
Lakehead University, Thunder Bay

OBJECTIVES:

To address conflicts between timber management and caribou/moose habitat maintenance in northwestern Ontario, through a case study approach, and to provide an economic analysis of the regime of incentives created by alternative institutional frameworks.

DESCRIPTION:

The variety of forest tenure arrangements has resulted in different incentives for tenure holders with respect to the stewardship of resources including wildlife. Greater demands on the forest from tourism, recreation, and other uses can be expected to place pressure on the current tenure arrangements which have not been designed with unpriced resources, such as caribou, in mind.

A number of qualitative techniques will be employed to examine the trade-offs between timber harvesting and caribou habitat including the travel cost method, hedonic pricing, contingent valuation, and mathematical programming.

The project is divided into four phases:

1. Project initiation and literature review;
2. Economic assessment of costs and benefits of woodland caribou guidelines;
3. Workshops and presentations; and,
4. Final report completion.

EXPECTED RESULTS:

The project will produce a technical report summarizing procedures, findings, and recommendations. Workshops are also planned for resource managers in industry and government to convey findings and to enable resource policy makers to report on policy implications.

IMPLICATIONS:

Project results will facilitate decision making in multiple use and integrated resource management in northwestern Ontario forests. Fundamental issues in economic theory and measurement regarding the pricing of traditionally unpriced natural resources will also be addressed.

COLLABORATORS:

D.W. McKenney, NRCan, Sault Ste. Marie; G. Racey, OMNR, Thunder Bay.

A Market Segmentation Analysis of Desired Ecotourism Opportunities

Duration: 14 July 1993 to 30 September 1995

Contract Value: \$101,019

Principal Investigator: D. Twynam and D. Robinson
Lakehead University, Thunder Bay

OBJECTIVES:

To identify the desired ecotourism opportunities of those visitors who make up the latent ecotourism market for northern Ontario and to develop a visitor segmentation profile that, for marketing purposes, identifies the desired ecotourism opportunities of specific socio-economic sectors of the latent ecotourism market of northern Ontario.

DESCRIPTION:

Nature-based tourism (ecotourism) is the fastest growing sector of both the Canadian and international tourism market. There exists a potentially large market in Ontario and the northern United States for forest-based ecotourism in northern Ontario. The project has two main phases: a mailed survey study, and a U.S.A. – Canada border intercept study.

Phase 1 will involve sampling 2000 potential visitors who are associated with nature-oriented recreation organizations/groups such as the Mountain Equipment Co-op in Toronto. A survey questionnaire will be developed that specifically addresses desired ecotourism opportunities. Multivariate analyses will be used to generate socio-economic segmentations.

Phase 2 is designed to profile the desired opportunities (forest setting/environment, forest-based activities, and forest-based experiences) of the ecotourist who already visits northern Ontario. A sample will be drawn by interviewing travellers coming into the region from U.S. border crossing points.

EXPECTED RESULTS:

A report highlighting the U.S.A. – Canada intercept study, a workshop on project results and a final report will be produced.

IMPLICATIONS:

In order to develop a strategy to successfully promote northern Ontario as a suitable destination for the ecotourist, it is necessary to identify and quantify the demand side of the demand-supply relationship. It will then be possible to match these demands to the supply side of this relationship.

COLLABORATORS:

W. Haider, Centre for Northern Forest Ecosystem Research, OMNR, Thunder Bay; T. Mullins, Resort Management Systems, Sault Ste. Marie; M. Squires, Abitibi-Price Inc., Thunder Bay; J. Grayson, Northern Ontario Tourist Outfitters Association, North Bay; D. Schafer, OMNR, Wawa.

Identifying Sites/Opportunities for Forest-based Ecotourism in Northern Ontario

Duration: 20 July 1993 to 30 September 1995

Contract Value: \$146,812

Principal Investigator: S. Boyd and R. Butler
Butler and Boyd Associates, Strathroy

OBJECTIVE:

To devise a methodology to identify sites in northern Ontario that are suitable for forest-based ecotourism using an existing Landsat forest cover classification.

DESCRIPTION:

The methodology will use Geographic Information Systems (GIS) along with client group survey and interview techniques to study the ecotourism potential of the 125,000 km² area from Sault Ste. Marie to North Bay. The project is comprised of seven phases.

- 1 Literature review on "Ecotourism";
- 2 Identification of suitable criteria and parameters for ecotourism;
- 3 Mapping of areas which have GIS coverage and where the necessary criteria are present and parameters are satisfied;
4. Field interviews and assessment of identified sites;
5. Detailed site selection and examination;
6. Development of guidelines for a comprehensive planning process for forest-based ecotourism in northern Ontario; and,
7. Evaluation of the methodology.

EXPECTED RESULTS:

The project will produce a report identifying the potential for forest-based ecotourism in northern Ontario, establishing methodology to identify and evaluate potential sites, and locating sites suitable for long-term development. In addition, the following will be prepared: a guide to the principles for developing ecotourism sites, and, a report containing data gathered on the case studies to assist in ecotourism promotion of those sites. Two workshops are planned in communities near the case study sites.

IMPLICATIONS:

A heightened awareness, on the part of tourist operators, community leaders, and policy makers, of ecotourism opportunities within the study area will become evident. The methodology established for this project can also be extended for use in all of northern Ontario.

COLLABORATORS:

A. Perera, OFRI, OMNR, Sault Ste. Marie; W. Haider, Centre for Northern Forest Ecosystem Research, OMNR, Thunder Bay; C. Pearce, University of Western Ontario, London.

Forest-based Ecotourism in Small Northwestern Ontario Communities – Panacea or Placebo

Duration: 01 August 1993 to 31 March 1994

Contract Value: \$76,150

Principal Investigator: M. Wanlin
Boreal Ecosystems Associates Ltd., Thunder Bay

OBJECTIVES:

To identify opportunities for successful forest-based ecotourism developments by looking at three northwestern Ontario communities and their surrounding areas; to develop criteria for establishment of successful ecotourism initiatives in northwestern Ontario; to identify the economic impact of ecotourism in existing or potential parks on the selected communities; and, to illustrate how forest and park planning systems can support the development of ecotourism opportunities.

DESCRIPTION:

Three communities in northwestern Ontario (Atikokan, Armstrong and Rosspport) have been chosen for detailed study and will be compared with two communities in the United States that have developed very successful ecotourism sectors (Ely, Minnesota and Bayfield, Wisconsin). Atikokan and Armstrong will be contrasted with Ely and Rosspport will be contrasted with Bayfield.

The project will use community workshops and key informant interviews for information gathering. An economic analysis based on existing published information and the key informant interviews will be conducted for each community.

EXPECTED RESULTS:

The project will produce a set of criteria for the successful establishment of ecotourism opportunities in small northwestern Ontario communities.

IMPLICATIONS:

The three Ontario communities specifically targeted in the project will acquire a strong awareness of their ecotourism development potential. The workshop formats used, as well as the criteria produced, can be of potential benefit to many northern Ontario communities.

COLLABORATORS:

P. Meyer, Quandra Consulting Group, Thunder Bay; B. Heyer, Boreal Ecosystems Associates Ltd., Thunder Bay; P. Duinker, Lakehead University, Thunder Bay; D. Plumridge, Armstrong Wilderness Outfitters Association, Armstrong; G. McKinnon, Atikokan Community Futures, Atikokan; M. Burnett, Rosspport Area Conservation & Development Group, Rosspport; L. Dickson, Schreiber-Terrace Bay Community Futures Organization, Terrace Bay; D. Smith, Environment North, Thunder Bay.

Innovative Ecotourism at the Boreal Edge

Duration: 15 June 1993 to 30 April 1994

Contract Value: \$45,200

Principal Investigator: A. Salmoni,
Laurentian University, Sudbury

OBJECTIVE:

To develop innovative ecotourism techniques which will encourage active learning about forest ecosystems and about the impact of forest management practices on those ecosystems.

DESCRIPTION:

Informing people about the nature and use of our forests should not be viewed solely as an educational undertaking but also as a health promotion opportunity. Barriers may exist, however, that may prevent certain user groups, particularly older adults and families with young children, from enjoying certain forest-based active learning opportunities.

Information will be gathered by personal and telephone interviews along with written questionnaires concerning the perceived barriers that keep these target groups from fully participating in forest-based active learning experiences.

Sites along the existing Deer Trail tour route, between Iron Bridge and Elliot Lake, will be identified that demonstrate a range of forest management techniques, are of interest from an ecology/wildlife aspect, and are easily accessible to nontraditional ecotourist groups (i.e., target groups).

Sites of ecological value will be assessed for their interactive educational potential. Site requirements for physical alterations and information packaging will be determined.

EXPECTED RESULTS:

The project will produce an ecological assessment report of the selected sites and a report on forest-based active learning techniques developed for seniors and families with young children. A conference/workshop presentation is also planned.

IMPLICATIONS:

The project will identify the special needs of certain target groups (seniors and families with young children) who currently may not be considering ecotourism as a form of recreation. Tour planners throughout northern Ontario will benefit from the results of this study.

COLLABORATORS:

M. Poitras and M. Murphy-Foran, Elliot Lake Retirement Living Incorporated, Elliot Lake; A. Penekitt, G. Campbell and B. Fox, OMNR, Blind River; M. Robinson and L. Killen, Elliot Lake Secondary School, Elliot Lake; D. Berthelot, Elliot Lake Research Field Station, Elliot Lake.

Predicting Canopy Closure for Habitat Modeling

Duration: 01 August 1993 to 31 July 1994 **Contract Value:** \$26,830
Principal Investigator: A. Aldred
Dendron Resource Surveys Inc., Ottawa
Scientific Authority: T.J. Lynham
NRCan, Sault Ste. Marie

OBJECTIVE:

To develop a canopy closure model based on inputs from OMNR's Forest Resource Inventory (FRI).

DESCRIPTION:

The survival and reproductive success of many species of forest dwelling wildlife is dependent on the characteristics of forest stands such as tree species composition, size or age structure, and density. More specifically, these characteristics determine the ability of the stand to provide food, breeding sites, thermal shelter and escape cover. Canopy closure may be particularly important to some species.

Habitat supply analysis requires suitability models that translate habitat inventory data into a measure of supply. The suitability models depend on inventory data, such as FRI, that describe resource characteristics and quantities. FRI includes species composition, age, height, site class and stocking (a measure of density). However, the stocking measure does not specifically express canopy closure and the photo interpreter's original assessment of crown cover density is not retained as part of the FRI attribute data set.

Since acceptable relationships have been established to derive FRI stocking from photo-interpreted crown cover

density, species composition, height, age and site class, this project will develop a model that will reverse the process. Given all the data currently in the FRI database, it should be feasible to develop models to reliably estimate canopy closure (crown cover density) from stocking, species composition, height, age and site class.

EXPECTED RESULTS:

The project will produce a set of equations for predicting canopy closure from FRI attributes for each working group, statistics on the accuracy of the models and cost of applying them, and recommendations on how to apply the developed models and adapt them to different stand conditions.

IMPLICATIONS:

The results of this project will be used in habitat suitability and supply models and will enable managers to better evaluate habitat supply and predict the impacts of forest management practices and interventions.

COLLABORATORS:

B. Naylor, Central Region Science and Technology, OMNR, North Bay.

Integration of New Technologies for Deer Yard Assessment

Duration:	01 August 1993 to 30 September 1995	Contract Value: \$124,180
Principal Investigator:	A. Aldred Dendron Resource Surveys Inc., Ottawa	
Scientific Authority:	D. Voigt OMNR, Maple	

OBJECTIVE:

To develop a decision support system for deer yards that integrates dynamic habitat supply and population simulation models.

DESCRIPTION:

Two activities will be carried out under this project. The first will map conifer cover to identify suitable candidate deer yards using Landsat 5 thematic mapper (TM) or Système Probatoire d'Observation de la Terre (SPOT) panchromatic image in conjunction with digitized Forest Resource Inventory (FRI) maps and data. The sample will be used to interpret and quantify features or indices related to such characteristics as winter cover and potential food supply. The second activity will be the development of a model relating stand age and overstory to the biomass of browse per hectare for each FRI working group. The models will be developed from browse data bases that currently exist in the Central Region, OMNR, and will be supplemented with field data collected during this study using standard browse survey procedures developed by the OMNR. The Geographic Information System (GIS) will provide the platform for analysis, mapping and linkage of supply information to supply analysis and simulation models.

EXPECTED RESULTS:

The report produced will include a description of the methodology used during the execution of this project and recommendations for future user application of the methodology. Maps, a data base and analyzed statistics on suitable conifer cover for deer yards, and estimates of accessible area, browse area, and carrying capacity, will be produced.

IMPLICATIONS:

The decision support system developed will enable managers to predict the consequences of timber management activities on the supply of deer habitat and subsequent population responses, and to identify locations with the greatest potential for yard management activities such as browse plot location and emergency feeding.

COLLABORATORS:

B. Naylor, Central Region Science and Technology, OMNR, North Bay; North Bay District, OMNR, North Bay.

SILVICULTURAL PRACTICES

Prediction of Residual Crown Cover for White Pine in Central Ontario

Duration: 01 August 1993 to 31 March 1994 **Contract Value:** \$19,076
Principal Investigator: C. Bentley
Consultant, Churchill, Ontario
Scientific Authority: S. Reid
OMNR, Huntsville

OBJECTIVE:

To determine natural crown cover and produce stocking guides for white pine stands of different diameter at breast height (DBH) classes in the White Pine Working Group.

DESCRIPTION:

Estimates of stand parameters, such as basal area and number of trees at a given age or height, should provide foresters with a reliable indication of how much wood will be produced, as well as how much growing space individual trees will have until harvest time. Stocking guides are used for prediction of residual forest stands following cutting, based on current stand data. However, there are no stocking guides for large diameter white pine in Ontario. An algorithm is needed to predict crown cover from basal area because it is easier to determine basal area in the field. Preliminary silvicultural prescriptions can then be determined in the office, using readily available information from timber cruising.

Data collected for this project will be used to validate and modify models by Seymour and Smith (1987) and Leak and Tubbs (1983), rather than to develop a new model.

EXPECTED RESULTS:

The outputs from this project will be stocking guides and tables of percentage of crown cover for white pine in the White Pine Working Group.

IMPLICATIONS:

This planning tool is important to timber and wildlife managers, for preplanning harvests and estimating regeneration stocking levels for successful shelterwood management applications. The use of residual crown cover estimation as a planning tool will ensure and promote natural regeneration and protect wildlife values.

COLLABORATORS:

F. Pinto, B. Naylor and B. Chambers, Central Region Science and Technology Development Unit, OMNR, North Bay.

Uneven-aged Silviculture for Peatland Second Growth Black Spruce

Duration: 01 June 1993 to 30 September 1995 **Contract Value:** \$179,000
Principal Investigator: J.R. Gemmell
Abitibi-Price Inc., Iroquois Falls
Scientific Authority: P.A. Addison
NRCan, Sault Ste. Marie

OBJECTIVE:

To provide information on the aspects of uneven-aged silviculture for second growth black spruce swamps, including: harvesting costs; productivity and equipment suitability; damage to residuals and advance growth; forecasts of stand structure and growth; and, analysis of wood supply implications.

DESCRIPTION:

An experimental/demonstration area will be established next to the Wade Lake Interpretive Centre and within the Lake Abitibi Model Forest with treatments being applied in three replications of 3.75 ha units and a control. The treatments are: 35% basal area removal, 50% basal area removal, and removal of all merchantable trees. The harvesting will be carried out using a single grip harvester and forwarder combination believed to be superior to larger scale equipment in protecting advance regeneration and residual trees.

Permanent sample plots will be established by the CFS, prior to the harvest, to collect baseline data. The plots will be remeasured the year after harvesting to assess stand and regeneration damage. Stand growth and structure forecasts will be made on the new stand. The Forest Engineering Research Institute of Canada (FERIC) will conduct studies of the machines working in one replication of each of the three different treatment types. The forecasts of stand growth will be combined with a Geographic Information System (GIS) to examine the implications of uneven-aged silviculture on wood supply from the Lake Abitibi Model Forest.

EXPECTED RESULTS:

Several reports will be produced in addition to the creation of a demonstration area that can be used for public information. The reports include a series on uneven-aged silviculture for peatland black spruce giving stand structure, forecast growth and logging damage, harvesting costs and productivity, implications for wood supply (a case study), and a summary. A field tour/workshop will be held to transfer information developed during the project. Training courses for supervisors and operators will be conducted prior to the harvesting.

IMPLICATIONS:

Second growth black spruce stands in northeastern Ontario have invariably developed an uneven-aged and uneven-sized structure. Such structures appear to be well-suited to uneven-aged silvicultural systems but these have not been attempted previously in northeastern Ontario. This project will provide forest industries and natural resource managers with information on the effectiveness and costs of using uneven-aged silvicultural systems.

COLLABORATORS:

A. Groot and N.W. Foster, NRCan, Sault Ste. Marie; J.-F. Gingras, FERIC, Pointe Claire; D. Archibald, Northeast Science and Technology, OMNR, Timmins.

Methodologies for Maintaining the Softwood Component in Boreal Mixedwoods

Duration: 01 June 1993 to 30 September 1995 **Contract Value:** \$54,709
Principal Investigator: R.M. Edmonds
McChesney Lumber Division, E.B. Eddy Forest Products Ltd., Timmins
Scientific Authority: J.E. Wood
NRCan, Sault Ste. Marie

OBJECTIVE:

To demonstrate and transfer methodology for establishing white spruce on competitive mixedwood sites for each of three methods and two stock types.

DESCRIPTION:

Two activities will be undertaken in this project. The first, a demonstration area on a fertile site with unmerchantable hardwoods or shrubs, will receive three treatments: corridors of mechanical site preparation with manual planting (control), herbicide pellets applied at 1 m x 1 m spacing and manual planting at 2 m x 2 m spacing, and mounding with an excavator and manual planting at approximately 2 m x 2 m spacing. There will be four replications with each replication split into two types of planting: bare root nursery stock and containerized full season white spruce. Condition and growth will be assessed at the end of the first and second growing season. Various competition factors will also be assessed. The second experiment will generate data determining the effectiveness

of a new pelletized herbicide, Power Pellets[®], relative to Gridballs[®] in controlling weed vegetation and in promoting white spruce establishment.

EXPECTED RESULTS:

A report will be produced documenting seedling establishment costs and performance over the first two growing seasons for each of the three treatment methods.

IMPLICATIONS:

Silvicultural treatment of harvested mixedwood sites can be expensive due to the size and quantity of residual hardwood stems and the potential for hardwood sprouting. The information obtained from this project will help forest managers to optimize available silvicultural funds by applying the most cost effective treatments.

COLLABORATORS:

R.F. Sutton, Sault Ste. Marie; T.P. Weldon, NRCan, Sault Ste. Marie.

Reforestation Using Timber Harvesting Wastes

Duration:	01 June 1993 to 30 September 1995	Contract Value: \$40,000
Principal Investigator:	J.G. Marshall University of Waterloo, Waterloo	
Scientific Authority:	B.A. Nicks E.B. Eddy Forest Products Ltd., Espanola	

OBJECTIVE:

To examine natural regeneration using the cone-bearing logging debris left at the roadside of jack pine and black spruce cutovers.

DESCRIPTION:

The project will focus on developing the mechanical release of viable seed from harvesting debris and optimizing the biological effect of the resulting mulch on the induction of site-specific reforestation. The study will have three phases: laboratory analysis, to compare the release of viable seed from harvesting residues using a combination of a chipper and a shredder to that of standard heat extraction protocols; field testing the biological effect of mechanically produced seed mulches of jack pine and black spruce on a range of different site types and seed beds; and, economic and policy analyses.

EXPECTED RESULTS:

A report will be prepared containing a set of management guidelines outlining the site, season, seedbed, and dose rate to encourage effective, natural regeneration from a

mechanically produced mulch of seed-containing logging residues. An economic and policy analysis of direct seeding using harvesting wastes will be prepared. Demonstrations of the process will be made in one or possibly two locations in northeastern Ontario in cooperation with industry. A slide and poster presentation of the results will be prepared.

IMPLICATIONS:

In line with the recent emphasis on increasing the use of direct seeding and natural regeneration, this project will focus on developing low-cost, site-specific regeneration techniques for black spruce and jack pine cutover sites using the residual seed cones, branches, and foliage left from the harvested trees.

COLLABORATORS:

R. Fleming, NRCan, Sault Ste. Marie; B. Downie, University of Guelph, Guelph; E.B. Dumbroff, University of Waterloo, Waterloo; J. Monty and B.S.P. Wang, NRCan, Petawawa National Forestry Institute, Chalk River; E. Turk, Lake Abitibi Model Forest, Iroquois Falls.

Management of Black Spruce on Highly Productive Sites

Duration: 01 April 1994 to 30 September 1995

Contract Value: \$35,400

Principal Investigator: R.L. Fleming
NRCan, Sault Ste. Marie

OBJECTIVES:

To enhance smaller-scale black spruce silvicultural systems and techniques on highly productive coarse-textured sites by determining growth response of black spruce plantations to various levels of basal area removal and by comparing the development and growth rates of pure black spruce and interplanted black spruce-jack pine plantations.

DESCRIPTION:

Two experiments established in 1985 near Tyrol Lake in the Beardmore area will be remeasured in 1994. One is a dense, pure black spruce plantation planted in the spring of 1962 and the other an interplanted jack pine-black spruce plantation at the same site. Diameter, height and a variety of other parameters, including foliage analysis and feathermoss abundance, will be measured. Comparative information on the black spruce and jack pine stands will also be gathered.

EXPECTED RESULTS:

One report will document the 10-year growth response of planted black spruce on highly productive, coarse textured sites based on the effects of different site types and thinning regimes. The second report will provide stand

and site-specific guidelines for the management of mixed black spruce-jack pine stands on highly productive, coarse-textured sites. Two technical notes will summarize the results of the two reports. Additionally, the plots will be included in a proposed Tyrol Lake demonstration area.

IMPLICATIONS:

Development of appropriate site specific and stand specific crop plans and timber stand improvement strategies for black spruce in northern Ontario will allow for increased sawtimber production, greater allowable cuts, and greater production of high value-added wood products. In addition, the intermediate and final cuttings will help to redress the impending wood shortages and sawtimber deficits anticipated in northern Ontario in the next 30 years. The management of mixed black spruce and jack pine stands will permit two harvests from the same area at different times.

COLLABORATORS:

D.S. Mossa, NRCan, Sault Ste. Marie; R. Booth, Domtar Forest Products, Red Rock; D. Lemon and T. Zitnak, OMNR, Nipigon District, Nipigon; B. Towill, Northwest Region Science and Technology, OMNR, Thunder Bay.

Influence of Environmentally Considerate Silviculture on Bird and Mammal Populations in Boreal Mixedwoods

Duration: 01 May 1993 to 30 September 1995 **Contract Value:** \$243,120
Principal Investigators: K.F. Abraham
Southern Terrestrial Ecosystem Section, OMNR, Maple
A.R. Rodgers
Centre for Northern Forest Ecosystem Research, OMNR, Thunder Bay
Scientific Authority: S. Holmes
NRCan, Sault Ste. Marie

OBJECTIVES:

To monitor the changes in the density and species diversity of bird and mammal populations in boreal mixedwoods before and after the application of environmentally considerate silvicultural techniques and harvesting. Comparisons will be made among uncut areas, areas harvested by two partial cutting methods, and possibly burned areas in boreal mixedwoods.

DESCRIPTION:

This project will study the influence of partial cutting on bird and mammal populations as part of a broad-based, multidisciplinary research program (*see* Project 4038 in the Compendium of Projects) initiated by CFS-Ontario in the Black Sturgeon Lake area (northeast of Thunder Bay, Ontario). The goal of the program is to build the scientific foundation needed to support ecosystem management and integrated resource management. The program is studying four harvesting systems (conventional clearcut, low intensity partial cut, high intensity partial cut, and uncut control) and two harvesting methods (conventional cut to length or modified full tree, and "soft footprint" single grip harvester). Some plots will be burned to prepare the site for the new crop. Baseline data has been gathered with

respect to bird and mammal populations, and further monitoring of population changes will be carried out over the next two years.

EXPECTED RESULTS:

Together with other studies at the same location, this project will provide a valuable case study of the technical aspects, environmental impacts, and silvicultural benefits and constraints of partial cutting in boreal mixedwoods. The major results of the mammal and bird components of this study will be published giving short term impacts of alternative harvesting on the populations. A strategy for long term monitoring will be developed.

IMPLICATIONS:

This project will benefit sustainable forestry in northern Ontario by assessing the feasibility of alternative management strategies in boreal mixedwoods through an evaluation of the effectiveness, costs and impacts of partial cutting on the forestry/wildlife interface.

COLLABORATORS:

J.B. Scarratt and C.J. Sanders, NRCan, Sault Ste. Marie; D.W. Morris, J. Ryder, and one or two graduate students, Lakehead University, Thunder Bay.

A New Approach to Training Trainers in Spacing and Thinning

Duration:	01 August 1993 to 31 March 1994	Contract Value: \$30,626
Principal Investigator:	H.J. Kelly BGLN Economic Development Centre Inc., Geraldton	
Scientific Authority:	H.L. Jääskeläinen NRCan, Sault Ste. Marie	

OBJECTIVE:

To develop a core of qualified trainers, knowledgeable in all aspects of motor or manual spacing and thinning, including proper equipment use, equipment maintenance, and safe work practices.

DESCRIPTION:

Using a training package developed by NORDFOR Training and Consulting (Sweden) that considers stands in 1–30 and 31–50 year age classes, trainees from the four pilot Community Forests, the OMNR, and First Nations will be given intensive training. Instruction will include the proper handling and maintenance of brushsaws and chainsaws, the biological reasons for spacing and thinning, appropriate methodologies for instruction and the use of training aids. Candidates will be chosen by their respective agencies based on their knowledge of forestry, experience in using motorized equipment, and a demonstrated ability to train others. Each graduate will be expected to teach their own course in thinning and spacing when they return to their place of employment.

EXPECTED RESULTS:

Nine participants from the various agencies will take the course. These trainers will, in turn, train others at their

place of work, and will initiate a sizable workforce knowledgeable in thinning and spacing techniques.

IMPLICATIONS:

Research has shown that “cleaning” (removal of undesirable species and stems) and spacing will have a significant impact on reducing projected wood shortages in local areas. As well, tree quality is improved, and thinning and spacing may also improve resistance to diseases and insects, improve the vigor of the residual stand, provide an enhanced habitat for wildlife, and reduce potential damage by wildfire. This project will ensure that there are properly trained forestry workers in northern Ontario, and that there are trainers who are able to teach proper spacing and thinning techniques.

COLLABORATORS:

Geraldton Community Forest, Geraldton; 6/70 Community Forest, Kapuskasing; Elk Lake Community Forest, Elk Lake; Wikwemikong Community Forest, Manitowaning; Town of Geraldton; B. Klassen, NORDFOR Training and Consulting, Huskvarna, Sweden; V.F. Haavisto, NRCan, Sault Ste. Marie.

Autecology of Selected Competitive Species in the Boreal and Great Lakes–St. Lawrence Forest Regions of Ontario

Duration: 01 May 1993 to 31 March 1994
Principal Investigator: H.M. Kershaw
Devlin Consulting Services, Sudbury
Scientific Authority: F.W. Bell
OFRI, OMNR, Sault Ste. Marie

Contract Value: \$36,956

OBJECTIVE:

To produce a comprehensive guide to the autecology of selected competitive vegetation for the Boreal and Great Lakes–St. Lawrence Forest Regions of Ontario (through the updating and the addition of 20 new species to Bell et al. 1991. *Critical Silvics of Conifer Crop Species and Selected Competitive Vegetation in Northwestern Ontario*).

DESCRIPTION:

The current literature will be reviewed to provide updated information on species summarized in Bell et al. 1991. Summaries for 20 additional species will be written, based on literature reviewed. New sections will be added on common insects and diseases, and propagation for all competitive species. The introduction will be revised to include the new sections and species.

EXPECTED RESULTS:

An updated edition of Bell et al. 1991 will be produced and will be entitled: Bell, F.W.; Bentley, C.; Kershaw, M.; Sims, R.A.; Buse, L.; Hollstedt, C. 1994. *Critical Silvics*

of Selected Crop and Competitor Species in the Boreal and Great Lakes–St. Lawrence Forest Regions of Ontario.

IMPLICATIONS:

Good vegetation management requires a basic understanding of ecological principles and successional patterns, and characteristics of competitive species. This manual will be provincially applicable and will provide field personnel with a greater understanding of vegetation dynamics, increasing flexibility in vegetation management and reducing dependence on herbicides.

COLLABORATORS:

R.A. Sims and K. Baldwin, NRCan, Sault Ste. Marie; L. Buse, OFRI, OMNR, Sault Ste. Marie; C. Bentley and A. Morneau, Central Region Forest Science and Technology, OMNR, North Bay; C. Hollstedt, Northwest Region Forest Science and Technology, OMNR, Thunder Bay; S. Pickering, Northeast Science and Technology, OMNR, Timmins.

Demonstrating Sustainable Integrated Resource Management to Private Landowners in Northern Ontario

Duration: 01 September 1992 to 31 December 1993

Contract Value: \$98,980

Principal Investigator: C.R. Smith
NRCan, Sault Ste. Marie

OBJECTIVES:

To transfer to landowners information for the adoption of the latest techniques and tools used in small scale woodlot management; to promote to landowners the concept of sustainable forestry through integrated resource management; to increase the awareness of the full range of values associated with small scale forestry; and, to provide educators with forestry education resources and information.

DESCRIPTION:

This project will provide assistance to small woodlot owners through demonstrations and displays of forest management techniques and a variety of forestry equipment. Under the project, approximately 21 displays and activities will be developed and exhibited at the Copeland Forest, near Barrie, Ontario, as part of Silvilog '93. A strong educational component for school groups is being developed as part of the program.

EXPECTED RESULTS:

Approximately 10,000 woodlot owners, families, students, educators, and the general public are expected to visit Silvilog '93. They will be exposed to over 130 displays and activities on sustainable integrated resource management and small scale forestry.

IMPLICATIONS:

This is an opportunity for a 'one-stop' centre to provide information and demonstrations of forest management concepts, services, and equipment to educators and small woodlot managers. All material will be applicable to northern Ontario locations.

COLLABORATORS:

A large number of OMNR and NRCan staff.

Aerial Seeding of Prescribed Burns

Duration: 01 November 1993 to 31 August 1995

Contract Value: \$18,550

Principal Investigator: F.F. Foreman
NRCan, Sault Ste. Marie

OBJECTIVE:

To publish a manual, entitled *The Effect of Rate of Seed Application and Site Conditions on Subsequent Stocking and Density of Jack Pine Stands from Aerial Broadcast Seeding Prescribed Burns*, both as hard copy and as decision support software for use by forest managers.

DESCRIPTION:

The project will take the results of three prescribed burn sites that have been seeded and develop a computer model to appraise post-burn conditions and predict the stocking and density of a stand resulting from various rates of seed applied by an aircraft.

EXPECTED RESULTS:

A manual and a software package, designed to operate in a DOS environment, will be written and produced in a

user-friendly format. Case studies and examples will be included.

IMPLICATIONS:

This project will produce a manual presenting some case study results on burn-seeding. A decision support tool will enable forest managers to appraise post-burn site data and estimate both the potential of aerial broadcast seeding as a stand establishment technique and required seeding rates. Both costs and projected results will be compared with the alternative of planting.

COLLABORATORS:

D.A. Cameron, NRCan, Sault Ste. Marie; J. Régnière, NRCan, Ste. Foy.

Standard Procedure for Testing Aerial Seeding Equipment

Duration: 01 November 1993 to 31 March 1995 **Contract Value:** \$12,860

Principal Investigator: J.-D. Leblanc
NRCan, Sault Ste. Marie

OBJECTIVE:

To publish a manual, both as hard copy and as decision support software, entitled *Standard Assessment Procedure for Determining Deposition and Distribution of Ultra Low Volumes of Dry Matter (seed) Afforded by Aircraft/Spreader Combinations*.

DESCRIPTION:

Using case studies already completed over the past 18 years, a step-by-step standard assessment procedure will be developed. An interactive simulation model will also be developed for a PC environment. The procedure will cover preparation, testing, and data collection of aircraft-seeding equipment combinations in a recommended sequence that includes the on-site setup, material, tally sheets, and calculations. Two examples will be provided in the report.

EXPECTED RESULTS:

The Standard Assessment Procedure for Testing Aerial Seeding Equipment will be published and can be used alone or in combination with the computer program.

IMPLICATIONS:

Both products will enable forest managers to evaluate different aircraft/seeder combinations with respect to seed distribution, and allow them to choose the most efficient combination for the proposed aerial seeding activity.

COLLABORATORS:

F.F. Foreman, and D.A. Cameron NRCan, Sault Ste. Marie; J. Régnière, NRCan, Ste Foy.

Effects of Alternative Silvicultural Practices on Wildlife

Duration: 01 June 1993 to 31 October 1994 **Contract Value:** \$41,104
Principal Investigator: C. Wedeles
ESSA Technologies Ltd., Richmond Hill
Scientific Authority: K.F. Abraham
Southern Terrestrial Ecosystem Section, OMNR, Maple

OBJECTIVE:

To complete and publish a comprehensive literature review and annotated bibliography on the effects of alternative silvicultural practices on wildlife habitat and populations in the boreal forest. The emphasis in the review will be on examining practices relevant to the boreal mixedwood forests of Ontario. The examination will concentrate on wild mammals and birds but not, however, on soil fauna, fish, insects or plants.

DESCRIPTION:

Under the project, an extensive literature search will be conducted for scientific and technical articles covering the effects of alternative silvicultural practices on wildlife. The search will include the use of on-line computerized databases, university and government libraries, and use of the ESSA Technologies Ltd. library collection. While the scope of the review will focus on articles dealing with northern Ontario, other material will be reviewed to extrapolate results that might also apply to northern Ontario and boreal mixedwoods in particular.

EXPECTED RESULTS:

A report outlining the process followed during the literature review and including selected annotated bibliographic references will be published. An electronic version of the complete bibliography will be produced in ProCite, a computerized bibliographic database. Two seminars describing the results of the project will be delivered.

IMPLICATIONS:

The project will provide forest managers with a comprehensive review of the available scientific literature that addresses wildlife-related issues and other concerns of relevance to forest managers. The economy of northern Ontario will benefit indirectly as forest managers address wildlife habitat and population concerns while planning and undertaking forestry operations.

COLLABORATORS:

J.B. Scarratt, NRCan, Sault Ste. Marie; P. Jewiss, Rainy River Forest Products, Fort Frances; M. Squires, Abitibi-Price Inc., Thunder Bay; D. Hogg, Wildlife Policy Branch, OMNR, Toronto; B. Towill, Northwest Science and Technology, OMNR, Thunder Bay.

Risk Assessment of Residual Stands Following Forest Harvesting

Duration: 01 September 1993 to 30 September 1995

Contract Value: \$38,975

Principal Investigator: R.L. Fleming
NRCan, Sault Ste. Marie

OBJECTIVES:

To develop site and stand-specific guidelines to reduce the damage to residual mature stands during and following logging operations; and, to identify and assess salvage opportunities for damaged or windfall trees in residual stands.

DESCRIPTION:

Several existing data sets of windfall, mortality, and stem deterioration will be analyzed and summarized. This will provide the principal framework for developing site and stand-specific guidelines for reducing damage to residual stands and for optimizing salvage recovery of such material. Predictive equations of windfall and mortality will be developed that incorporate site, stand and cut block layout characteristics, and indices of stem deterioration.

EXPECTED RESULTS:

A risk assessment manual will be produced for residual stands following forest harvesting. It will present management guidelines for reducing damage and mortality in residual boreal conifer stands after harvesting, and will provide a deterioration index for assessing the salvage potential of such material. Emphasis will be placed on the use of photographs and diagrams to convey and illustrate

the major points. Two technical notes will be produced, one describing a Stem Deterioration Index for windthrown or standing dead boreal conifers, and the other presenting management guidelines for reducing tree damage from logging, wind throw, and insects and diseases in residual boreal conifer stands. A poster, which outlines the 'do's and don'ts' of boundary location and harvesting practices for residual stands, will compliment the risk assessment manual. Field seminars/workshops will ensure the information is transferred to the forest manager.

IMPLICATIONS:

This project will permit the manager to refine the selection criteria for sites, stands, and the lay out of strips to reduce losses of trees in uncut areas and to improve the longevity and integrity of the residual stands. The manager will also be better able to plan operations to salvage material from residual stands with a knowledge of the rates of deterioration of the species and classes of downed material.

COLLABORATORS:

D.B. Roden, NRCan, Sault Ste. Marie; R.D. Whitney, Sault Ste. Marie; OMNR, Northwest Region and Districts; Domtar Forest Products, Red Rock; Avenor Corp., Thunder Bay.

Economic Analysis of White Pine Management

Duration: 01 June 1993 to 31 October 1993

Contract Value: \$6,600

Principal Investigator: K. Rollins
University of Guelph, Guelph

Scientific Authority: H.L. Jääskeläinen
NRCan, Sault Ste. Marie

OBJECTIVE:

To produce a document for forest managers summarizing the results of four unpublished economic studies based upon data from the Petawawa National Forest Institute's Cartier Lake White Pine Study.

DESCRIPTION:

Over two decades of technical data have been collected by forest researchers at the Petawawa National Forest Institute from their white pine management study at Cartier Lake. This technical data set is rather unique in its completeness and timespan but little economic analysis had been performed with the data. Since October 1992, several doctoral students under the supervision of Dr. Kimberly Rollins have combined the forestry data with economic data to produce a series of economic analyses of various components of the Cartier Lake experiment.

EXPECTED RESULTS:

This project will further refine the work completed by the students and will result in a document that describes the economic models of decision making as they relate to

forest management in general. These concepts are then applied specifically to white pine management in the context of the Cartier Lake study. The different aspects of white pine management under analysis include: optimal shelterwood harvest schedules; decision making when industry prices for finished products are expected to increase over time; and, optimal harvest age decision making when the primary consideration is the industrial value of timber and when the nontimber amenity values from recreation and wildlife are incorporated into forest management goals.

IMPLICATIONS:

The results of these economic studies will be accessible for practical application by forest managers, and will demonstrate general principles of economic analysis as a component of forest management decision making.

COLLABORATORS:

D.W. McKenney, NRCan, Sault Ste. Marie; B. Amoah, S. Bonti-Ankomah, and M. Forsyth, University of Guelph, Guelph.

Stand Dynamics of Boreal Mixedwood Forests of Ontario

Duration: 02 July 1993 to 30 June 1994 **Contract Value:** \$75,600
Principal Investigator: D.J. Smith
Consultant, Sault Ste. Marie
Scientific Authority: R.A. Sims
NRCan, Sault Ste. Marie

OBJECTIVE:

To develop and transfer Stand Density Management Diagrams (SDMD's) for use in managing boreal mixedwood ecosystems.

DESCRIPTION:

A series of SDMD's for interpretation in mixedwood stands will be developed utilizing models that have been adapted for multi-species stands using species-averaged parameters. The SDMD's consist of a series of curves and models of height, volume, diameter at breast height (dbh), mortality, and density relationships superimposed onto one diagram. Additional relationships can also be superimposed on the SDMD if needed. The temporal component of the interpretation of the SDMD's is introduced when site-index curves are used during SDMD interpretation to determine the height-stand age relationship. Given this information, managers are then able to determine the timing and extent of single or multiple thinnings of fully-stocked stands. The SDMD's would provide managers with a valuable tool to maximize volume production and plan thinning prescriptions.

EXPECTED RESULTS:

Stand density management diagrams will be developed for six boreal mixedwood species compositions. An instructional booklet will include SDMD derivation, model verification, and validation procedures and will demonstrate interpretation utility. A comprehensive final report will outline the methodology used to develop the SDMD's and will provide supporting information for the curve derivation. Suggestions for improvement of the curves will be included. Three workshops will be conducted to acquaint forest managers with the methodology.

IMPLICATIONS:

The information provided through SDMD's will enable forest managers to determine the timing and extent of single or multiple thinnings of fully-stocked stands. This is a valuable tool to maximize volume production and plan thinning prescriptions.

COLLABORATORS:

D.J. Archibald and B. Watt, Northeast Science and Technology, OMNR, Timmins; C. Bowling, Northwest Region, OMNR, Thunder Bay; R. Greenwood, OFRI, OMNR, Sault Ste. Marie; T. Moore, PNFI, Chalk River; L. Bennett, QUNO Corporation, South Porcupine.

NOTES

FOREST PROTECTION

Forest Fire Behavior Guidelines for Jack Pine Stands in Northern Ontario

Duration: 01 September 1993 to 30 September 1995 **Contract Value:** \$17,000
Principal Investigator: B.J. Stocks
NRCan, Sault Ste. Marie

OBJECTIVE:

To develop a poster describing fire behavior in jack pine stands under a broad range of weather conditions to increase the understanding and effectiveness of forest fire managers in Ontario.

DESCRIPTION:

Using file photographs and text based on existing knowledge, a ca. 90 x 100 cm color poster will be produced and distributed to fire managers in Ontario and other areas where jack pine grows. The poster will depict fire behavior of jack pine under a range of experimental burning conditions carried out in immature and mature stands in Ontario.

EXPECTED RESULTS:

A large poster, which can be displayed in offices and used for training, will give ready access to information on jack pine burning conditions.

IMPLICATIONS:

This is the first poster of its kind designed specifically for a northern Ontario fuel type. The addition of this technical poster, showing behavior of jack pine wildfires, to the fire manager's arsenal will enhance the manager's ability to analyze and make fire management decisions more effectively.

COLLABORATORS:

P.A. McBay and P.C. Ward, Aviation, Flood and Fire Management, OMNR, Sault Ste. Marie.

Field Guide to Ontario Tree Diseases

Duration: 01 June 1993 to 31 March 1995

Contract Value: \$38,000

Principal Investigator: C.N. Davis*
NRCan, Sault Ste. Marie

OBJECTIVE:

To produce a pocket-sized guide for quick and easy use in the field to identify tree diseases; to recognize and understand disease impacts; and, to provide recommendations for appropriate forest tree disease management actions.

DESCRIPTION:

Under the project, descriptions and color photographs will be made for each of the common tree diseases in Ontario. Approximately 150 diseases will be featured. A separate section on control strategies will be included (referred to in the description of each disease) that will provide up-to-date recommendations for the control of each disease. Additional space will be provided to permit the user to add new controls to the section.

EXPECTED RESULTS:

A full color field guide will be produced and distributed to the forest managers in Ontario.

IMPLICATIONS:

This project will provide forest managers and planners with a practical guide to enable them to identify disease agents and understand the consequences of future forest management interventions. This knowledge could have tremendous economic benefit by addressing potential disease outbreaks in the forest management planning stage and by reducing the need to react to an outbreak with expensive treatment.

COLLABORATORS:

T.R. Meyer, OFRI, OMNR, Sault Ste. Marie; D.A. Cameron, NRCan, Sault Ste. Marie.

*C.N. Davis will be replacing the late D.T. Myren as principal investigator in this project..

Prescribed Fire Ignition Strategies for Northern Ontario

Duration: 01 May 1993 to 31 March 1995

Contract Value: \$20,000

Principal Investigator: D.J. McRae
NRCan, Sault Ste. Marie

OBJECTIVE:

To produce a handbook for fire operations personnel detailing ignition strategies for the purpose of increasing the effectiveness of the prescribed burning program for northern Ontario.

DESCRIPTION:

This project will build upon the present knowledge base of general ignition procedures to develop the next generation of procedures. The publication will provide the rules that eventually will lead to the development of a Canadian Prescribed Fire Expert System. It will incorporate information that will allow a prescribed fire ignition boss to confidently plan the specific fire ignition strategy of a burn.

EXPECTED RESULTS:

A handbook will be produced that will outline prescribed fire ignition strategies. It will cover such topics as: best ignition technique and patterns; manipulating energy-

release rates to control the prescribed fire; proper perimeter ignition procedures to prevent fire excursions; procedures to prevent the burning of Areas of Concern (AoC) found within the burn; proper procedures in initial burning out efforts; and, the proper distance between ignition incendiaries and ignition lines.

IMPLICATIONS:

This handbook will enable prescribed fire planners to better achieve their prescribed burning objectives by utilizing the proper fire ignition strategies and, in doing so, reduce the damage potential and suppression costs related to undesired fire excursions.

COLLABORATORS:

R. Vollebakk and P.A. McBay, Aviation, Flood and Fire Management, OMNR, Sault Ste. Marie; D. Archibald, Northeast Science and Technology, OMNR, Timmins; R. Burke, OMNR, Timmins.

Predicting Budworm Outbreaks with Pheromone Traps

Duration: 01 September 1993 to 30 September 1995

Contract Value: \$31,000

Principal Investigator: C.J. Sanders
NRCan, Sault Ste. Marie

OBJECTIVE:

To implement a spruce budworm pheromone trap monitoring system for Ontario based on data collected over the past 7 years.

DESCRIPTION:

Data collected annually since 1986 from 50 locations across northern Ontario and additional data from another 100 locations since 1992, covering the advancing front of a spruce budworm outbreak in northeastern Ontario, will be analyzed. Relationships between pheromone trap catch and other population parameters, such as larval densities, will be examined. Spatial analyses using Geographic Information Systems (GIS) will be carried out to determine how well the trap catches have mirrored population changes. The optimum deployment of trap locations, both in terms of distance between trap locations and forest cover types, will be determined using current GIS inventory maps.

EXPECTED RESULTS:

A report will be prepared outlining the analyses that were carried out. A manual outlining protocols for deploying

and handling the traps in an operational program, and for processing and interpreting the data, will be produced. A videotape supplement will be prepared that could double as an educational tool as well as enlisting the support and cooperation of provincial and industry managers. Workshops will be planned to familiarize staff with the use and handling of the traps.

IMPLICATIONS:

The transfer of this simple technology to deploy and report the results of catchments in pheromone traps by clients (OMNR, forest industry, universities, and interested non-specialists) would considerably expand the capabilities of the Forest Insect and Disease Survey section.

COLLABORATORS:

D.B. Lyons and G.M. Howse, NRCan, Sault Ste. Marie;
J.M. Power, NRCan, Petawawa National Forestry Institute,
Chalk River; A.M. Liebold, U.S. Forest Service.

ENVIRONMENTAL IMPACTS

Glyphosate Effects on Nutritional Quality of Moose Browse

Duration: 01 January 1994 to 31 December 1995 **Contract Value:** \$41,398
Principal Investigator: H. Cumming
School of Forestry, Lakehead University, Thunder Bay
Scientific Authority: R.A. Lautenschlager,
OFRI, OMNR, Sault Ste. Marie

OBJECTIVE:

To determine the effects of the silvicultural use of glyphosate on the nutritional quality of selected plants commonly eaten by moose in early successional forests.

DESCRIPTION:

Random samples from three moose browse species will be collected from previously established control plots and paired treatment plots where the browse quantities of the plots have been significantly reduced by glyphosate applications 3 1/2 and 7 1/2 growing seasons before sampling. Sampling methods are designed to simulate moose browsing behavior.

A total of 140 forage samples will be collected in 1993-94 and another 210 samples will be collected in 1994-95. Tests will yield values for digestible dry matter, digestible protein, and digestible energy.

EXPECTED RESULTS:

A report, along with an OMNR Research Note, will be produced with recommendations specifically applicable to mixed upland forests in the boreal forests of Ontario.

IMPLICATIONS:

Results will allow forest managers to better assess the effects of conifer release with herbicides on moose habitat quality and to better integrate forest management with wildlife management.

COLLABORATORS:

G. Simpson, Avenor Corp., Thunder Bay; P. McAlister, OMNR, Thunder Bay; R.A. Lautenschlager, OFRI, OMNR, Sault Ste. Marie; B. Spare, Tara Scientific Labs, Thunder Bay.

Environmental Impacts of Forestry Practices on Boreal Forest Soil Organisms

Duration: 01 June 1993 to 30 September 1995

Contract Value: \$130,000

Principal Investigator: J.A. Addison and K.N. Barber
NRCan, FPMI, Sault Ste. Marie

OBJECTIVE:

To evaluate the impacts of different harvesting and site preparation techniques on the soil invertebrate biodiversity and functions in boreal mixedwoods.

DESCRIPTION:

The study will be carried out in an experimental boreal mixedwood site near Black Sturgeon Lake in northern Ontario (*see* Project 4038 in the Compendium of Projects for a description of the Boreal Mixedwoods program). It will include elements of both the micro- and macro-fauna obtained before harvesting and in the first two years after harvesting. The response of the total soil community to the different treatments, as indicated by changes in soil metabolism, will be assessed. These results will be compared with those obtained in a parallel study of the impacts of site preparation techniques on soil organisms and processes (*see* Project 4025 in the Compendium of Projects).

EXPECTED RESULTS:

The study will provide a comparison of the immediate impacts of various current and alternative harvesting and

site preparation techniques on soil biodiversity and functioning. It will also provide an indication of short term recovery prospects. The installation of permanent plots will allow for future investigation of the critical longer term effects.

IMPLICATIONS:

The project will determine the effects of selected forestry practices on soil invertebrates and soil processes and how to use soil invertebrates to measure the health of the soil system. This knowledge will benefit the development of sustainable forestry in northern Ontario by providing information on techniques that could potentially reduce the use of herbicides, pesticides, and fertilizers in forest management.

COLLABORATORS:

J.B. Scarratt, NRCan, Sault Ste. Marie; Northwest Region Science and Technology Section, OMNR, Thunder Bay; Aviation, Flood and Fire Management, OMNR, Sault Ste. Marie.

PLANNING AND FOREST RESOURCE MANAGEMENT

Modeling of Post-harvest Forest Succession in Northern Ontario

Duration: 25 March 1994 to 30 September 1995 **Contract Value:** \$53,000
Principal Investigator: D.A. Welsh
Canadian Wildlife Service–Ontario Region, Nepean
Scientific Authority: K. Baldwin
NRCan, Sault Ste. Marie

OBJECTIVE:

To develop a preliminary classification system for the succession of boreal forest vegetation. The analysis will provide a template for wildlife habitat associations and enable forest managers to predict the implications of management decisions on the future of forest ecosystems.

DESCRIPTION:

Forest managers are increasingly required to plan for the long-term sustainability of all resources on the landscape. Traditional timber supply models have paid little attention to the details of forest succession with respect to wildlife requirements and use. Wildlife species require different ages of forests as well as different forest types. To sustain many wildlife species, adequate provision must be made for the necessary range of temporal stages of forest development.

Two large data sets collected in northern Ontario by the Canadian Wildlife Service and the CFS for 11 successional stages of forest within the Chapleau Crown Game Preserve and from 18 upland mixedwood successional and uncut stands near Manitouwadge will be utilized. A detailed

analysis of the data will be conducted and a preliminary model will be prepared which will allow the linkage of wildlife and other data to defined temporal stages in ecosystem supply models.

EXPECTED RESULTS:

Two technical reports will be produced giving a detailed analysis of the two data sets and a preliminary set of classification stages with vegetation descriptors.

IMPLICATIONS:

The classification could provide the basis for ongoing ecosystem supply research and management programs that require a successional stage model. The ability of forest managers to predict the implications of management decisions on wildlife and on forest ecosystems will also be enhanced.

COLLABORATORS:

J.K. Jeglum and R.A. Sims, NRCan, Sault Ste. Marie;
L. Venier, Canadian Wildlife Service–Ontario Region,
Nepean.

Development of Post-planting Forest Vegetation Management Predictive Models

Duration: 01 June 1993 to 30 September 1995

Contract Value: \$19,900

Principal Investigator: R.A. Fleming
NRCan, FPMI, Sault Ste. Marie

OBJECTIVE:

To develop quantitative predictive models for supporting decisions on vegetation management in black spruce plantations after planting.

DESCRIPTION:

Basic models, describing the effects of weeds on crop growth, will be developed using data gathered in 1992 from J. Wood's plantations (*see* Project 4023 in the Compendium of Projects). Tree volume, height, survival, and root collar diameter will serve as the independent variables. The changes in these independent variables over time, as a result of the imposed management regime, will be modeled. The imposed management regimes will be distinguished in terms of the types and amounts of competing vegetation tolerated in different years since the plantation was established.

EXPECTED RESULTS:

A simple manual and user-friendly tables/decision flowcharts, which outline the benefits and costs associated with each vegetation management regime, will be the principal output. Depending on the results, a technical report may be written. The results will also be available in a user-friendly software package. The technology will be transferred to the forest manager through a number of workshops and field tours.

IMPLICATIONS:

Basic models, describing the effects of weeds on crop growth, can provide useful information on threshold levels of competition and the cost-effectiveness of various treatments that reduce competition density.

COLLABORATORS:

J.E. Wood, NRCan, Sault Ste. Marie; Abitibi-Price, Inc., Iroquois Falls; Lake Abitibi Model Forest, Iroquois Falls.

ENSTRAT: A Decision Support Tool for Selecting Forest Field Plots in Ontario

Duration: 01 September 1993 to 01 September 1995 **Contract Value:** \$65,000
Principal Investigators: D.W. McKenney, V. Nealis, and A. Hopkin
NRCan, Sault Ste. Marie
B. Mackey
Australian National University, Canberra, Australia

OBJECTIVE:

To develop a decision support tool for stratifying environmental conditions as a basis for optimizing the location of forest field plots (e.g., research or monitoring). Although ENvironmental STRATification (ENSTRAT) will be generic, the project will focus on supporting insect, disease, and forest health surveys in Ontario.

DESCRIPTION:

The project will refine Forest Insect and Disease Survey (FIDS) survey data and incorporate it into the Bio-environmental Indices Project (BIP) spatial modeling framework (see Project 4208 in the Compendium of Projects). The data will undergo exploratory analysis to establish environmental conditions that best predict selected forest insect/health phenomena. Simulation or optimization routines will then be developed that will allow the database to be queried. The results will allow plot selection to be focused in representative environments.

EXPECTED RESULTS:

A user's manual and decision support system will be developed. Because of the size of the relevant databases and complexity of the problem, ENSTRAT will likely run on a UNIX Workstation rather than on a PC platform.

IMPLICATIONS:

The ability to identify the minimum number of plots and replicates that will achieve the desired level of representation will save both time and money in plot establishment. This will also reduce the establishment of additional plots to achieve the desired confidence levels.

COLLABORATORS:

Forest Insect and Disease Survey staff, NRCan, Sault Ste. Marie.

Forestry Investment Analysis Made Simple

Duration:	01 June 1993 to 31 March 1995	Contract Value: \$23,000
Principal Investigators:	A. Ghebremichael NRCan, Sault Ste. Marie J. Williams Consultant, Scarborough M. Vasievich, United States Forest Service, East Lansing, Michigan	

OBJECTIVES:

To explain the concept of forest investment in terms that can be readily understood by the field forester.

DESCRIPTION:

The informed investment of scarce funds among alternative projects and strategic courses of action is becoming a basic exercise for the forest manager. A simplified decision-making tool will allow the forest manager to make economic decisions on how and where to best invest his budget to achieve the maximum results of the stand at rotation age. Under this project, the financial analysis software, Quick-Silver, will be modified to handle Ontario forestry conditions and a user-friendly manual will be developed. The technology will be presented to forest managers at seminars and workshops.

EXPECTED RESULTS:

A software program diskette and a user's manual for a specific Ontario version of Quick-Silver will be produced. A comprehensive forest management decision support manual, containing all the decision-making guidelines for forestry investment in Ontario, will be produced. A series of workshops and seminars will be held to transfer this technology to forest managers.

IMPLICATIONS:

The forest manager will have a comprehensive, easy-to-follow decision-making tool that will allow forest managers to select the most efficient use of scarce project funds.

COLLABORATORS:

L. Gravelines, C. Mason, and C. Nelson, OMNR, Sault Ste. Marie; A. Willcocks, OMNR, Timmins.

Economic Wood Supply from Alternative Silvicultural Systems

Duration:	01 July 1993 to 30 September 1995	Contract Value: \$78,638
Principal Investigator:	L. Van Damme Lakehead University, Thunder Bay	
Scientific Authority:	B. Callaghan OMNR, Sault Ste. Marie	

OBJECTIVES:

To quantify the effects of implementing alternative silviculture systems upon the long-term economic wood supply from the Seine River Forest.

DESCRIPTION:

Using the Seine River Forest as a case study area, and including the Abitibi-Lakehead University Research Forest data on alternative silvicultural systems, the information will be processed through a personal computer-based version of the Harvest Schedule Generator (HSG-lite) simulation model to examine the long-term consequences of alternative silvicultural systems at both the stand and forest level. The focus will be on economic wood supply determined through the computer simulation. The study will be conducted in order to ensure that other performance indicators (such as biodiversity indices, wildlife habitat, use, and insect outbreak risk) could be investigated at a later time.

EXPECTED RESULTS:

A report will outline a total cost scenario for a fully-integrated wood harvest, transportation, and silviculture program that will address questions of additional costs and

revenues for alternative harvesting, establishment, and thinnings versus clear-cutting.

IMPLICATIONS:

As experience with alternative silviculture systems grows, more precise silviculture and harvest prescriptions will evolve. Despite advances in harvesting technology that make alternative silvicultural systems practical, the economic and biological consequences of these various systems at both the stand and forest level are not well understood by forest managers. An understanding of these consequences are required to determine the biophysical limits of the system and the suitability of new forest policies.

COLLABORATORS:

P. Duinker and R. Pulkki, Lakehead University, Thunder Bay; J. Williams, Scarborough; C. Wedeles, ESSA Technologies Ltd., Richmond Hill; T. Moore, NRCan, Petawawa National Forestry Institute, Chalk River; M. Squires, Abitibi-Price, Inc., Thunder Bay; P. Jewiss, Rainy River Forest Products, Fort Frances; B. Towill, OMNR, Thunder Bay.

Even-aged Boreal Forest Management Planning Models: Applications

Duration:	01 July 1993 to 30 November 1994	Contract Value: \$65,000
Principal Investigator:	P.W. Street MITIG Forestry Services Ltd., Thunder Bay	
Scientific Authority:	D. Hayhurst OMNR, Timmins	

OBJECTIVES:

To undertake a comparative analysis and demonstration workshop of selected even-aged boreal forest management planning models.

DESCRIPTION:

A variety of products, including FORMAN+1 (Vanguard Forest Management Services Ltd., Fredericton), Harvest Schedule Generator Level II (Dendron Resource Surveys, Ottawa), NORMAN (OMNR Northern Region), GLFC-FORMAN (NRCan, CFS-Ontario), CROPLANING (OMNR, Northwest Region) and FORMAN version 2.1 (N.B. Executive Forest Research Committee, Inc.) will be evaluated within the context of three case studies in selected northwestern Ontario forest management units. The respective case studies will be designed to test model applicability with respect to:

- developing five-year operational and twenty-year strategic timber production plans;
- economic analysis of impact on timber production possibilities given land alienation arising from the setting of reserves; and,

- economic analysis of impact on timber production possibilities given prohibitions against specific management activities.

EXPECTED RESULTS:

Three reports will be written. These will include a report titled *Comparative Evaluation of Selected Even-aged Forest Management Models*; a final report including a workshop commentary; and, a comparative evaluation report. A workshop to demonstrate the different models and their features will be conducted.

IMPLICATIONS:

This project will provide potential users with an objective picture of the capability of each model and which best serves a particular objective or need.

COLLABORATORS:

S. Andersen, NRCan, Sault Ste. Marie; J.M. Lawson and D.F. Dool, Avenor Corp., Thunder Bay.

An OBM Terrain Analysis Toolbox for Resource Managers

Duration:	01 October 1993 to 28 February 1995	Contract Value: \$50,000
Principal Investigator:	P.W. Street MITIG Forestry Services Ltd., Thunder Bay	
Scientific Authority:	K. Lawrence NRCan, Sault Ste. Marie	

OBJECTIVE:

To develop, using Geographic Information System (GIS) technology, a 'toolbox' of user-friendly programs that will provide decision support for resource managers through the utilization of digital topographic information from the new series of Ontario Basic Maps (OBM's).

DESCRIPTION:

A Terrain Analysis Toolbox will be developed using, as a base, the Digital Terrain Model (DTM) layer of a GIS file. Software tools will be developed to assist resource managers to determine Areas of Concern (AoC) reservation widths (i.e., areas removed from harvesting), road location and development (including culvert location and sizing, and road profiles), and to identify inoperable areas that are inaccessible because of slope or location. Silvicultural opportunities based on slope and aspect can also be identified.

EXPECTED RESULTS:

A computer program, Terrain Analysis Toolbox, and manual will be written in Arc Macro Language that is not

specific to any hardware system. A final report will be submitted that details the analyses that have been done and field surveys that have been completed.

IMPLICATIONS:

The resulting products will be especially useful to the forest industry in timber management planning. They will provide an improved capability for a cost-effective and environmentally-sensitive allocation of human and capital resources for harvesting, access road construction, and silvicultural activities.

COLLABORATORS:

G. Mitchell, MITIG Forestry Services Ltd., Thunder Bay; R.A. Sims, NRCan, Sault Ste. Marie; G.D. Racey, Northwest Region Science and Technology, OMNR, Thunder Bay; R.B. Adamson, OMNR, Thunder Bay; P. Poschmann, Abitibi-Price Inc., Thunder Bay; P. Jewiss, Rainy River Forest Products, Fort Frances; G. Swant, Buchanan Forest Products Ltd., Thunder Bay; J.A. Harrison, Kimberly-Clark Forest Products Inc., Longlac.

Image Analysis of Wetlands in Northwestern Ontario

Duration: 01 June 1993 to 30 June 1994 **Contract Value:** \$25,000
Principal Investigator: B.G. Warner
Wetlands Research Centre, University of Waterloo, Waterloo
Scientific Authority: J.K. Jeglum
NRCan, Sault Ste. Marie

OBJECTIVE:

To develop a high resolution image scanning technique for wetlands in boreal Ontario and to test this technique as a wetland inventory tool.

DESCRIPTION:

Aerial photographs, either black and white or color, at standard scales (1:15,840 or 1:20,000) will be scanned with high intensity image scanning equipment capable of resolutions of up to 3,600 dots per inch (DPI). In conjunction with multivariate statistics and field sampling, boreal wetlands will be delineated at the level of the physiognomic Wetland Classification System for Ontario. Areas selected for the test include wetlands in the Geraldton Community Forest and the Rinker Lake Research Area, both of which have been extensively studied and much of the necessary field sampling is already available.

EXPECTED RESULTS:

The final product will be a manual on computer-aided wetland classification, with a set of modular programs

with which one may, with a minimum amount of experience, produce an image classification and determine the statistical accuracy of the classification.

IMPLICATIONS:

This technique would be inexpensive and readily accessible for field managers since aerial photographs (at scales of either 1:15,840 or 1:20,000) exist in most field offices. It would enable the field forester to produce reasonable and accurate wetland inventories using these existing photographs and the software modules developed through this project.

COLLABORATORS:

M. Shepard and P.W. Adams, Wetlands Research Centre, University of Waterloo; G. Racey and A. Harris, Northwest Region Science and Technology, OMNR, Thunder Bay; C. Davis, Cochrane District, OMNR, Cochrane; Geraldton Community Forest, Geraldton; A. Solomon, Environmental Protection Agency, Corvallis, Oregon.

SOCIO-ECONOMIC ANALYSIS

Community Development Impact Model

Duration:	07 September 1993 to 31 September 1994	Contract Value: \$86,650
Principal Investigator:	A.A. Kubursi Econometrics Research Ltd., Oakville	
Scientific Authority:	A. Ghebremichael NRCan, Sault Ste. Marie	

OBJECTIVE:

To address community development concerns and resource sensitivities of northern Ontario communities by focusing on three typical and vital communities and by producing a user-friendly computer model that captures the economic impact of capital investments, industrial expansion, and demand changes at the local level.

DESCRIPTION:

Communities dependent on natural resource-based industries in forestry and mining have traditionally experienced the 'boom and bust' cycles of fluctuating markets and prices. Many communities ignore or dismiss the need for economic renewal and diversification until a major plant closure or layoff is announced.

There are two major components to accelerating economic renewal and diversification. The first involves creatively identifying, exploring, and evaluating existing and potential economic opportunities. The second component consists of parallel and ongoing community initiatives intended to create the climate for economic expansion and entrepreneurship. Both components must be effectively

coordinated. The proposed model, which integrates input-output analysis, location theory, and economic base models, will enable this coordination process to occur.

EXPECTED RESULTS:

A user-friendly computer model, specifically tailored to assist in economic development planning for the three participating communities, will be produced along with user manuals and on site-training sessions.

IMPLICATIONS:

Community planners using the model will have a much clearer understanding of the impact of various projects and investment opportunities on the local economy. The planning tool developed can also be adapted economically to any northern community.

COLLABORATORS:

F. Alberni, Kapuskasing Economic Development Corp., Kapuskasing; D. Watson, Sault Ste. Marie Economic Development Corp., Sault Ste. Marie; P. Charbonneau, Thunder Bay Economic Development Corp., Thunder Bay.

Economic Evaluation of Forest Research: A Framework for Allocation of Research Funds

Duration: 27 September 1993 to 31 March 1995 **Contract Value:** \$85,560
Principal Investigator: G. Fox
University of Guelph, Guelph
Scientific Authority: D.W. McKenney
NRCan, Sault Ste. Marie

OBJECTIVES:

To develop an Ontario version of the research evaluation model developed by the Australian Centre for International Agricultural Research (ACIAR); to compile the necessary database to analyze potential research benefits for forestry research in northern Ontario; to characterize economic benefits of at least three NODA/NFP research projects; and, to develop a forest research valuation scoring model that is applicable to Ontario.

DESCRIPTION:

Forest management is becoming increasingly complex with the shift towards an ecosystem approach to management. These informational requirements are moving research programs into new areas of study. Even within a specific discipline, choices among alternative research strategies are necessary.

The project is divided into four phases:

1. Literature review on research management and research priority setting;
2. Examination of three NODA/NFP projects in a case study approach to assess potential economic benefits and impacts;

3. Refinement and extension of adaptation of the ACIAR model to Ontario conditions; and,
4. Development of a forestry research evaluation scoring model.

EXPECTED RESULTS:

A report on the application of the research evaluation model and scoring model along with a modeling workshop targeting research managers is expected. A report detailing the expected economic impacts of three NODA/NFP projects will also be produced.

IMPLICATIONS:

The model is intended to be used to support strategic planning of research priorities and investment of research funding.

COLLABORATORS:

V. Wearn, (retired), OFRI, OMNR, Sault Ste. Marie;
P. Addison and T. Ennis, NRCan, Sault Ste. Marie.

The Economic Value of Canoeing in Relation to Forest and Park Management

Duration:	01 May 1994 to 31 March 1996	Contract Value: \$38,085
Principal Investigator:	P. Boxall NRCan, Edmonton	
Scientific Authority:	D.W. McKenney NRCan, Sault Ste. Marie	

OBJECTIVES:

To examine the economic value of recreational canoeing in the park system of the Ontario–Manitoba–Minnesota region. The study will construct a system of demands in a travel cost framework across the park system and assess the values of individual canoe routes. Estimates will be made of the influence of forest and landscape characteristics and the presence of recreational facilities on the economic value of canoeing. User information will be linked with geographic data to build economic models to measure the impacts of forest/park management schemes.

DESCRIPTION:

This project is part of a larger study initiated by CFS–Northern Forestry Centre that examines recreational canoeing in Woodland Caribou, Quetico, Bright Sands, Wabikimi, Turtle River Provincial Parks in Ontario; Atikaki, Nopiming and White Shell Parks in Manitoba; and the Boundary Waters Canoe Area in Minnesota (U.S.). The study will be completed in three phases. The first, a park level analysis, will be completed for all nine parks to construct the system of demands in a travel-cost framework. In the second phase, the travel costs of individual canoe routes in the three Manitoba parks and Woodland Caribou Park will be modeled. During the third phase, recreational

use of Nopiming Park, where there is an overt forest industry presence, will be examined in detail.

EXPECTED RESULTS:

The results of the study will be presented in a series of information notes on the individual parks and canoe routes. The notes will assess the value of canoeing in each park and relate the value to the geographic characteristics of the canoe routes. A computer model will be constructed to link these characteristics with economic value.

IMPLICATIONS:

The project will develop a greater understanding of the interaction of forestry and park management activities with recreational canoeing. Resource planners will measure the effects of management interventions upon the recreational value of the forest. The economic models produced in this study would be used to predict changes in values and visitation rates that may result from changes in the physical characteristics of the canoe route.

COLLABORATORS:

J. Englin, University of Nevada; G. Williamson, NRCan Winnipeg; W. Haider, Centre for Northern Forest Ecosystem Research, OMNR, Thunder Bay.

NOTES
