# STUDY WORK PLANS 1988-89



## NORTHERN FORESTRY CENTRE EDMONTON ALBERTA

Government of Canada
Gouvernement du Canada

Canadian Forestry Service
Service canadien des forêts

Canada

# STUDY WORK PLANS

1988-89



NORTHERN FORESTRY CENTRE

CANADIAN FORESTRY SERVICE

5320 - 122 STREET

EDMONTON, ALBERTA

T6H 3S5

MARCH 1988

CANADIAN FORESTRY SERVICE

STUDY WORK PLAN

1988-89

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: February 9, 1988

1. Project: Resource Economics and Statistics

2. Title: Forestry development and fire management economics

3. New: Cont.: X 4. No.: NOR-3-03

5. Study Leader: T.B. Williamson

6. Key Words: Wildland fire management planning economics, cost plus net-value-change, market and non-market benefit assessment, forest sector supply and demand modelling, forest industry, socio-economic impact evaluation, strategic planning, regional perspective development, decision support systems.

7. Location of Work: Prairie provinces, NWT, Ottawa

8. Study Objectives:

   1. To provide statistical data and analytical support for policy and program development of regional and national forestry research and development programs and policies.

   2. To provide input to working groups and study teams analyzing and reviewing forest sector related issues and policies at the national level.

   3. To assist in the development of guidelines and frameworks for use in the determination of wildland fire protection priorities in the region.

9. Goals for 1987-88:

   Scientific Authority for Contract Research

   1. Act as Scientific Authority for the contract study entitled Determining Forest Values for Strategic Fire Response in Manitoba. (Williamson)

Regional Development Analysis, Policy and Planning, Evaluation Documentation

2. Publish updated versions of the Saskatchewan and Manitoba Forestry Reports. Develop proposals for reports for Alberta and NWT. Assess feasibility with appropriate government agencies. (Bohning)

3. Provide information and assistance for activities under Forestry Perspectives '87. (Williamson, Bohning)

4. Publish summary report entitled The Continuing Challenges: Competition and New Products in the World Forest Products Market under agreement covers in Alberta, Manitoba, and Saskatchewan. (Williamson)

Economics Research, Reports and Publications

5. Complete the fire economics research concept paper, as redefined, and utilize to develop strategic and operational framework for future fire economics research. The planning framework will be coordinated with the NOR-5 strategic plan currently being developed. (Williamson)

6. Participate in the development and implementation of the NFEP project entitled Canada's Timber Supply: Current Status and Mid-Term Outlook. (Williamson)

Reviews, Comments, Briefings

7. Continue to provide review/comments of journal articles, reports, proposals and briefings.

Miscellaneous

8. Continue to provide socio-economic and statistical data, analysis and documentation for policy and program development, and regional development activities as required.

Added Goals:

9. Prepare the information report entitled: Manitoba's forest industry, 1985. (Williamson)

10. Provide recommendations to Sask. Parks Tourism and Culture re: optimum harvesting and manufacturing options in Cypress Hills Provincial Park. (Bohning)

Economics Research, Reports and Publications

11. Identify fire economics research needs and priorities with AFS personnel. (Williamson)

12. Initiate damage appraisal study for the May 1987 Elan fire. (Williamson)

10. Accomplishments in 1987-88:

Scientific Authority for Contract Research

1. Residual value timber appraisal methodology was developed. Preliminary harvesting productivity and machine cost data was collected. Draft report was prepared. Additional field data will be collected this spring.

Regional Development Analysis, Policy and Planning

2. Manitoba and Saskatchewan forestry reports were published. (Bohning)

3. Forestry perspectives 87 was not undertaken.

4. Alberta agreement report entitled "The continuing challenge: competition and new products in the world forest products markets" was published. (Williamson)

5. Major revisions to the proposed information report "Manitoba's forest industry, 1985" have been incorporated. Report is in the final draft stage. (Williamson)

6. Recommendations regarding harvesting, manufacturing, and marketing practises in Saskatchewans Cypress Hills Provincial Park were provided. (Bohning)

Economics Research, Reports and Publications

7. Fire economics research concept paper was not completed. Strategic framework for fire economics research was not developed. (Williamson)

8. Became familarized with PC-TRIM model. Monitored initial planning activities. Major involvement in 88-89. (Williamson)

9. In response to research needs originally expressed by the AFS, a proposal entitled "Expert assessment of relative resource values for evaluating strategic fire response" was prepared. (Williamson)

10. A methodology for fire damage appraisal in Saskatchewan has been developed. The approach will be demonstrated using the Elan fire as a case study. (Williamson)

11. Reviews were provided for numerous internal and external manuscripts including; Manitoba and Saskatchewan primary wood-using industry reports, AWA Hidden Creek Rec. Study, CJFR articles, "Utilization of poplars in Alberta", and the Alberta agreement report titled "Secondary Wood-Industry Directory. Analytical support for various regional policy and program development activities was provided.

Miscellaneous

12. Forest industry related statistical data, analysis, and information for numerous diverse information requests were provided.

13. Participated on the executive and various subcommittees of the CIF - RMS including the Renewable Resources Subcommittee of the ECA which is currently preparing the Alberta Conservation Strategy.

11. Goals for 1988-89:

Scientific Authority for Contract Research

1. Document the theory, procedures, results, and conclusions of the study: Commercial timber default values in Manitoba. (Williamson)

Regional Development Analysis, Policy & Planning, Evaluation Documentation

2. Provide socio-economic and statistical data, analysis and documentation for policy and program development for new forestry development agreements in Manitoba, Saskatchewan, Alberta and NWT.

3. Prepare Alberta agreement report on the Secondary wood-using industry in Alberta. (Bohning)

4. Develop terms of reference and act as scientific authority for a small study of marketing opportunities for wood products from Saskatchewan's Cypress Hills Provincial Park. (Bohning)

Economics Research, Reports and Publications

5. Provide regional input to the CFS national study on Canada's timber supply.

6. Develop economic and fire effects models required for fire damage appraisal. Complete Elan fire study.

Reviews, Comments, Briefings

7. Continue to provide reviews/comments on journal articles, CFS reports, proposals, and briefings.

12. Present Status of Study:

Each of the three objectives stated in section eight continue to be relevant to the past and proposed activities undertaken within the sphere of study 03-03. Objective one captures those ongoing activities undertaken in support of program development (i.e., Federal - Provincial Agreements). Objective two relates to the provision of regional input into national level analyses such as Forestry Perspectives and the National Timber Supply Project. Objective three applys to activities related to the development of decision aids in wildland fire management. Activities related to this objective include; The Elan Fire damage appraisal study, the Manitoba commercial timber default values study, and the fire economics concept paper.

13. Publications 1987-88:

Bohning, R.A. 1987. Manitoba's forests. Can. For. Serv., North. For. Cent., Edmonton, Alberta. Forestry Report 32.

Bohning, R.A. 1987. Saskatchewan's forests. Can. For. Serv., North. For. Cent. Edmonton, Alberta. Forestry Report 33.

14. Environmental Implications:

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.

15. Duration:

Started: 1980 Completion: Continuing

16. Resources 1988-89:

| | | |
|---|---|---|
| Prof.: | Williamson | 1.0 |
| Tech.: | Bohning | 0.9 |
| Total: | | 1.9 |
| Term/Student: | | 0.3 |

O & M: $5,000

17. Signatures:

Investigator

Program Director, Development

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY WORK PLAN

1988-89

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: February 1, 1988

1. Project: Fire Management Systems and Guidelines

2. Title: Fire behavior in boreal forest fuels

3. New: Cont.: X 4. No.: NOR-5-01

5. Study Leader: Z. Chrosciewicz

6. Key Words: Canadian Forest Fire Weather Index, fire behavior, fire effects, danger rating

7. Location of Work: Various areas within the Western and Northern Region

8. Problem:

Intensive fire management requires improved methods of assessing and forecasting fire danger for all major fuel types over a wide range of weather and site conditions. A good start in the development of such methods was made with the introduction of the new Canadian Forest Fire Weather Index tables in 1970. The main index as well as the component codes are designed to summarize and rate the important weather variables that affect the ignition and spread of forest fires. In its daily rating of fire danger, the system uses primarily weather-dependent scales, and so it does not really provide means for rating fire behavior and effects in specific fuels. A thorough knowledge of fuel types, their characteristics and their ultimate interactions with fire is, therefore, essential for both proper control and proper use of fire on problem areas.

Specifically, the research in this study is aimed at (a) developing suitable techniques for assessing spatial distribution and loading of dimensionally categorized total biomass in any forest ecosystem, (b) delineating basic relationships between weather, moisture codes, and actual moisture contents of various dead components of that biomass, (c) documenting seasonal changes in moisture content, dry-weight content, chemical content, and heat content of some more important living biomass components present, (d) determining microclimatic differences between major forest ecosystems and the open in terms of solar radiation, temperature, relative humidity, wind speed, and rainfall, (e) measuring

and analyzing various fire-behaviour parameters, and fire effects, over a range of diverse forest weather, fuel, and landform conditions, (f) devising seasonally differentiated fire-hazard rating for major forest ecosystems in the region, and (g) testing and formulating ecologically sound and economically feasible methods for securing adequate postcut forest reproduction by the use of controlled burning and various supplementary treatments including seed-tree systems, direct seeding and planting. The work is of both fundamental and practical nature.

9. Study Objectives:

1. To determine fire spread and intensity for major fuel complexes under various weather combinations.

2. To assess fire effects in terms of fuel reduction and plant succession over a range of burning conditions.

3. To establish guidelines for rational uses of fire in manipulation of various fuel combinations.

4. To assist fire control agencies in application of the resulting guidelines.

10. Goals for 1987-88:

1. Conclude publication of a journal article on "Slash burning under seed trees to induce jack pine regeneration on an upland cutover site in central Saskatchewan". (5-42)

2. Conclude publication of an Information Report on "Development of forest regeneration on burned, planted, and seeded clear-cut areas in central Saskatchewan". (5-43)

3. Conclude publication of a journal article on "Regressions between the standard moisture codes and the actual moisture contents of forest-floor fuels on a jack pine clear-cut site, central Saskatchewan". (5-8)

4. Complete preparation and submit for review a journal article on "Metric roundwood classification, and dry-weight regression equations in jack pine biomass studies, central Alberta". (5-3)

5. Complete preparation and submit for review a journal article on "Dry-weight regression equations for dimensionally categorized biomass of six understory shrub species, central Alberta". (5-4)

6. Complete preparation and submit for review an Information Report on "Fire behavior and effects in semimature jack pine stands, central Alberta". (5-7)

7. Complete preparation and submit for review a journal article on "Regressions between the standard moisture codes and the actual moisture contents of forest-floor fuels in undisturbed forest stands of four different types, central Alberta". (5-44)

8. If time permits, commence a report on "Microclimatic differences between the open and four different forest stands in central Alberta". (5-54)

9. As always, provide advisory services as required. (5-26)

Added Goals:

10. Prepare a proceedings article on "Site conditions for jack pine seeding". This was an invited contribution to a symposium re: "Towards prime site management", Ont. Min. Nat. Resour., March 23-25, 1987, Thunder Bay, Ont.

11. Prepare a Forest Management Demonstration Note on "Burning for black spruce regeneration on a lowland cutover site in southeastern Manitoba".

12. Remeasure postburn jack pine stand growth on a seed-tree area in central Saskatchewan.

13. Analyze humus consumption and mineral soil exposure data for predicting silvicultural effects of burning on jack pine cutovers.

11. Accomplishments in 1987-88:

1. The journal article on "Jack pine regeneration following postcut burning under seed trees in central Saskatchewan" was prepared, revised, and approved for publication.

2. The Information Report on "Forest regeneration on burned, planted, and seeded clear-cuts in central Saskatchewan" was prepared, revised, and approved for publication.

3. The journal article on "Regressions between weather-based moisture codes and the actual moisture contents of mor humus on a clear-cut jack pine site, central Saskatchewan" was prepared and it is about ready for review.

4. The journal article on "Metric roundwood classification and dry-weight regression equations in jack pine stand biomass studies, central Alberta" is in preparation.

5. This is being combined with the article under Item 4 above.

6. The Information Report on "Fire behavior and effects in semimature jack pine stands, central Alberta" is in preparation.

7. The journal article on "Regressions between weather-based moisture codes and actual moisture contents of mor humus under diverse forest conditions, central Alberta" is in preparation.

8. No free time was left to commence work on this report.

9. (a) On request, provided advisory services, and also critically refereed or otherwise reviewed papers for publication by various authors (six manuscripts).

   (b) Gave an illustrated talk re: "Site conditions for jack pine seeding" during (March 23-25, 1987) Ont. Min. Nat. Resour. Symposium, Thunder Bay, Ont.

   (c) Participated in Dempster and Associates' risk modelling (January 21, March 4, and May 1, 1987).

10. The proceedings article on "Site conditions for jack pine seeding" was prepared and approved for publication.

11. The Forest Management Demonstration Note on "Burning for black spruce regeneration on a lowland cutover site in southeastern Manitoba" was prepared and approved for publication.

12. Jack pine stand growth was remeasured on five 0.04-ha plots within the burned seed-tree area in central Saskatchewan.

13. Some 24 regression is were produced for predicting silvicultural effects of burning on jack pine cutovers.

12. Present Status of Study:

The new Canadian Fire Weather Index was introduced to the Region in 1970 through a series of training sessions for the user agencies. Since then, fire behavior and fire effects were studied by means of experimental burning on a number of cutover sites and in uncut stands.

Varying in area from 0.09 to 33.35 ha, the tests included: 2 burns of black spruce slash, plus 17 burns of jack pine slash in Manitoba; 31 burns of jack pine slash in Saskatchewan; and 22 burns of lodgepole pine slash, 2 burns of undisturbed black spruce stands, plus 20 burns of undisturbed jack pine stands in Alberta.

While this work was nearing completion, variations in moisture content, dry-weight content, chemical content, and heat content of green conifer foliage (jack pine, black spruce, white spruce and balsam fir) were studied in Alberta to determine their seasonal lows and highs that may contribute substantially to the incidence and the spread of crown fires.

Postburn treatments such as seed-tree systems, direct seeding, and planting were routinely tested in conjunction with all experimental fires on cutover areas to provide authentic prescription data for silvicultural purposes.

Other work included development of methods for fuel classification, stand biomass assessments, stand fire hazard ratings, and microclimate studies in diverse forest ecosystems.

In all this, results are being published as they become available. About 28 journal articles, in-house reports, and notes have been published on the basis of this study. The specific contributions by the objectives listed can be summarized as follows:

Objective #1. Fire spread and intensity values were determined for (a) lodgepole slash (22 burns), (b) undisturbed black spruce stands (2 burns), and (c) undisturbed old jack pine stands (8 burns). Further fire spread and intensity values will be forthcoming for (d) undisturbed semimature jack pine stands (12 burns).

Objective #2. Fuel reduction values and information on plant succession, including forest regeneration, were provided for (a) black spruce slash (2 burns) and (b) jack pine slash (48 burns). In addition, fuel reduction values alone were provided for (c) lodgepole pine slash (22 burns) (d) undisturbed black spruce stands (2 burns), and (e) undisturbed old jack pine stands (8 burns). Further fuel reduction values will be forthcoming for (f) undisturbed semimature jack pine stands (12 burns).

Objective #3. Explicit guidelines were published for postcut disposal of fuels as well as for formulation of specific prescriptions in preparation of favorable seeding and planting sites by fire. Further 24 regressions and readout tables will be forthcoming for more precise setting up of silvicultural burning prescriptions over a wide range of jack pine-black spruce cutover sites.

Objective #4. Fire control agencies, silviculturists, educators, and all those willing to listen were instructed on the use of available guidelines. This was done by means of personal contacts, through various handouts, and through a series of some 18 more or less formalized, often illustrated lectures, seminars, and workshops. The process of instruction will continue.

13. Goals for 1988-89:

1. Conclude publication of a journal article on "Regressions between weather-based moisture codes and actual moisture contents of mor humus on a clear-cut jack pine site, central Saskatchewan".

2. Conclude publication of a journal article on "Metric roundwood classification and dry-weight regression equations in jack pine stand biomass studies, central Alberta".

3. Conclude publication of an Information Report on "Fire behavior and effects in semimature jack pine stands, central Alberta".

4. Conclude publication of a journal article on "Regressions between weather-based moisture codes and the actual moisture contents of mor humus under diverse forest conditions, central Alberta".

5. Prepare a report on "Microclimatic differences between the open and four diverse forest ecosystems in central Alberta."

6. Prepare a report on "Regressions predicting silvicultural effects of burning on jack pine cutovers".

7. Prepare a report with "Tables for silvicultural burning prescriptions on jack pine cutovers".

8. Remeasure postburn jack pine stand growth on seven 0.04-ha plots within the seed-tree area in central Saskatchewan.

9. Initiate preparation of a report on "Jack pine stand recovery from severe browsing by snowshoe hares in central Saskatchewan".

10. Provide advisory services as required.

14. Publications in 1987-88:

1. Chrosciewicz, Z. 1987. Evaluation of postburn seeding of jack pine in central Saskatchewan. Can. For. Serv., North. For. Cent., Edmonton, Alta. For. Manage. Note. No. 41.

2. Chrosciewicz, Z. 1988. Jack pine regeneration following postcut burning under seed trees in central Saskatchewan. For. Chron. 64 (in press).

3. Chrosciewicz, Z. 1988. Forest regeneration on burned, planted, and seeded clear-cuts in central Saskatchewan. Can. For. Serv., North. For. Cent., Edmonton, Alta. Inf. Rep. NOR-X-293.

4. Chrosciewicz, Z. 1988. Site conditions for jack pine seeding. Pages ..... in W.D. Towill (compiler). Towards prime site management. Symposium proceedings. Ont. Min. Nat. Resour. (in press).

5. Chrosciewicz, Z. 1988. Burning for black spruce regeneration on a lowland cutover site in southeastern Manitoba (a summary). Can.-Man. Econ. Reg. Dev. Agreement, Winnipeg, Man. For. Manage. Demo. Note (in press).

15. Environmental Implications:

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.

16. Duration:

Start: 1970. Estimated Completion: 1983. Revised: 1990.

17. Resources 1988-89:

PYs: Prof.: Chrosciewicz 1.0
Tech.: 0.0
Total: 1.0
Term/Student:

O & M: 1000

Capital: Nil

18. Signatures:

Investigator

Program Director, Extension

Regional Director General

NOR-5-02

CANADIAN FORESTRY SERVICE

STUDY WORK PLAN

1988-89

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: February 1, 1988

1. Project: Fire Management Systems and Guidelines

2. Title: Evaluation and development of fire detection-suppression technology

3. New: Cont.: X 4. No.: NOR-5-02

5. Study Leader: C.J. Ogilvie

6. Key Words: Aerial patrols, lookouts, detection, storm tracking, wildfire mapping, remote sensing, retardants, combustion lab, air tankers, suppression, fire control, fire planning

7. Location of Work: Throughout region

8. Problem:

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.

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 optional 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.

9. Study Objectives:

1. Develop techniques and equipment for wildfire surveillance and mapping.

2. Identify the most advantageous primary detection medium for given conditions.

3. Develop techniques to evaluate fire retardants and determine the optimum application required to inhibit fire spread in different fuels under varying burning conditions.

4. Develop fire suppression production information for a variety of methods and conditions.

5. To analyze and disseminate information to fire management agencies through technical assistance, consultation, and training.

10. Goals for 1987-88:

1. Co-author report with AFS on 1986 field tests on Daedalus line scanner and publish report on 1985 trials. (C.J.O.) (5-104)

2. Act as technical representative for fire detection study contracts in Manitoba and Saskatchewan. (C.J.O.) (5-105)

3. Complete production visible area maps for 34 Manitoba fire towers. (C.J.O.) (5-102)

4. Continue to collect lightning fire origin data to be used for supporting the lightning fire prediction model. Conclude the publication of the Forest Fire News note "Some observations on lightning fires in Saskatchewan forests". (C.J.O.) (5-17)

5. Monitor and assess new developments and technology breakthroughs that can be implemented directly or adapted for use in forest fire detection, surveillance and analysis. This goal will be conducted in cooperation with R. Hall (NOR-04-07). (C.J.O.) (5-16)

6. Adapt and test the suitability of available water misters for fire suppression. (C.J.O.) (5-103)

7. Provide technical services and training to client agencies. (C.J.O., R.J.B.) (5-26, 5-56)

11. Accomplishments in 1987-88:

1. The Information Report "Daedalus line scanner trials in Alberta 1985" is with the editor. A report on the 1986 trials is in preparation.

2. The contracts are divided into three stages; The work plan, the problem analysis and the recommendation report. The first stage of contracts have been completed and the information to complete the second stage has been made available to the contractor. This stage has required a significant effort by both the CFS and the respective provinces to supply seen-area maps and fire occurrence data. The final stage should be completed by July 31, 1988.

3. The visible area maps for 34 Manitoba fire towers were completed as well as a composite seen-area map. The maps were delivered and a seminar on seen-area mapping given to personnel from Manitoba Natural Resources.

4. There was no lightning fire origin data collected due to a wet early season and other commitments later on (see goal 6). The data already collected (11 fires) has been incorporated in a prediction model at PNFI but due to the elemental nature of the model no more data is required at this time. This work should be continued at some future date because there is a knowledge gap but for now there are other more pressing areas that would benefit form the resources.

   A description of the work and an outline of the findings has been published in "Forest Fire News".

5. Field tests designed to evaluate and compare the capabilities of the AGA 720-CFS scan extender combination; The Barr and Stroud scanner-Compuheat analyzer; and The Daedalus Scanner were conducted in cooperation with the AFS. It was determined that the Barr and Stroud was most reliable for detecting small hot spots under a forest canopy with the AGA next and The Daedalus last.

   As a result of the quality of the imagery and the ability to make timed measurements of area and distance as well as density slice The Barr and Stroud-Compuheat combination was enlisted for large prescribed burn observations in Ontario. An unusual method that involved a specially designed helicopter mount and required the aircraft to hover at 10,000 ft. AGL was employed to include as much of the burn as possible in a single frame. The work provided data that would not have been obtained by any other method.

   A working trip was taken to Redding California to be a part of the Operational Retardant Evaluation (ORE) team. The work involves ground and air evaluation of retardant drops. The air evaluation is done using an Inframetrics FLIR scanner and visible light video. The infrared imagery is especially interesting in that the fire is visible through the smoke as is the drop made by the air tanker. The rough draft of a Tech. Transfer Note titled "Can the results of the U.S. ORE study be applied in Canada?" has been written.

6. A new water mister was purchased. The nozzle component was sent to E. Stechishen's group at PNFI who adapted it to be capable of foam generation. Demonstrations were conducted on grass fires in Saskatchewan and Manitoba. The mister proved effective on grass fire flames up to 1.5 m and has the advantages of using very little water and being foam capable when compared to the conventional back pack pump. The outline for a Fire Management Note has been written.

7. Provided technical services and liaison as follows:

   a) Provided detection information to Prince Albert National Park.

   b) Reviewed a detection study by P. Gagnon, Ontario Ministry of Natural Resources, and other in-house publications.

   c) Checked by helicopter 4 possible tower sites for 2 new towers in western Saskatchewan.

   d) Accompanied AFS Air Attack Coordinator to Northern Saskatchewan to observe CL-215 foam drops.

   e) Attended joint US-Canada Forest Fire Equipment meeting in Abbotsford, B.C. and Bellingham, Wash.

   f) Trained a member of Saskatchewan Parks and Renewable Resources in seen-area mapping basics.

12. Present Status of Study:

1. The use of hand-held infrared scanners for forest fire mapping was initiated and methods developed for their use.

   A "scan-extender" designed to expand the capabilities of hand-held infrared scanners was conceived, built and tested.

   An "area estimater" designed to measure ground distances from the air was developed and built.

   A large capacity battery and charging system capable of powering various instruments for long periods was developed.

   An inexpensive portable lookout fire finder was developed.

   Equipment for gathering and analysing infrared imagery of large prescribed burns has been identified, modified and tested.

2. Detection appraisal studies have been completed for Manitoba (1987), Riding Mountain National Park, (1981), Saskatchewan (1978), Prince Albert National Park (1978), Wood Buffalo National Park (1978), Northwest Territories (1975), and Yukon (1974).

   An attempt was made to integrate the LLP system and the CFS scan extender to improve the ability to locate holdover fires. This met with limited success due to inaccuracies in the LLP system at that time and the lack of a reliable lightning fire prediction model.

Data was collected at the source of lightning ignitions in support of a lightning fire prediction model.

Nine detection tower sites have been evaluated for effectiveness, following recommendations made in the detection appraisal studies in Saskatchewan. Extensive tests were conducted to determine the suitability of the Daedalus LGO-IL68 line scanner for detecting holdover fires.

Tests were also conducted to compare the CFS scan extender AGA scanner combination, The Barr and Stroud scanner and The Daedalus.

3. The apparatus and methods were developed for doing comparative evaluations of retardants in the combustion laboratory.

   An orientation trip was made to California to become familiar with the retardant evaluation program.

   A proposal has been made to develop methods of guiding the air tanker operation and evaluating drops using infrared technology.

4. The University of Alberta has been conducting fireline production work which started in 1986 with a PRUF grant. The work continued in 1987 a under an Alberta/Federal agreement contract and will be extended through 1988. Several papers are in progress covering production rates for both crews and equipment. An interim report is on file.

5. Information dissemination takes up an estimated 25% of the PY time in this study and is ongoing.

13. Goals for 1988-89:

1. Prepare and publish a Fire Management Report Note on: Real-time observation and analysis of large prescribed burns using digitized infrared scanner.

2. Complete co-authored report on 1986 Daedalus line scanner trials for publication.

3. Complete and publish a Technology Transfer Note on the application of the U.S. Operational Retardant Evaluation study to Canadian conditions.

4. Prepare and publish a Fire Management Note on The Water Misters.

5. Initiate preparation of a report on procedures for fire tower seen-area mapping.

6. Initiate work to develop methods of using infrared technology operationally for optimum placement of air tanker loads and at the same time evaluate retardant effectiveness under operational conditions. Load placement effectiveness can probably be doubled using infrared information which provides a clear view of the fire and the retardant drop. In addition, effectiveness information on the

applied retardant will provide basic data for use in upgrading the materials composition and rates of application. This goal is to be conducted in cooperation with PNFI, the Canada-Saskatchewan Forestry Development Agreement and the province of Saskatchewan.

7. In cooperation with GLFC and contractor further develop methods of observing wild and prescribed fires to study rates of spread, fire intensity, fire spotting, fire whirlwinds and other aspects of fire behavior.

8. Act as technical representative for detection study contracts of Manitoba and Saskatchewan.

9. Provide technical services and training to client agencies.

14. Publications 1987-88:

[Ogilvie, C.J.]. 1988. Lightning fires in Canada. Forest Fire News No. 25:24.

Ogilvie, C.J.; Skrenek, J.; Young, R.W.; 1988. Daedalus line scanner trials in Alberta, 1985. Ag. Can., Can. For. Serv., Edmonton, Alberta Inf. Rep. NOR-X-00 (in preparation).

15. Environmental Implications:

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.

16. Duration:

Start: 1971. Completion: 1993

17. Resources 1988-89:

PYs: Prof.:

Tech.: Ogilvie 1.0

Total: 1.0

Term/Student: 0.0

O & M: $5,600.00

Capital: Nil

18. Signatures:

Investigator

J. M. Powell
Program Director, Environment

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY WORK PLAN

1988-89

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: February 1, 1988

1. Project: Fire Management Systems and Guidelines

2. Title: Evaluation of the role of fire in forest and intermingled vegetation in the prairie provinces, Rocky Mountains, and far north

3. New: Cont.: X 4. No.: NOR-5-03

5. Study Leader: Vice Delisle, R.J. Barney

6. Key Words: Fire ecology, fire history, fire cycle, fire type, fire climax, fire scar rating

7. Location of Work: Region wide

8. Problem:

Within broad climatic limitations, fire has been the most important single, natural influence on vegetation throughout the region for about the past 10,000 years. Areal and temporal patterns of burning have varied along with fire intensity. Fire has played a significant role in influencing the physical-chemical environment; in regulating dry-matter accumulation; in controlling plant species and communities, in determining wildlife habitat patterns and populations; in controlling forest insects, parasites, fungi, etc.; in controlling major ecosystem processes and characteristics such as nutrient cycles and energy flow, succession, diversity, productivity and stability. The "natural" fire regime has been obscured by man's intervention and the long-term consequences of fire suppression are now becoming clear.

Resource management problems are developing which require an understanding of the historical role of fire, the effects of fire on a variety of landscapes, the alternatives available to resource managers and approaches required to implement alternatives.

9. Study Objectives:

1. To develop and implement fire management programs in designated national parks.

2. To define the needs and priorities of client agencies in the area of fire impact assessments.

10. Goals for 1987-88:

1. Complete publication of two papers based on M.Sc. thesis, (a) Biomass regression equations for common shrubs and tree seedlings native to Jasper, (b) Quadratic mean diameter and specific gravity values for tree species native to Jasper. (R.B.) (5-63)

2. Completion of a personal service contract with Gilles Delisle to prepare existing data summaries for use by Parks Canada. (R.B.) (5-63)

3. Enter into an agreement with Dr. Paul Woodard to use Jasper National Park fire fuels data for additional analysis and publish a report. (R.B.) (5-63)

4. Evaluate the position of study NOR-5-03 and make formal recommendations regarding its future. (R.B.) (5-111)

5. Complete report on Pukaskwa National Park fire history and ecology study. (M.E.A.) (5-24)

6. Resample permanent plots, Vermilion Pass fire, Kootenay National Park. (R.B.) (5-47)

11. Accomplishments in 1987-88:

1. Both papers have been prepared, accepted and are at the final stage of the publication process (see section 14).

2. Contract completed and report received. Data now available in project files for future analysis and application.

3. Agreement consummated, data analysed, paper reviewed and accepted for publication, under title "Sample size and variation of fuel estimates in natural stands of Pinus contorta Dougl."

4. Evaluation begun but not completed due to delays in overall planning activities.

5. A 500+ page draft report entitled "Forest Fire Environment of Pukaskwa National Park: Analysis, Evaluation, and Assessment Guides" was submitted to Environment Canada-Parks, Ontario Region through GLFC. The manuscript was reviewed by HQ and regional office staff. The response was very positive. The draft requires final typing to complete report.

   A 100+ page draft report entitled "Forest Fire Management of Pukaskwa National Park: An Interim Planning Guide" was submitted to Environment Canada-Parks, Ontario Region through GLFC. No comments have been received to-date.

6. Plots not sampled in FY. Interest is still there and plans are to resample next FY possibly in cooperation with Parks Canada and the Boreal Institute at University of Alberta.

12. Present Status of Study:

Currently both objectives are in limbo, although advice is continuing to be provided to Parks Canada personnel. Efforts are now attempting to clean up ongoing projects. If the study is approved to continue possibly new objectives will be formulated. Existing projects will be completed following the summer 1988 field season. Recent publications are reported on the following pages.

13. Goals for 1988-89:

1. Supervise completion of all pending publications.

2. Remeasure Vermillion Pass plots with Parks Canada and University, Boreal Institute or other personnel.

3. Complete project continuation assessment and formulate recommendations for future direction of study including personnel recommendations.

4. Present recommendations to senior management for approval prior to next FY planning cycle.

14. Publications 1987-88:

Delisle, G.P.; Woodard, P.M. 1988. Constants for calculating fuel loads in Alberta. Can. For. Serv., North. For. Cent., Edmonton, Alberta, For. Manage. Note 45. (In press).

Woodard, P.M.; Delisle, G.P. 1988. Biomass regression equations for common shrubs and tree seedlings native to Jasper National Park, Alberta. U. of Alberta, Occasional Forestry Note. (In press).

Delisle, G.P.; Woodard, P.M.; Titus, S.J.; Johnson, A.F. 1988. Sample size and variation of fuel estimates in natural stands of Pinus contorta Dougl. Can. J. For. Res. (In press).

Alexander, M.E. 1987. Forest Fire Environment of Pukaskwa National Park. Analysis, Evaluation and Assessment Guides. Can. For. Serv., submitted to Environ. Can. Parks, Ont. Region. 500+ pp. (Draft Rept.).

Alexander, M.E. 1987. Forest Fire Management of Pukaskwa National Park: An Interim Planning Guide. Can. For. Serv., submitted to Environ. Can. Parks, Ont. Reg. 100+ pp. (Draft Rept.).

15. Environmental Implications:

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.

16. Duration:

Start: 1974. Estimated Completion: 1984. Revised: 1989.

17. Resources 1988-89:

| | | | | |
|---|---|---|---|---|
| PYs: | Prof.: | vice Delisle | 1.0 | (Part used for S.T.E.P. appointment of Dr. S.G. Pickford (0.25) in study NOR-05-04) |
| | | Barney | 0.1 | |
| | Tech.: | | 0.0 | |
| | Total: | | 1.1 | |
| | Term/Student: | | 0.0 | |

O & M: $2,500

Capital: Nil

18. Signatures:

Richard J. Barney
Investigator

J. M. Powell
Program Director, Environment

C. D. Hill
Regional Director General

CANADIAN FORESTRY SERVICE

STUDY WORK PLAN

1988-89

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: February 1, 1988

1. Project: Fire Management Systems and Guidelines

2. Title: Decision-aid models for use in fire management

3. New: Cont.: X 4. No.: NOR-5-04

5. Study Leader: B.S. Lee

6. Key Words: Fire behavior, fuels, fireline production, fire statistics, fire effects, decision models, fire management, computer systems

7. Location of Work: Regional

8. Problem:

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 an electronic age to support management operations and decisions. It becomes continually important that we develop processes and support to integrate new fire research outputs, developing management science, and electronic processes into workable, friendly programs and packages for management application.

The application and integration of management science techniques such as numerical models (i.e., simulation and gaming), expert systems, and artificial intelligence management emphasizes the development and technology transfer components of the innovation (research) process. Fire management needs computerized decision-aids, data base management structures and/or systems, and associated technology transfer documents to operate effectively in today's environment.

Expert systems software packages for fire and natural resource management are needed to aid resource managers with their day-to-day decision making. These systems must integrate factual information now being derived from numerical models like the FWI and FBP systems with the knowledge and "expertise" of fire managers. These systems 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.

9. Study Objectives:

1. To identify the key factors relating to the occurrence, behavior, 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 during demanding or multiple fire occurrence situations.

3. To develop and maintain regional data bases on fire weather, fire occurrence, fire environments, and fire management activities for use in fire research and fire management activities.

10. Goals for 1987-88:

1. To continue the development of the Western and Northern Fire Weather Data Library by: (B.L.) (5-23)

   a. Processing the following fire weather data:

      - 40 AES stations for the period of 1953 to present.
      - 40 Saskatchewan stations for the period 1978 to present.
      - 20 NWT stations for the period 1977 to present.
      - 26 Manitoba stations ???? to present.

   b. Prepare two additional utility programs to support FIREWXBASE.

   c. Prepare a draft user's guide for FIREWXBASE.

2. Prepare for review and publish an Information Report on the development and application of the NoFC Initial-Attack Planning Model, incorporating a user guide for the companion micro-computer program. (B.L.) (5-40)

3. Prepare an Information Report entitled, "A user's guide to FWI/PC: a computer program to calculate, report on, and archive Canadian Forest Fire Weather Index (FWI) System data". (B.L.) (5-88)

4. Continue development leave until June 1987 at the University of Washington to obtain a Master's degree in fire operations research. (B.L.) (5-87)

5. Develop and initiate co-op study using artificial intelligence and expert system techniques in the areas of:

   a. Automatic dispatching
   b. Prescribed fire
   c. Mountain fire behavior

These studies are to be operated under federal/provincial agreements with Alberta, Saskatchewan, and Manitoba. The NWT will also be included in these activities (B.L.). Assistance in these studies will be provided by Dr. S.G. Pickford under the S.T.E. Program. (5-109)

6. Establish visiting scientist opportunity as an adjunct to fire management system efforts. (B.L.) (5-110)

7. Complete field work and first draft of M.Sc thesis on chosen topic. (B.L.) (5-87)

Added Goals:

8. Prepare a paper on the use of expert systems for dispatching fire suppression resources to wildfires for presentation at the 9th Conf. Fire For. Meteorology. (B.L., S.P.)

9. Provide advisory services to client agencies, universities, and others as required. (B.L., S.P.)

11. Accomplishments in 1987-88:

1. Western and Northern Region Fire Weather Data Library accomplishments: (B.L.) (5-23)

   a. Processing of fire weather data:

      AES - No new data was added to the library.

      Sask. - 42 station/years (1978-82) were returned to Saskatchewan for their use and validation.

      Man. - The capture of annual FWI/PC data has been transferred to the Winnipeg District Office. No new data added to the NoFC library.

      Alta. - Cypress Hills Provincial Park data for 1986-87 entered and data summary prepared. Alberta Forest Protection Branch continued to archive their own FWI data.

      Parks Canada - Majority of parks in both the Prairie and Western Regions are using NoFC's FWI/PC program to calculate and archive FWI system data. No new data added to our library.

      NOTE: Only limited progress was made on archiving and processing of 1986 fire weather data due to:

      1. B. Lee being on development leave, and

      2. Processing and data storage constraints of NoFC's VAX computer system.

b. No additional VAX utility software developed due to lack of summer student programming support.

c. No progress made on user's guide due to development leave.

2. A proposed Information Report on initial attack planning was revised and will be submitted for review prior to March 31, 1988. (B.L.) (5-40)

3. The FWI/PC program was adopted by Parks Canada in spring of 1987 for use in national parks and national historic parks nation wide. The program has also been in use in Manitoba since 1986. Due to requests for modifications to the program by Manitoba, Parks Canada, and Saskatchewan, the preparation of the Information Report has been delayed until version 2.0 of the software can be completed. A "User's Guide to FWI/PC: version 1.1" has been provided on disk in the interim. (B.L.) (5-88)

4. Course work towards a Master's degree in operations research was completed in June 1987. B. Lee returned to NoFC from the University of Washington on July 1987. (B.L.) (5-87)

5. New initiatives in the "high technology" areas of expert systems, mathematical programming, and microcomputer-based geographic information systems were initiated as follows: (5-109)

   a. Planning to develop prototype microcomputer-based expert systems for initial attack dispatching was initiated for the provinces of Saskatchewan and Manitoba. (B.L.)

   b. Cooperative work on GIS applications in fire and natural resource management were initiated with two private sector firms using data from the Whitecourt Forest, Alberta. A geographic data base for the forest was developed. Spatial analysis techniques were used to demonstrate fire management applications using GIS. (B.L.)

   c. An interactive computer program of Ryan's WNDCOM surface wind model was developed for the Northwest Territories. (S.P.)

6. Dr. S.G. Pickford from the University of Washington arrived in July 1987 to begin a year-long sabbatical at NoFC under the STEP program. (S.P.) (5-110)

7. The knowledge acquisition and program development for a prototype expert system for initial attack dispatching on the Whitecourt Forest, Alberta continued. This expert system is being developed as a M.Sc. thesis in Management Science. The first draft is to be completed by March 1988. (B.L.) (5-87)

8. Prepared a paper entitled: 'An expert system for use in dispatching suppression resources to wildfires', for presentation at the 9th Conf. Fire For. Meteorol. and for publishing in the proceedings.

9. Provided advisory services as follows:

   a. Gave three technical presentations on the "Application of expert systems to forest fire initial attack dispatching" as follows:

      - Graduate level course in artificial intelligence and expert systems, Surveying Engineering Dept., Univ. of Calgary, Sept. 22, 1987. (B.L., S.P.)

      - GNWT Fall Fire Conference, Inuvik, Dec. 9, 1987. (B.L.)

      - Alberta Forest Protection Officer's Conference, Edmonton, Dec. 22, 1987. (B.L.)

   b) Gave a presentation entitled "Applications research: microcomputer- based GIS for fire and natural resource management" at the Workshop on Remote Sensing for Forestry sponsored by the GNWT Dept. of Natural Resources and held in Yellowknife, NWT on January 26, 1988. (B.L.)

   c) A paper entitled "Estimating winds in mountainous terrain for predicting fire behavior" will be presented to the Fourth Western Region Fire Weather Committee (WRFWC) Scientific & Technical Seminar, March 1, 1988. (S.P.)

   d) Gave a technical presentation entitled "Computer-based fire management information systems" at the Univ. of Alberta Forestry Seminar, Nov. 2, 1987. (S.P.)

   e) Served as a member of the Alberta Presuppression Preparedness System (PPRS) review committee. (S.P.)

   f) Conducted field work in the GNWT's Norman Wells district to establish RAWS network for fire danger forecasting and testing of the WNDCOM surface wind model. (S.P., B.L.)

12. Present Status of Study:

Fire management in the Western and Northern Region is becoming increasingly more sophisticated. All clients in the region have deployed microcomputers at their HQ and forest level operations, with minicomputers also 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 to 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. Knowledge engineering approaches, currently underway with client agencies will serve 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.

2. Computer-based decision aid models developed at NoFC such as FWI/PC and the Initial Attack Planning Model are being used by client agencies. Planned expert systems for initial attack along with mathematical models for optimal allocation and deployment of suppression resources are nearing completion. Future initiatives in GIS along with expert systems for prescribed fire and fire effects will also contribute to fire management in the region.

3. A large historical fire weather data library has been developed for clients of the Western and Northern Region. This data library has assisted clients in developing the data bases required to evaluate fire management effectiveness and will provide the data bases essential for future fire occurrence prediction models.

13. Goals for 1988-89:

1. Complete a M.Sc. thesis entitled 'An evaluation of the application of expert systems for dispatching initial attack resources to wildfires. (B.L.)

2. Prepare and present a paper entitled "Use of advanced concepts in dispatching fire control resources" at the 1988 Interior West Fire Council Annual Meeting and Workshop, to be held October 24-27, 1988 at Kananaskis Valley, Alberta. (B.L.)

3. Prepare and present a paper entitled "Application of computer-based information systems to fire management" at the 1988 Interior West Fire Council Annual Meeting and Workshop, to be held October 24-27, 1988 at Kananaskis Valley, Alberta. (S.P.)

4. Prepare a report entitled "Implementing Ryan's WNDCOM model for predicting winds in mountainous terrain". (S.P.)

5. Revise version 1.1 of the FWI/PC program as per client requests and publish "A user's guide to FWI/PC: a computer program to calculate, report on, and archive Canadian Forest Fire Weather Index (FWI) System data". (B.L.)

6. Continue applied research in expert systems for initial attack dispatching by:

   a. Conducting field trials of a prototype expert system in Whitecourt Forest during the 1988 fire season.

   b. Conduct knowledge engineering/acquisition in the provinces of Saskatchewan (contract) and Manitoba (agreement) for similar prototype expert systems. (B.L.)

7. Prepare a paper on estimating winds in mountainous terrain for predicting fire behaviour for presentation at the Fourth West. Reg. Fire Weather Comm. Sci. Tech. Seminar. (S.P.)

8. Test the WNDCOM surface wind model prediction against observed surface winds at a site near 67° N, and determine its usability in the sub arctic. (S.P.)

9. Continue development of the Western and Northern Fire Weather Data Library by: (B.L.)

   a. Capturing and archiving fire weather data from client agencies who voluntarily make their data available to the library.

   b. Preparing a File Report summarizing the fire weather stations, years of record, and quality of the data currently in the library.

10. Explore and initiate cooperative research and development opportunities with P. Kourtz at PNFI and the Manawaki Technology Transfer Centre in the area of Fire Management Systems. (B.L.)

11. Provide advisory services to client agencies, universities, and others as required. (B.L., S.P.)

14. Publications 1987-88:

Lee, B.S.; Pickford, S.G. 1987. An expert system for use in dispatching suppression resources to wildfires. Pages 245-248 in 9th Conf. Fire For. Meteorol., April 21-24, 1987. Am. Meteorol. Soc., Boston, Mass.

Pickford, S.G. 1987. Using the 'WNDCOM' wind prediction model in a fire dispatching system. Pages 222-226 in the 9th Conf. Fire For. Meteorol., April 21-24, 1987. Am. Meteorol. Soc., Boston, Mass.

15. Environmental Implications:

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.

16. Duration:

Start: 1984. Completion: Continuing.

17. Resources 1988-89:

| | | | |
|---|---|---|---|
| PYs: | Prof.: | Lee | 1.00 |
| | Tech.: | Smith | 1.00 |
| | Total: | | 2.00 |
| | Student: | | 0.25 |
| | Others: | | |
| | | Pickford | 0.25 (S.T.E.P. appointment) |
| | | Analyst | 0.75 (contract) |

O & M: $6,000.00
Capital: Nil
Contract: $10,000 (Saskatchewan)
Agreement: $10,000 (Manitoba proposed)

18. Signatures:

Investigator

Program Director, Environment

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY WORK PLAN

1988-89

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: February 1, 1988

1. Project: Fire Management Systems and Guidelines

2. Title: Fire danger and behavior rating in forest and rangeland environments

3. New: Cont.: X 4. No.: NOR-5-05

5. Study Leaders: M.E. Alexander and R.S. McAlpine

6. Key Words: Canadian Forest Fire Danger Rating System, wildfire case histories and studies, fire behavior estimation, fire environment

7. Location of Work: Regional

8. Problem:

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 wild fire 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?

The Canadian Forest Fire Danger Rating System (CFFDRS) represents the practical output of the continuing CFS fire behavior research programme (i.e., experimental burning projects and wildfire investigations.).

The CFFDRS is the national system of rating fire danger in Canada. The CFFDRS includes all guides to the evaluation of fire danger and the prediction of fire behavior such as the Canadian Forest Fire Behavior Prediction (FBP) System and Canadian Forest Fire Weather Index (FWI) 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. 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. Note that this study is designed to compliment rather than duplicate some of the RD&A efforts covered under Studies NOR-5-01 and NOR-5-04.

9. Study 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.

10. Goals for 1987-88:

1. Publish FMN on relationship between FFMC and Cladonia Fire Hazard Index. [M.E.A. & K.G.H.] (5-29)

2. Continue to participate in cooperative project of the CFS national fire danger working group associated with the maintenance and development of the CFFDRS. [M.E.A. & R.S.M.] (5-30)

3. Publish Inf. Rep. on "Fire behavior in the black spruce-lichen woodland fuel complex: the Porter Lake Project, NWT". [M.E.A.] (5-31)

4. Continue to provide advice and services with respect to fire danger and fire behavior rating as required, including serving on the Central and Western Region Fire Weather Committees. [M.E.A. & R.S.M.] (5-32)

5. Publish Inf. Rep. on "Spring fires in a semi-mature trembling aspen stand, central Alberta". [M.E.A.] (5-67)

6. Complete fieldwork associated with experimental burning project in the lowland black spruce fuel type and begin to analyze data for publication. [M.E.A. & R.S.M.] (5-72) Continue data acquisition on the acceleration of point source fires to equilibrium spread from ignition and use for M.Sc. thesis project (see 5-100 under Study NOR-5-06). [R.S.M.] (5-92)

7. Publish Inf. Rep. "Annotated bibliography of 25 years of CFS fire research in the prairie provinces and NWT". [M.E.A. & R.S.M.] (5-75)

11. Accomplishments in 1987-88:

1. A draft FMN manuscript "Relationship between the Fire Fuel Moisture Code and the Cladonia Fire Hazard Index" will be ready for review on or before Feb. 1. Delay in earlier submission in March 1987 due to technology transfer activities (i.e., Advanced Fire Behavior Course at Hinton and CFFDRS seminars in eastern Canada).

2. a. Attended two working sessions of the CFS Fire Danger Group in 1987 (officially recognized as a national CFS Working Group in Feb. 1987): Mar. 16-20, CIFFC, Winnipeg [M.E.A. & R.S.M.], Oct. 15-23, Toronto, Ont. [M.E.A.].

b. Presented five highly successful 1-day information sessions on the CFFDRS in Quebec and the four Atlantic Canada provinces between Mar. 31-Apr. 8. (see Alexander, Stocks, Dubé 1988).

c. Draft of a "Strategic and Operational Plan for Forest Fire Danger Rating Research and Development in Canada, 1987-1992" was prepared for review by CFS management and user agencies.

d. The first version of the very popular CFFDRS Users' Guide (see Canadian Forestry Service, 1987) was completed and released. A distribution plan for the Western & Northern Region and a limited number of international contacts has been completed.

e. Prepared poster paper entitled "Wildfires as a Source of Fire Behavior Data: A Case Study from Northwest Territories, Canada" for Ninth Conference on Fire and Forest Meteorology held Apr. 21-24 at San Diego, California (see Alexander and Lanoville 1987). This contribution was intended to provide an example of the documentation section in the 1984 interim edition of the FBP System User Guide and also exemplified the conference theme of 'Research and Management -- Partners in the Future'. [M.E.A.]

f. A NoFC Forest Management Note advertising the availability of BASIC programs for the FWI and FBP Systems was published (see McAlpine 1987a). A poster paper on the same subject, presented by W.J. De Groot (SDO), was prepared for the Ninth Conference on Fire and Forest Meteorology. (see McAlpine 1987b). [R.S.M.]

g. A prototype FBP System field reference (similar in format to a planned Forestry Technical Report for the CFFDRS Users' Guide) was distributed informally across Canada for review, comment and use (see Alexander and McAlpine 1987). The report was prepared in part on the basis of lectures given since 1984 on the mechanics of the FBP System at the Advanced Fire Behavior Courses held at AFTS in Hinton.

3. A 85-page draft IR manuscript "Fire behavior in black spruce-lichen woodland: the Porter Lake Project" will be ready for review on or very shortly after Feb. 1. Delay in earlier submission due to technology transfer activities.

4. a) Attended the annual business meeting of the Western Region Fire Weather Committee (WRFWC) held Mar. 3 at the AES Western Region office in Edmonton. Developed program for bi-annual WRFWC scientific and technical seminar to be held Mar. 1 at NoFC. [M.E.A.]

   b) Presented a paper entitled "Recent developments in the Canadian Forest Fire Danger Rating System" at the 4th Central Region Fire Weather Committee scientific and technical seminar held Apr. 2 at AES Central Region office in Winnipeg. [R.S.M.] Paper for proceedings co-authored with M.E.A.

   c) Served as instructor at the sixth annual AFS Advanced Fire Behavior Course held at AFTS in Hinton Feb. 24-27 (topics: chemistry & physics of forest fires, CFFDRS, extreme fire behavior: 1968 Lesser Slave Lake Fire, and fire behavior estimation: FBP System mechanics. [M.E.A.]

   d) Attended workshop at NoFC on "Risk modelling for yield forecasting in the boreal forest of Alberta" as 'forest fire expert' at request of W.R. Dempster & Associates. Provided supplemental information and reviewed sections of Canada/Alberta FRDA report. [M.E.A.]

   e) Served as the moderator for the Fire Behavior session at the Ninth Conference on Fire and Forest Meteorology held at San Diego, California, Apr. 21-24. Served as the group spokesperson and co-reporter for the Fire Occurrence & Behavior Analysis futuring at the Wildland Fire 2000 Symposium held at South Lake Tahoe, California (see Alexander and other 1987). Reports were prepared on both meetings and distributed to user agencies in the Western & Northern Region. [M.E.A.]

   f) Attended meeting at NoFC on "federal forest fire issues" as Western & Northern Region representative at request of Program Director. Meeting initiated by J. Hayes (Special Advisory to CFS Assoc. DM) and D.E. Dubé (CFS-HQ), and attended by senior CFS fire researchers. [M.E.A.]

   g) Made a presentation on Sept. 30 entitled "A Review of Canadian Forestry Service prescribed Fire Research in Alberta: 1965-1969" at the Prescribed Burning Workshop (Forest Management Application) held at AFTS in Hinton, Sept. 28 - Oct. 2. [M.E.A.]

   h) Attended Symposium and workshop on Protecting People and Homes from Wildfire in the Interior West held at Missoula, Montana, Oct. 6-8. Presented a poster paper entitled "Help With Making Crown Fire Hazard Assessments" (see Alexander 1988) as a result of interest expressed in use by Alberta Forest Service and

Environment Canada- Parks (Western Region). Paper submitted for publication in proceedings. Meeting report prepared in cooperation with W.J. DeGroot (SDO). [M.E.A.]

i) Served on committee to participate in review of the AFS Presuppression Preparedness System (PPRS) at request of Alberta Forest Service, principally with respect to CFFDRS applications and fire behavior expertise. Attended two meetings in Edmonton (Dec. 21 and Jan. 27-28). Provided tabulated material on the fire growth and difficulty of control modelling. [M.E.A.]

j) Consulted with Snyder & Company on several occasions in 1987, at request of Western & Northern Regional Director General, with respect to a hold-over fire situation/ wildfire investigation near Westlock. [M.E.A.]

k) At the request of the Program Director, met with Dr. P.J. Finn (Program Evaluation Branch, Audit and Evaluation Division, Agriculture Canada HQ) at NoFC on Jan. 12 to discuss the "Evaluation of Major Forest Fire Research Technologies developed by the Canadian Forestry Service" and specifically in regards to the use of the FWI System in Alberta as a specific case study. Provided much background information and wildfire statistics, including an analysis of FWI Severity ratings for 1982-86. Reviewed draft report of the evaluation exercise. [M.E.A.]

l) Initiated and developed program for the first Interior West Fire Council meeting to be held at Kananaskis Valley, Alta. in October 1988. Met with AFS officials on numerous occasions in regards to planning (Aug. 31, Nov. 5 & 16, Dec. 1 & 15 and Jan. 12). [M.E.A.]

m) Reviewed 6 external and 9 internal manuscripts on a variety of fire related topics [M.E.A.].

n) Served as Scientific Authority on former CFS-HQ PRUF sponsored project "Climatology of Atmospheric Conditions Related to Extreme Forest Fire Behavior in West-central and Northern Canada" undertaken by Dr. E.R. Reinelt Meteorology Division, Department of Geography, University of Alberta. Final report received. [M.E.A.]

5. Very little progress made towards completing the review draft IR of "Spring fires in a semi-mature trembling aspen stand, central Alberta". Suggest spending 3 days at AFTS Hinton with co-author D. Quintilio the week of Feb. 8-12 to finalize manuscript. [M.E.A.]

6. Five successful point source fires were conducted and documented during the last two weeks of July 1987 (30 x 30 or 0.1 ha plots). Elapsed times varied from 9 to 26 minutes. Maximum spread rates varied from 2.4 to 4.4 m/min. None of the fires appeared to be approaching a equilibrium "stead-state" condition. Ponton Lookout (40 km south of the study area) was able to detect the associated smoke columns within 3-9 minutes of ignition. [M.E.A.]

Considerable time was taken in 1987 to satisfy several requests of the NoFC Information Officer regarding the Big Fish Lake experimental burning project, by reviewing three drafts of the popularized article on the project which appeared in the spring 1987 issue of Timberlines; by arranging/ outlining video documentary on the project and review of the script/ narration; and by review of a proposed newspaper article on the project. [M.E.A.]

A presentation on the results of the 1987 field season was made at the 1987 AFS Fall Fire Review at Slave Lake, Nov. 24-26. [M.E.M.]

The co-study leader is attending the University of Montana under CFS professional development leave during the 1987-88 academic year pursuing a M.Sc. degree in forestry. His thesis project deals with the acceleration of initiating fires to equilibrium "Steady-state" conditions. A draft proposal has been prepared and submitted to the USDA Forest Service's Intermountain Fire Sciences Laboratory to conduct some point source fires in the ISFL wind tunnel during the winter of 1988. This laboratory work will supplement the empirical field data in order to develop a workable adjustment in the simple elliptical fire growth model of the FBP System. [R.S.M.]

Other permanent CFS fire research staff participating in the project during the 1987 field season included: W.J. DeGroot (SDO) and B.D. Lawson (PFC) on a part-time basis.

7. The author, subject, and area indexes for the proposed IR "Twenty-five years of Canadian Forestry Service fire research in the prairie provinces and Far North, 1962-1987: An Annotated Bibliography" were completed. Copies were distributed at the Regional Technical Subcommittee on Fire Research meeting held at NoFC, Oct. 27-29. The first draft of the FOREWORD has been reviewed. The initial group of annotations ready for editorial review have been submitted. Target date for submission of review draft is early April. [M.E.A. & R.S.M.]

12. Present Status of Study:

The present project 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 at present), as a co-project leader. M.E. Maffey serves as the project technician. Both project leaders are currently members of the CFS Fire Danger Group. This group maintains liaison with regional, national, and international fire organizations, committees and agencies to ensure research, development and application of the CFFDRS continues in a timely and relevant manner.

The major accomplishments of the Group since 1981 have been:

- Production of an updated edition of the FWI System in 1984 (i.e., CFS Forestry Technical Reports dealing with Tables and Equations/FORTRAN Program).

- Distribution of an interim edition of a user guide to the rate of spread component of the Canadian Forest Fire Behavior Prediction (FBP) System in 1984 which also includes a simple elliptical fire growth model.

- 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 "systems" 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 project coordinated by NoFC but involving fire staff from the other CFS 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) 1985-7: Big Fish Lake, Footner Lake Forest, Alta. - black spruce-Labrador tea-Cladonia fuel complex (FBP System Fuel Type C-2); a cooperative project with Ablerta Forest Service (AFS).

Other notable achievements during the period 1981-7 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 1987). Fire management personnel from N.W.T., Manitoba and Parks Canada 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 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 method 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 Western & Northern Region.

13. Goals for 1988-89:

1. Complete the publication of FMN on the "Relationship between the Fine Fuel Moisture Code and the Cladonia Fire Hazard Index". [M.E.A. & K.G.H.]

2. Continue to participate in cooperative activities of the national CFS Fire Danger Working Group as outlined in the "Strategic and Operating Plan for Forest Fire Danger Rating Research and Development in Canada 1987-82 (i.e., Completion of the first fuel edition of the FBP System). [M.E.A. & R.S.M.]

3. Complete the publication of IR on "Fire Behavior in Black Spruce-Lichen Woodland: the Porter Lake Project". [M.E.A.]

4. Continue to provide advice and services with respect to fire danger rating and fire behavior as required, including serving on the Central and Western Region Fire Weather Committees (e.g., compile/edit proceedings of the 4th WRFWC scientific and technical seminar). [M.E.A. & R.S.M.]

5. Complete the publication of IR on "Spring Fires in a Semi-mature Trembling Aspen Stand, central Alberta". [M.E.A.]

6. Burn the remaining plots (7) associated with the Big Fish Lake experimental burning project and begin preparation of IR on the project for publication in 1989. [M.E.A. & R.S.M.]

7. Begin preparation of M.Sc. thesis on the acceleration of point source fires to equilibrium spread from ignition. [R.S.M.]

8. Complete the publication of IR on "Twenty-five years of Canadian Forestry Service fire research in the prairie provinces and far north, 1962-1987: an annotated bibliography". [M.E.A. & R.S.M.]

9. Serve as program co-chairman of the 1988 Interior West Fire Council Annual Meeting and Workshop, including the compilation/editing of the proceedings as a IR. [M.E.A.]

14. Publications 1987-88:

Alexander, M.E. 1988. Help with making crown fire hazard assessments. in Proc. Symp. and Workshop Protecting People and Homes form Wildfire in the Interior West (Oct. 6-8, 1987, Missoula, Mont.). USDA For. Serv., Intermt. Res. Stn., Ogden, Utah. Gen. Tech. Rep. INT-xxx. [in press].

Alexander, M.E.; Andrews, P.L.; Davis, K.M.; Lynham, T.J.; Robinson, O.L.; Rothermel, R.C.; Van Wagner, C.E. 1987. Fire Occurrence and Behavior Analysis. Report of Futuring Group 9. Pages 253-255 in Proc. Symp. WILDLAND FIRE 2000 (Apr. 27-30, Tahoe, Calif.). USDA For. Serv., Pac. Southwest For. and Range Exp. Stn., Berkeley, Calif. Gen. Tech. Rep. PSW-101.

Alexander, M.E.; Lanoville, R.A. 1987. Wildfires as a source of fire behavior data: a case study from Northwest Territories, Canada. Pages 86-93 in Postprint Volume Ninth Conf. Fire and For. Meteor. (Apr. 21-24, San Diego, Calif.). Am. Meteor. Soc., Boston, Mass.

Alexander, M.E.; McAlpine, R.S. 1987. Canadian Forest Fire Behavior Prediction (FBP) System Field Reference. Govt. Can., Can. For. Serv., West. and North. Reg., North. For. Cent., Edmonton, Alta. Study NOR-5-05 (NOR-5-191) File Rep. No. 17. 91 p.

[Alexander, M.E.; Stocks, B.J.; Dubé, D.E.] 1988. Canadian Forest Fire Danger Rating System seminars. Forest Fire News No. 25:26.

Canadian Forestry Service. 1987. Canadian Forest Fire Danger Rating System--Users' Guide. Produced by the Canadian Forestry Service Fire Danger Group. Three-ring binder (unnumbered publication). [Limited Distribution]

McAlpine, R.S. 1987b. Two BASIC programs for fire danger and fire behavior computations. Govt. Can., Can. For. Serv., North. For. Cent., Edmonton, Alta. For. Manage. Note 43. 3 p.

McAlpine, R.S. 1987b. LAPFWI and LAPFBP: Two 'BASIC' computer programs to assess fire danger and potential fire behavior. Pages 243-244 in Postprint Volume Ninth Conf. Fire and For. Meteor. (Apr. 21-24, San Diego Calif.). Am. Meteor. Soc., Boston, Mass.

15. Environmental Implications:

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.

16. Duration:

Started: 1982 Estimated Completion: 1992

17. Resources 1988-89:

| | | | | |
|---|---|---|---|---|
| PYs: | Prof.: | Alexander | 1.0 | |
| | | McAlpine | 0.7 | [Educational leave until July 88] |
| | Tech.: | Maffey | 1.0 | |
| | Total: | | 2.7 | |
| | Term/Student: | | 0.6 | |

O & M: $11,000

Capital: $4,300

18. Signatures:

Martin E. Alexander
Investigator

J. M. Powell
Program Director, Environment

Robert S. McAlpine mea
Investigator

C. D. Hunt
Regional Director General

CANADIAN FORESTRY SERVICE

STUDY WORK PLAN

1988-89

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: February 1, 1988

1. Project: Fire Management Systems and Guidelines

2. Title: Prescribed fire in forest and rangeland management

3. New: Cont.: X 4. No.: NOR-5-06

5. Study Leaders: R.S. McAlpine

6. Key Words: Prescribed fire, fire use, Canadian Forest Fire Danger Rating System, fire behavior, fuels, fire effects, decision models

7. Location of Work: Regional

8. Problem:

An increase in the use of prescribed fire as a forest management tool is anticipated in the northern region where it is becoming a viable method of habitat management for wildlife, rangeland management, fuels management, site preparation, site conversion, and insect and disease infestation eradication.

This study has been created in an effort to provide better management guidelines in the use of prescribed fire for various purposes. Since many of the client agencies are now becoming involved in prescribed fire operations, it is an excellent opportunity to expand knowledge and design guidelines in response to user needs.

The results of the study will 1) Improve the ability with which prescribed fire is implemented by user agencies in the region through a better understanding of fuel and weather relationships; 2) Improve the implementation of prescribed fire for silvicultural uses, through a better understanding of prescribed fire effects and weather conditions necessary to achieve these effects; 3) Reduce losses due to wildfire through better guidelines for hazard reduction burning; 4) Increase wildlife population through improved habitat management.

Prospects for the findings from this study being put to practical use are excellent since the study will be based on user needs.

9. Study 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 and establish guidelines for the use of prescribed fire in various fuel types within the region.

3. To assess fire spread and intensity under various weather conditions for major fuel complexes appropriate for prescribed burning.

10. Goals for 1987-88:

1. Continue work on a fuels documentation and prescription preparation handbook in conjunction with agency prescribed fire handbooks. (R.S.M.). (5-93)

2. Participate in cooperative projects of the CFS Prescribed Fire - Fire Effects working Group. (R.S.M.). (5-101)

3. Commence development leave in September to obtain a masters degree in fire research at the University of Montana. (R.S.M.) (5-100)

4. Provide advice and services with respect to prescribed fire. (R.S.M.) 5-26)

11. Accomplishments in 1987-88:

1. Transferred to National Prescribed Fire Working Group. A working meeting on the subject was postponed.

2. Attended meeting of the CFS Prescribed Fire Working Group (Petawawa, Ont., May 26-28, 1987).

3. Started development leave in September at University of Montana.

4. a) Attended USDA Forest Service course "Fire Management for Line Officers and Resource Managers" Feb. 27 - March 4, 1987, Marana, Arizona.

b) Worked with T. Van Nest (Alberta Forest Service) on a section of a prescribed burn course for range and wildlife habitat enhancement in Hinton, Alberta May 12, 1987.

c) Attended the Symposium and Workshop - Protecting People and Homes from Wildfire in the Interior West (Oct. 6-8, 1987, Missoula, Mont.).

12. Present Status of Study:

1. The development of fuels documentation and prescription preparation handbooks have been taken up by the recently formalized (1987) Prescribed Fire working group. The group felt that these two items

(among others) should be developed on a national basis and should take the highest priority of group work. Participants in this work include all members of the group and according to the current Strategic and Operational plan for the Canadian Forestry Service Prescribed Fire Working Group 1987-1990, completion dates are on or before FY 89/90. The prescription preparation handbook has highest priority within the group and the expected completion date FY 89/90. Fuels documentation has been broken down into 3 separate areas of endeavour; 1) develop a video demonstration line intersect methods, techniques and problems (due FY 88/89), 2) a slash inventory handbook - fuels and fire documentation (due 89/90), and 3) non-slash inventory handbook (1991+). The planned handbooks will provide all agencies within the region specific planning and inventory guidelines.

2. The Prescribed Fire Working Group met once, May 26-28 1987, at the Petawawa National Forestry Institute. At that time the Group's terms of reference, structure and operational procedures were decided upon as well as a Strategic and Operational Plan for 1987-1990 discussed. This was later written up and now is in the editorial stage. This document should be consulted for a more complete discussion of the groups planned activities. A second meeting planned for the fall of 1987 to begin work on a National Prescription Development Handbook was cancelled due to financial constraints. During the study leader's absence for educational leave it was determined that W. DeGroot (CFS, Saskatchewan) would represent the region in the group.

3. Development leave commenced in September 1987 and will continue until July, 1988.

13. Goals for 1988-89:

1. Participate in cooperative projects of the CFS Prescribed Fire Working Group. (R.S.M., W.J.D.).

2. Continue development leave until July and complete field work and thesis preparation after that to obtain a masters degree in fire research at the University of Montana. (R.S.M.)

3. Provide advice and services with respect to prescribed fire. (R.S.M.)

14. Publications 1987-88:

Nil

15. Environmental Implications:

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.

16. Duration:

Started: 1985 Estimated Completion: 1995

17. Resources 1988-89:

| | | | |
|---|---|---|---|
| PYs: | Prof: McAlpine | 0.3 | (Educational Leave until July 1988) |
| | Tech: | 0.0 | |
| | Total: | 0.3 | |
| | Term/Student: | 0.0 | |

O & M: $1,500
Capital: Nil

18. Signatures:

Robert S McAlpine
Investigator

J. M. Powell
Program Director, Environment

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY WORK PLAN

1988-89

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: February 1, 1988

1. Project: Fire Management Systems and Guidelines

2. Title: NoFC Forest Fire Research Coordination

3. New: X Cont.: 4. No.: NOR-5-07

5. Study Leaders: R.J. Barney

6. Key Words: Fire Research, Fire Programs, Research Management, Fire Research coordination

7. Location of Work: Region Wide

8. Problem:

The widespread nature of the fire research program at NoFC requires considerable effort in coordination and management. The problems, the size of the area which includes, Alberta, Saskatchewan, Manitoba and the NWT in itself presents severe coordination challenges, especially with the provincial/federal agreement program activities. The diverse nature of the fire problems, research program and wide variety of user needs all make for an extremely complex management task. The need to use existing funding, secure outside funding, extensive support and agency cooperation adds to the complex dimensions already encountered. There is a need for coordination to maximize productivity and wise use of all resources within the fire research project.

9. Study Objectives:

1. To coordinate NoFC fire research activities as an essential element of the overall forest fire management programs in the prairie provinces and NWT.

2. To enhance the regional, national and international perspectives of the Canadian Forestry Service fire research program through participation on committees, task forces, review boards and other service activities aimed at improving the protection of Canada's forestry.

3. To promote the fire research program within the prairie provinces and NWT as well as nationally.

4. To develop support and cooperation for fire research programs through a wide array of activities processes and action.

10. Goals for 1987-88:

1. Provide advisory services to National Parks with emphasis on the management guidelines. (R.B.) (5-61)

2. Supervise and coordinate the regional fire research program including that by the Fire Specialists in the District Offices. ((R.B.) (5-59)

3. Continue to provide technology, participation on committees, task forces etc. aimed at improving the protection and use of Canada's forests through efficient fire management. (R.B.) (5-26)

4. Complete regional fire research strategy, including integration of studies under the Forestry Development Agreements and Memorandums of Understanding. (R.B.) (5-78)

5. Conduct regional fire research technical subcommittee meeting. (R.B.) (5-79)

6. Maintain cooperative relationships and studies with University of Alberta and other Canadian universities as appropriate. (R.B.) (5-99)

7. Make presentations at academic institutions throughout the year as appropriate. (R.B. and others) (5-99)

8. Provide technical services and training to client agencies. (R.B. and others) (5-56).

9. Provide guidance and assistance to forest economist for studies in fire management economics. (R.B. and others) (5-112)

10. Develop and propose research operational planning and documentation procedures including problem analysis and research/study documentation and process.

11. Accomplishments in 1987-88:

1. Met with park personnel at Kootenay National Park, Radium Hot Springs, B.C., discussing a wide array of research/management issues. Also met with regional personnel on several occasions.

2. Functioned in traditional management role as project leader. Held several project meetings on program activities.

3. Functioned on and attended several meetings throughout the year including CCFFM, Fish Cr. Provincial Park, UA committee to develop a centre of excellence, provincial committees and NoFC library committee.

4. Prepared and submitted two major versions of a regional strategic plan for fire research. Reviewed agreement efforts related to fire to insure relevance.

5. With the help of the program committee planned, conducted and summarized the 1987 Regional Fire Research Technical Committee.

6. No participation required, territory reorganized. This function currently not necessary. Independently project staff provided assistance to GNWT Fire Management staff when requested.

7. Promoted several cooperative ventures with the University of Alberta. Currently an adjunct faculty member.

8. Taught classes at University of Alberta and Forest Technology School, Hinton.

9. Continued to provide a wide array of technical services throughout the project.

10. Promoted initiation of a fire economic study on the Elan Fire in Saskatchewan. Provided consultation, support and encouragement to fire management economic activities.

12. Present Status of Study:

Under this new study we have been able to expand support in several areas. Work associated with federal-provincial agreements has increased this past year. New and stronger ties are in place with the University of Alberta and greater cooperative efforts are under way. An international agreement is being developed with the USDA Forest Service, Intermountain Research Station, Forestry Fire Sciences Laboratory. Good progress is being made on all objectives.

13. Goals for 1988-89:

1. Continue to provide advisory services to National Parks with emphasis on the management guidelines. (R.B.)

2. Supervise and coordinate the regional fire research program including that by the Fire Specialists in the District Offices. ((R.B.).

3. Continue to provide technology, participation on committees, task forces etc. aimed at improving the protection and use of Canada's forests through efficient fire management. (R.B.)

4. Complete regional fire research strategy, including integration of studies under the Forestry Development Agreements and Memorandums of Understanding. (R.B.)

5. Conduct regional fire research technical subcommittee meeting. (R.B.)

6. Maintain cooperative relationships and studies with University of Alberta and other Canadian universities as appropriate. (R.B.)

7. Make presentations at academic institutions throughout the year as appropriate. (R.B. and others)

8. Provide technical services and training to client agencies. (R.B. and others).

9. Provide guidance and assistance to forest economist for studies in fire management economics. (R.B. and others)

10. Complete current International Assignment Agreement which expires July 1, 1988.

11. Make plans and develop process to replace the current project leader in a manner that meets long term goals and objectives of the Northern Forestry Centre and the fire research project.

12. Complete manuscripts currently in preparation prior to July 1, 1988.

    a. Forest/Urban fire in the Prairie Provinces
    b. The Fish Creek Provincial Park Challenge
    c. Research - management relationships

14. Publications 1987-88:

Anon., 1987. Strategic Plan for forest fire research - Northern Forestry Centre, Edmonton, Alberta (Draft). 17 p.

Barney, Richard J. 1987. Fire Research Needs and Priorities - Field Survey. Northern Forestry Centre, Edmonton, Alberta. Fire Research File Report #1-0507, 31 p., w/Appendix.

Noste, Nonan V.; Barney, Richard J. 1987. Comparative vegetational recovery on fireline cleared with explosives and with handtools. USDA Forest Serv., Intermountain Res. Stn., Ogden, Utah. Res. Note. INT-370, 3 p.

15. Environmental Implications:

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.

16. Duration:

Start: 1987. Estimated Completion: Continuing.

17. Resources 1988-89:

PYs: Prof: Barney 0.9 (Exchange assignment until June 30, 1988)
Tech: 0.0
Total: 0.9

Term/Student:

O & M: $3,000

Capital:

18. Signatures:

Richard J Barney
Investigator

J. M. Powell
Program Director, Environment

C. E. Hunt
Regional Director General

NOR-36-01-3

CANADIAN FORESTRY SERVICE

STUDY WORK PLAN

1988-89

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 19, 1988

1. Project: Development Agreements

2. Title: Fire Management (Manitoba)

3. New: Cont.: X 4. No.: NOR-36-01-3

5. Study Leader: K.G. Hirsch

6. Key Words: Fire management, information exchange, training, development, fire weather, cost effectiveness, fire behavior, fuels, fire environment

7. Location of Work: Manitoba

8. Study Objectives:

   1. To participate in the development of and facilitate the application of fire research technology that is relevant to Manitoba and will help to improve and advance fire management in the province.

   2. To promote and encourage the identification and expression of fire research requirements by the fire management agencies in Manitoba so as to assist the effective communication and presentation of these ideas to the NoFC fire research project and other appropriate research groups.

   3. To collect pertinent information on a variety of fire management subject areas, permitting the development and application of models to assist fire managers in their decision-making process.

9. Goals for 1987-88:

   1. Continue to enhance the relationship between fire research and operations in Manitoba by:

      a) participating in provincial and regional meetings which deal with the various aspects of Manitoba's fire management program,

b) interacting with fire management personnel at all levels of the organization.

c) participating and/or instructing at regional and provincial training courses.

2. In cooperation with the Province, develop and conduct training courses on fire behavior.

3. Establish a formal research working group within the province which could provide input the regional technical subcommittee.

4. Continue to monitor and provide input and direction to research projects being conducted under the agreement. This includes: fuel-type mapping, detection study, damage appraisal, and expert systems.

5. Continue the compilation and analysis of the relationship of fire weather and fire danger to fire activity in Manitoba.

6. Transfer the latest technology on the FBP System by:

a) finishing the fuel-type photo series and producing a poster for use in Manitoba,

b) completing a case study on extreme fire behavior in Manitoba,

c) if possible, obtain field observations of extreme wildfire behavior.

7. Produce and distribute (within Manitoba) three bulletins on various fire management topics.

8. Continue to provide advice and services on various fire management topics, especially to the provincial fire management organization.

10. Accomplishments in 1987-88:

1. - Represented the CFS fire research project at the province's Annual Fire Program Meeting, November 24-25, in Winnipeg.

- Made presentations on the FBP System at three regional fire meetings held this spring.

- Held one or two day meetings with each of the six regional Fire Control Officers to discuss fire management and fire research in Manitoba.

2. Organized and conducted two Fire Behavior Prediction Workshops held January 11-14 and February 1-4, 1988 at Hecla Island. Attendees included 31 provincial Natural Resource Officers and representatives from MANFOR and Abitibi-Price Inc.

3. A formal fire research working group comprized of four Regional Services staff (both management and field staff) and one CFS person was established. The direction for this group is now provided by the provincial organization and two meetings were held this year.

4. C. Ogilvie (NoFC) completed the seen area maps for all of the province's fire towers and the information was used by a consultant to complete a report on the effectiveness of the entire detection system.

   - Work by R. Dixon (Manitoba Remote Sensing Centre) on forest fuel type mapping continued but this project is no longer being funded by the agreement.

   - Funding was provided to B. Lee (NoFC) to support his work on expert systems for prescribed burning and initial attack dispatching.

   - Assisted in the arrangements and logistics which will send five Manitoba Natural Resources staff to the course entitled Fire and Resource Management for Line Officers and Resource Managers. It will be held February 29 to March 11, 1988 at the National Advanced Resource Technology Centre in Marana, Arizona. Funding was provided through the Agreement.

5. A fire occurrence database for the period of 1968-86 has been compiled, checked for accuracy and errors have been corrected. This work was done by Dave Hahn who was hired under the Agreement.

6. A poster comprized of 23 representative photos of the FPB System fuel types in Manitoba was published (see section 13).

   - Observations of extreme fire behavior and on-site fire behavior predictions were made at the 1987 Wallace Lake Fire were made and used by the provincial overhead team. Pertinent weather data and fire behavior information has been analyzed. This information was used at a number of workshops and presentations and will be formally published in 1988-89. An article entitled "An Overview of the 1987 Wallace Lake Fire, Manitoba" was submitted to Fire Management Notes for publication.

   - Fire behavior information for the 1987 Woodridge Fire was also collected but no analysis has taken place at this time.

7. Two Technology Transfer Notes were produced and distributed (see section 13 for titles).

8. Provided information to provincial staff regarding the potential for and requirements needed to conduct prescribed burns in both the Duck Mountains and Lake St. George areas.

   Publications on a variety of fire management topics were distributed to fire management personnel upon request.

- In cooperation with AES a second set of data was collected with regard to evaluating the accuracy of the thermo-hygrometer.

- A Fire Weather and Fire Behavior Workshop is to be held at Riding Mountain National Park, March 15-17, 1988. Eighteen Parks Canada staff will be in attendance.

- Served as a member of the Central Region Fire Weather Committee and coordinated the Fourth Scientific and Technical Seminar held April 2, 1987 in Winnipeg. A file report outlining the four presentations has been completed.

- Assisted in the coordination of an equipment demonstration during which Chuck Ogilvie (NoFC) showed the effectiveness of a "blower" in fighting grass fires. Approximately 40 provincial staff attended.

- Participated in the public information programs during Forest Week and at the Thompson Nickel Days (July 9-13, 1987).

11. Present Status of Study:

1. Various technology transfer activities have been undertaken to improve and advance fire management in Manitoba. This includes:

   - planning and conducting workshops and training courses on recent developments in fire weather, fire behavior, and fire management planning,

   - demonstrations of new fire fighting equipment and computer programs,

   - publication of newsletters (2/year) and posters on topics of current interest to fire management staff, and

   - distribution of publications on various fire management topics plus personal consultation.

2. To assist the identification of research needs, meetings are held annually with regional and provincial fire management staff. A formal committee composed of field and management staff has also been established to deal with fire research matters in the province.

3. A number of applied research projects have been conducted in order to assist fire managers in their decision-making process. This includes:

   - an analysis of the provincial fire weather stations and instrumentation used,

   - the development of a fire occurrence database for the period of 1968-86,

   - the compilation of all available fire weather data,

- an analysis of the efficiency of the present fire weather station network,

- a report on the use of Bird-dog aircraft in Manitoba, and

- an anlysis of some examples of extreme fire behavior in Manitoba.

The objectives of this study are on-going and will be continued under the present Canada/Manitoba Forest Renewal Agreement.

12. Goals for 1988-89:

1. Maintain liaison between fire research and operations in Manitoba by:

   a) participating in provincial and regional meetings which deal with the various aspects of Manitoba's fire management program,

   b) interacting with fire management personnel at all levels of the organization,

   c) continue to participate as a member of the Manitoba Fire Research Committee,

   d) continue to provide advisory services on fire weather and serve as a member of the Central Region Fire Weather Committee.

2. Continue to monitor and provide input and direction to research projects and other fire management activites conducted under the Agreement.

3. Complete a file report on the accuracy of the thermo-hygrometer.

4. Finish the analysis of the fire occurrence database (1968-86) and complete a file report showing any significant trends in Manitoba. A formal presentation of this report will be made to the province.

5. Publish an article and an Information Report on the fire weather and fire behavior associated with the 1987 Wallace Lake Fire.

6. Collect fuel loading, fire weather and fire behavior data on a prescribed fire conducted by the province at Lake St. George.

7. Assist in the field work associated with the Lowland Black Spruce Experimental Burning Project at Big Fish Lake (NOR-05-05).

8. Continue to provide technology transfer services by:

   a) participating in and conducting workshops on various topics (e.g., fire weather, fire behavior) upon request from the province,

   b) producing and distributing two Technology Transfer Notes on topics related to fire management in Manitoba.

c) continuing to provide advice and services on fire management topics, especially to the provincial fire management organization.

13. Publications 1987-88:

Hirsch, K.G. 1987a. A Brief overview of the Canadian Forest Fire Weather Index (FWI) System. Govt. Can., Can. For. Serv., Man. Dist. Office, Winnipeg, Man. Tech. Trans. Note M-001. 2 p.

Hirsch, K.G. 1987b. An example of the sensitivity of the Canadian Forest Fire Weather Index (FWI) System to small fire weather observation changes. Govt. Can., Can. For. Serv., Man. Dist. Office, Winnipeg, Man. Tech. Trans. Note M-002. 2 p.

Hirsch, K.G. (compiler) 1987c. Fire Behavior Prediction Workshop (manual), Hecla Island, Manitoba, February 16-19, 1987. Govt. Can., Can. For. Serv., Man. Dist. Office, Winnipeg, Man. Study NOR-36-01-3 (NOR-36-06) File Report No. 2. [Three-ring binder; limited distribution].

Hirsch, K.G. 1988a. Examples of the Canadian Forest Fire Behavior (FBP) System fuel types in Manitoba. Govt. Can., Can. For. Serv., Man. Dist. Office, Winnipeg, Man. (poster with text).

Hirsch, K.G. (editor) 1988b. Proceeding of the Fourth Central Region Fire Weather Committee Scientific and Technical Seminar, April 2, 1986. Gov't Can., Can. For. Serv., Man. Dist. Office, Winnipeg, Man. Study NOR-36-01-3 (NOR-36-06) File Report No. 3.

14. Environmental Implications:

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 study activities are not potentially detrimental to the environment.

15. Duration:

Started: 1984 Completion: 1989

16. Resources 1988-89:

PY's: Prof.: Hirsch 1.0

Student: 0.4

Tech: 0.0

O & M: $11,080

17. Signatures:

Investigator

District Manager

Technical Advisor

Program Director, Development

Program Director, Environment

Regional Director General

NOR-36-03-4

CANADIAN FORESTRY SERVICE

STUDY WORK PLAN

1988-89

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 19, 1988

1. Project: Development Agreements

2. Title: Fire Management (Saskatchewan)

3. New: Cont.: X 4. No.: NOR-36-03-4

5. Study Leader: W.J. De Groot

6. Key Words: Fire management, technology transfer, development, training, intelligence systems, information data base

7. Location of Work: Saskatchewan

8. Study Objectives:

   1. To provide fire management information to Saskatchewan through research and technology transfer that will assist in the development and advancement of fire management in the province.

   2. To promote the continued fire research effort in Saskatchewan by participating in problem/need identification and analysis with provincial personnel and NoFC fire research staff to aid in the development of a comprehensive fire management program for the province.

9. Goals for 1987-88:

   1. Provide information transfer through communication with Fire Research staff, the 'Saskatchewan Forest Fire Notes' technical newsletter, participation on committees, training workshops, seminars, field work, and personal contact.

   2. Organize and conduct a local workshop/seminar dealing with a specific fire management topic.

   3. Develop fire management expertise through courses and field experience.

   4. Initiate and supervise a contract to evaluate the efficiency of the Saskatchewan detection system.

5. Continue development of an information package for rural homeowners on protecting property from fire in the rural/forest interface.

6. Initiate a pilot study of fuel-type mapping in Saskatchewan.

7. Complete the data base containing the fire weather observations from the Saskatchewan fire weather station network for the period 1978-82.

8. Complete the data base containing individual fire report information for 1981-86, and establish a procedure for new records to be annually transferred to the data base.

9. Continue to provide provincial personnel the opportunity to attend training courses and seminars on various aspects of fire management.

10. Continue to act as project officer on cost-shared projects and capital purchases..

10. Accomplishments 1987-88:

1. a) Maintained consultations with the NoFC Fire Research Unit on all Fire Management activities in Saskatchewan being done under the agreement.

   b) Acted as liaison between the Province and Tim Williamson on the Elan Fire Economics Study; and Bryan Lee on his Studies/Contracts with the Province.

   c) Continued use of the 'Saskatchewan Forest Fire Notes' Newsletter as an information transfer medium.

   d) Attended the Central Region Fire Weather Committee (CRFWC) Technical Subcommittee Meeting (Winnipeg) in April, and submitted an Agency Report for the 13th Annual Meeting (Winnipeg) in December.

   e) Attended the AGM of the Saskatchewan Climate Advisory Committee (Regina) in October.

   f) Participated on a committee with the Saskatchewan Climate Advisory Committee and the Saskatchewan Feasibility Study for a Climate Service Centre in Saskatchewan.

   g) Attended the Regional Technical Committee on Fire Research Meeting (Edmonton) in October, and the Technical Seminar in March.

   h) Participated on the Cypress Hills Management Plan Committee in regards to the use of fire in the Cypress Hills Provincial Park.

   i) Participated on the Prescribed Fire Working Group in the review of Terms of Reference and Strategic Plan.

   j) Produced a short, internal report with recommendations on the fire behavior of the Elan Fire, as requested by the Province.

k) Presented a brief on fire behavior of the Elan Fire at a Board of Review Meeting shortly after the fire.

l) Presented a Fire Behavior Case Study of the Elan Fire at the 36th Annual Meeting of the Canadian Committee on Forest Fire Management. The Case Study will be published next year.

m) Presented an overview of CFS-Fire Research Activities as a guest speaker at the Weyerhaeuser Annual Spring Fire Meeting.

n) Presented a paper entitled 'Interpreting the Canadian Forest Fire Weather Index (FWI) System' at the Fourth CRFWC Scientific and Technical Seminar (Winnipeg) in April.

o) Presented R.S. McAlpine's Poster Paper entitled 'LAPFWI and LAPFBP: Two BASIC Computer Programs to Assess Potential Fire Behavior' at the 9th Conference on Fire and Forest Meteorology (San Diego, CA) in April.

p) Participated at the Symposium and Workshop on 'Protecting People and Homes from Wildfire in the Interior West' (Missoula, MO) in October; acted as a co-ordinator for the Working Group on "Helping Homeowners and Developers Understand Residential Development Problems' and gave a presentation addressing the Working Group topic; presented a poster paper entitled 'Application of Fire Danger Rating to the Wildland/Urban Fire Problem: A Case Study of the Nesbit Provincial Forest, Saskatchewan'; participated in a short television interview regarding CFS participation at the symposium.

q) Presented a one-day course at the Northern Institute of Technology (Prince Albert) on use of the Canadian Forest Fire Danger Rating System (CFFDRS) in October.

r) Participated as an instructor at the Fire Behavior Prediction Workshop (Hecla Island, Man.) in January.

s) Testified as an expert witness at a trial in July involving a landowner burning windrows.

t) Acted as a reviewer on a number of manuscripts.

u) Provided fire behavior information in the field during the Elan Fire, and the fire bust in La Ronge Region in July.

v) Submitted an article entitled 'New Fire Danger/Behavior Training Courses in Saskatchewan' to Forest Fire News.

w) Distributed CFFDRS binders to all districts and regions in Saskatchewan, and to other interested agencies in the province.

x) Assisted in providing information during public displays at local exhibitions.

y) Commence secondment with the provincial Fire Management Branch for six months (beginning Feb. 29/88) to perform technology transfer activities.

z) Prepared a fire behavior presentation on the Elan fire for the departmental convention held in Saskatoon in January.

2. The local Workshop/Seminar was replaced with course instruction for the Province and the Northern Institute of Technology.

3. a) Participated in the Big Fish Lake Experimental Burning project again this year.

b) Attended an Instructor Training Course (ITC) in March.

4. A contract to evaluate the efficiency of the Saskatchewan Detection System was initiated with C.J. Ogilvie acting as CFS Technical Expert. The tower seen-area maps were digitized using the facilities at Saskatchewan Research Council; responsibility for establishing the required fire data base was assumed by the Province.

5. The information package for rural homeowners on protecting property from fire at the wildland/urban interface will not be produced due to the time being taken by secondment, and since this is an issue which was recommended for resolution at a national level (see report on Missoula, MO, conference by De Groot and Alexander, October, 1987).

6. The pilot study of fuel type mapping in Saskatchewan was merged with the 'Dispatch Assistant' program contract being undertaken by B. Lee and Dr. S. Pickford. This project will allow the Provincial Fire Centre to utilize the Province's Geographic Information System data base.

7. Collection of the 1978-82 data base for the Saskatchewan Fire Weather Station Network was completed.

8. Responsibility for the fire report data base was assumed by the Province (see Accomplishment 4). It is intended that the Fire Weather Information and Fire Report Information data bases will be annually stored for future use.

9 a) Provided partial funding for three provincial staff to attend the Regional Technical Committee on Fire Research Meeting (Edmonton) in October.

b) Provided partial funding for a provincial staff member to attend a course on trouble-shooting and maintenance of the Fire Weather Station Network (Victoria) in November.

c) Provided partial funding for a provincial staff member to attend a course on producing seen-area maps for lookout towers (Edmonton) in November.

10. Served as project officer for the following:

    a) Acquisition of an IBM 386-based microcomputer for the Province.
    b) Meteorologist contract.
    c) Detection Study contract.
    d) Computer Services contract with Provincial Fire Centre.
    e) Climate Service Centre Feasibility Study contract through Saskatchewan Research Council and Saskatchewan Climate Advisory Committee.

11. Present Status of Study:

    1. Information transfer has reached the level of activity designated in the original agreement Operational Plan. The technology transfer process and activities under the FRDA are firmly established and are ongoing at a rate comensurate with all predetermined goals.

    2. The continued long-term fire research effort in Saskatchewan by NoFC is being encouraged and promoted through various studies being done in the province with support from the agreement.

12. Goals for 1988-89:

    1. While working under secondment for the Saskatchewan Department of Parks, Recreation and Culture (April to early October):

        i) Provide technology transfer information by working closer with Regional Fire Operations and on-site fire activities.
        ii) Develop an initial Baseline Presuppression Planning System for Saskatchewan through a review of literature and other similar operational systems, and through participation and consultation with Saskatchewan fire operations.
        iii) Develop personal fire management expertise through exposure and participation in provincial fire management operations.

    2. Provide information transfer through communication with Fire Research staff, the 'Saskatchewan Forest Fire Notes' technical newsletter, participation on committees, training workshops, seminars, field work and personal contact.

    3. Develop fire management expertise through courses and field experience.

    4. Continue to supervise a contract to evaluate the efficiency of the Saskatchewan detection system.

    5. Continue to provide support for provincial personnel to attend training courses and seminars on various aspects of fire management.

    6. Continue to act as project officer on cost-shared projects and capital purchases.

    7. Complete a paper dealing with fire behavior on the Elan fire.

13. Publications 1987-88:

Alexander, M.E.; De Groot, W.J. 1988. Fire behavior in jack pine stands as related to the Canadian Forest Fire Weather Index (FWI) System. Govt. Can., Can. For. Serv., North. For. Cent., Edmonton, Alta. Poster (w/text). (in press)

De Groot, W.J. 1987. Interpreting the Canadian Forest Fire Weather Index (FWI) System. IN Proceedings of the Fourth Central Region Fire Weather Committee scientific and technical seminar (April 2, Winnipeg, Man.), K.G. Hirsch (compiler and editor). Government of Canada, Canadian Forestry Service, Manitoba District Office, Winnipeg, Man. (in press)

De Groot, W.J. 1987. An overview of the Canadian Forest Fire Danger Rating System. Gov. Can., Can. For. Serv., Sask. Dist. Off., Prince Albert, Sask. Tech. Trans. Note S-001. 4 p.

De Groot, W.J. 1988. A comparison of fuel types for predicting fire behavior with forest ecosystems in the mixedwood section of Saskatchewan. Gov. Can., Can. For. Serv., Sask. Dist. Off., Prince Albert, Sask. Tech. Trans. Note. (in press)

De Groot, W.J. 1988. Application of fire danger rating to the wildland/urban fire problem: a case study of the Nisbet Provincial Forest, Saskatchewan. IN Proceedings of the Symposium and Workshop on Proteting People and Homes from Wildfire in the Interior West (October 6-8, 1987, Missoula, Montana). U.S. Forest Service, Missoula, Montana. (in press)

De Groot, W.J. 1988. New fire danger/behavior training courses in Saskatchewan. Forest Fire News. No. 28. (in press)

14. Environmental Implications:

The agreement manager has been directed by Management Committee to include all pertinent environmental information on the PAF associated with this Project. The PAF will serve as the official document which the environmental screening committee will review.

15. Duration:

Started: 1985 Completion: 1990

16. Resources:

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|---|---|---|---|
| PY's: | Prof. | De Groot | 1.0 (0.5 assigned to STEP postion with province) |
| | Tech. | Barth | 0.1 |
| | Total | | 1.1 |

O&M: $32,500.00

Contract: 35,000.00

Capital: Nil

17. Signatures:

Investigator

Technical Advisor

Supervisor

Program Director, Environment

District Manager

Program Director, Development

Regional Director General