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# STUDY STATEMENTS 1986–87



Northern Forestry Centre
Edmonton, Alberta

Canada

# STUDY STATEMENTS

# 1986-87

NORTHERN FORESTRY CENTRE

CANADIAN FORESTRY SERVICE

5320 - 122 STREET

EDMONTON, ALBERTA

T6H 3S5

MARCH 1986

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 23, 1986

1. Project: Environmental Effects of Toxic Substances and Vegetation Management

2. Title: Assessment of air pollutant impact on forest systems and of industrial development in natural areas

3. New: Cont.: X 4. No.: NOR-7-01

5. Study Leader: D.G. Maynard, S.S. Sidhu, M.J. Apps, S.C. Zoltai, J. Feng, and vice Addison

6. Key Words: Sulphur gases, elemental sulphur, vegetation, lodgepole pine, AR-NEWS, biomonitoring, environmental impact assessment, advisory

7. Location of Work: Region wide with emphasis on west-central Alberta

8. Study Objectives:

   1. Describe and assess changes in the forest ecosystem as a result of two sour gas plants in west-central Alberta.

   2. Determine the mechanism of particulate elemental sulphur dust impact to the forested soil-plant system.

   3. Assess the impact of industrial development on the terrestrial environment and recommend measures for mitigating the damaging impacts of the proposed developments.

   4. Advise and contribute to the establishment and sampling of AR-NEWS plots in the region and coordinate the preparation and analysis of samples with FIDS (NoFC and PFC).

9. Goals for 1985-86:

   1. Provide consultative and advisory services and undertake studies to resolve problems related to industrial development in natural areas as needs and opportunities arise in consultation with the Program Director. Attend workshops and symposia. (Maynard, vice Addison, Sidhu, Apps, Zoltai)

2. Prepare and submit for review a paper on spatial, temporal, and vertical variability of pollutants and other elements in forest soils. (Maynard, Addison, carried over from 1984-85)

3. Prepare and submit for review a journal article on the effects of pollutant deposition on soil chemistry. (Maynard, Addison)

4. Continue to determine the factors that control the mobility and form of pollutants and other elements in forest soils. (Maynard)

5. Publish a journal article on the influence of soil chemistry on the population of Thiobacillus in contaminated soils. (Maynard, Addison)

6. Complete the study on the impact of low pH and high conductivity on the moss Pleurozium and prepare a manuscript for review. (Addison)

7. Publish a journal article on the deposition of pollutants from sour gas processing as measured by lichen and moss elemental content. (Addison)

8. Re-examine biomonitoring plots in the vicinity of sour gas processing in west-central Alberta. (Maynard, Addison)

9. Consult with and assist NoFC FIDS staff to carry out their responsibility to CFS AR-NEWS program in the region. (Sidhu, vice Addison, Maynard)

10. Publish a journal article on the effects of concentration and duration of exposure to $SO_2$ on the lichen Evernia mesomorpha. (Addison, from NOR-7-02)

11. Complete and publish a journal article on the distribution of $SO_2$ in forest canopies. (Addison, carried over from NOR-7-02)

12. Prepare and publish results of $SO_2$ intermittant fumigation effects on aspen photosynthesis and growth. (Addison, from NOR-7-02)

13. Prepare and submit to the Research Management Division of Alberta Environment an annual report on the research accomplishments in 1984-85. (Addison, Maynard, from NOR-7-02)

14. Publish a paper entitled "Effects of $SO_2$ on leaf conductance, xylem tension, fructose, and sulphur levels in jack pine seedlings". (Addison, from NOR-7-02)

15. Complete and submit a paper on the distribution and effects of smelter emissions in the Thompson, Manitoba area. (Carried over from 1983-84 Hogan at GLFC, from NOR-7-02)

16. Prepare and submit for review a journal article on the influence of elemental S dust on the vascular plant communities in the foothills of Alberta. (Addison, carried over from 1984-85)

17. Complete study to determine the influence of elemental S dust on the growth and elemental content of the upper crown of lodgepole pine. (Addison)

18. Complete preparation and submit for review an Information Report on uranium mining and milling and radionuclides in the terrestrial environment. (Apps, carried over from 1983-84)

19. Publish a journal note on the colorimetric determination of elemental S in forest litter. (Maynard, Addison)

20. Continue to participate in the DOE Regional Screening and Coordinating Committee and to participate in environmental assessment through regional technical subcommittees of RSCC. (Zoltai)

Added Goals:

21. Publish a journal article on the sulfur constituents in soils and streams of a watershed in the Rocky Mountains of Alberta in collaboration with other researchers. (Maynard)

22. Present a seminar at the Canterra Annual Environmental Review on the five years of research carried out by CFS around the Strachan and Ram River sour gas plants. (Maynard)

23. Participate and present a paper at a Soil pH Monitoring Workshop sponsored by the Research Management Division of Alberta Environment. (Maynard)

24. Prepare and submit for review a journal article on some considerations of visual estimates of vegetation for biomonitoring. (Addison)

25. Prepare and submit for review a journal article on fisson track mapping of uranium in black spruce twigs. (Apps)

26. Review NoFC studies to fulfill mandate of the NoFC Environmental Screening Committee. (Sidhu, Maynard, Zoltai)

10. Accomplishments in 1985-86:

1. Consultative and advisory services have been rendered to a variety of government (federal and provincial) agencies, industry (both energy and consulting companies) and university researchers and managers. In addition, there was involvement with a M.Sc. advisory committee and several papers for national and international journal articles were reviewed. Contributed to the standardization of field and laboratory methods for AR-NEWS.

2. The first draft of the paper on the variability is being prepared presently. The complexity of this subject along with the importance of variability in monitoring for acid deposition has resulted in more data and time required than was originally anticipated. Additional data on three sites looking at the effect of bulk density and depth of the organic surface horizons were collected and analyzed this summer.

A portion of this data may be presented at the acid forming emissions workshop in Calgary in May 1986.

3. The statistical analysis of the soils data was completed this fall. Collation and statistical analysis is being done on the deposition and lysimeter data at present. However, a portion of this work was being done by Paul Addison and it has been delayed because of his transfer. Publication of this data by itself may not be possible because of the large variability problems. Some of this may have to be incorporated into publications in goal #2 and #3 for 1986-87.

4. A growth chamber study looking at the effects of nutrients and innoculum at four rates of elemental S was completed. All the data has been collected and the statistics done on most of the data. This study was done in cooperation with Dr. Jim Germida from the University of Saskatchewan. Dr. Germida was responsible for measuring the microbial elemental sulfur oxidizing populations.

5. A paper entitled "Effect of elemental sulfur on selected chemical and biological properties in forest soils" by D.G. Maynard, J.J. Germida and P.A. Addison was submitted to the Canadian Journal of Forest Research.

6. Technical problems with the growth chamber and gas analyzer (IRGA) and extra time needed in the field to complete the re-examining of the biomonitoring plots delayed the start of the experiment.

7. The paper has been written and reviewed within project. It is presently with the senior author being revised. The progress of the paper has been delayed by the author's transfer to Ottawa.

8. The field collection of the soil and plant material and the reassessment of the vegetation was completed June through October. Problems were encountered in sampling the pine trees that resulted in more time than was originally expected. In addition the re-examination of the plots took 1 month instead of ten days due to poor weather. Chemical analysis has been started on the soil and plant material and should be completed by February. Growth measurement (i.e., needle counts, weights, etc.) have to be done and will start when a term position is filled. The assessment of the vegetation cover is being collated at present.

9. Discussions have taken place with: Alberta and Manitoba environment on the criteria for setting up of AR-NEWS plots and FIDS and analytical laboratory staff at NoFC and PFC for the collection and preparation of samples for chemical analysis. Assisted in the setting up of 9 of 11 AR-NEWS plots in the prairie region. Collected data on minor vegetation on 90 sub-plots in addition to the AR-NEWS protocols (FIDS). Initiated a contract for the digest preparation and analyses of the soil and plant samples from the AR-NEWS plots in B.C. and this region.

10. A journal article "The effect of sulphur dioxide on net $CO_2$ assimilation in the lichen Evernia mesomorpha Nyl." by D. Huebert, S. L'Hirondelle and P.A. Addison has been published in the New Phytologist 100:643-651.

11. The data for the paper has been collected but the manuscript has not been written. Other commitments owing to Paul Addison's transfer and the low priority assigned to this goal have not allowed for its completion.

12. An article entitled "Growth and physiological responses to aspen and jack pine to intermittent $SO_2$ fumigation episodes" by S. L'Hirondelle, P.A. Addison, and D. Huebert was submitted to the Canadian Journal of Botany in August 1985 and has been accepted and is under revision.

13. The 1984-85 fiscal year was the final year of the contract with the Research Management Division of Alberta Environment and ended 10 years of cooperative work with CFS and Alberta Environment on air pollution. It was decided that a more comprehensive report reviewing the 10 years of CFS involvement with Alberta Environment was needed. Therefore, a more extensive document to be published as an Information Report was prepared. The manuscript has been reviewed internally and by three members of the RMD of Alberta Environment and has been accepted. The paper has been submitted to the editorial staff of NoFC.

14. A paper entitled "Effect of $SO_2$ on leaf conductance, xylem tension, fructose and sulphur levels on jack pine seedlings" by S. L'Hirondelle and P.A. Addison has been published by Environmental Pollution Series A 39: 373-386.

15. The first draft has been completed and is with the senior author at GLFC. Additional analysis on sulfate adsorption is being carried out and the second draft is being prepared.

16. The first draft of the paper entitled "Effect of elemental sulfur on vegetation" by K.A. Kennedy, P.A. Addison, and D.G. Maynard has been reviewed within the group. Considerable reworking of the paper was required and a second draft has been completed. Final revision and submission of the article to Water, Air and Soil Pollution will be completed by March.

17. The sampling of the 7 age classes of pine at 4 sites down a gradient from the Strachan sour gas plant has been completed. Sampling was done every 2 months throughout last winter and every month during the frost free period. The last sampling was completed in September. Chemical analysis of all the pine tissue has been completed.

18. The first draft of an Information Report on uranium mining and milling is in the final stages of preparation and should be completed in February, 1986. Sections of the draft have been reviewed within the group.

19. A journal article entitled "Extraction and determination of elemental sulfur in organic horizons of forest soils" by D.G. Maynard and P.A. Addison has been published in the Canadian Journal of Soil Science 65: 811-813.

20. Participated in five DOE regional Screening and Coordinating Committee meetings. Participated as members for four subcommittees and was chairperson for one of these subcommittees.

21. A paper entitled "Sulfur constituents in soils and streams of a watershed in the Rocky Mountains of Alberta" by M.J. Mitchell, M.B. David, D.G. Maynard and S.E. Telang has been accepted for publication in the Canadian Journal of Forestry Research and will appear in the April 1986 issue. This paper reported data on the Marmot Creek Watershed.

22. Presented a review on our 5 years research around the Strachan and Ram River sour gas plants at the Canterra Annual Environmental Review, October 16, 1985.

23. Presented a paper entitled "Alternatives to soil pH monitoring: Total and elemental sulfur analysis" at the Soil pH Workshop, November 8, 1985. The workshop was sponsored by the Research Management Division of Alberta Environment to assess their soil monitoring program around sour gas plants in Alberta. The paper was well received and the final recommendations of the workshop participants was that a total S or elemental S analysis be included in any revision of the current monitoring workshop.

24. A paper entitled "Some considerations for the use of visual estimates of plant cover in biomonitoring" by K.A. Kennedy and P.A. Addison has been accepted for publication in the Journal of Ecology.

25. A paper entitled "Fisson track mapping of uranium in black spruce (Picea mariana) twigs" by M.J. Apps, M.J.M. Duke, and B.V. Turner was accepted for publication in the Journal of Radioanalytical and Nuclear Chemistry.

26. Reviewed NoFC studies to fulfill mandate of the NoFC Environmental Screening Committee.

11. Goals for 1986-87:

1. Provide consultative and advisory services and undertake studies to resolve problems related to industrial development in natural areas as needs and opportunities arise in consultation with the Program Director. Continue to participate in departmental and interdepartmental committees as required, including the NoFC Environmental Screening Committee. Attend workshops and symposia. (Maynard, Sidhu, Apps, Zoltai, Feng, vice Addison)

2. Prepare and submit for review a paper on the sources of variability of pollutants and other elements in forest soils. A portion of this data will be presented at a workshop on acid deposition in Calgary, May 1986. (Carried over from 1985-86, Maynard)

3. Publish a journal article entitled "Effect of elemental sulfur on some chemical and biological properties of forest soils". (Carried over from 1984-85, Maynard)

4. Prepare and submit for review a journal article on the interaction of Thiobacillus populations and soil chemistry in elemental sulfur contaminated soils. (Maynard)

5. Publish a journal article on "Elemental content of Hypogymnia physodes and Pleurozium schreberi near sour gas processing in Alberta". (Addison)

6. Prepare and submit the final report on ecological changes of a forest system caused by sour gas processing. (Maynard)

7. Contribute to AR-NEWS program in a consultative and advisory role. Establish two AR-NEWS plots and collect vegetation and soils in addition to the FIDS requirements in 30 subplots. Complete soil sampling to make up deficiencies in the plots set up in 1985. Complete the soil and vegetation analyses for 1985 and samples collected in 1986. Submit results to FIDS. (Sidhu, Maynard)

8. Complete and submit a paper on the distribution and effects of smelter emissions in the Thompson, Manitoba area. (Carried over from 1984-85, Hogan; Maynard will be the NoFC contact)

9. Publish a journal article on "The effects of particulate elemental sulfur on vegetation". (Maynard)

10. Prepare and submit for review an article on the seasonal variation in elemental concentrations of Pinus contorta in polluted and non-polluted areas. (Maynard)

11. Complete and publish Information Reports on the uranium mining and milling and radionuclides in the terrestrial environment. (Apps)

12. Publish an Information Report on the Effect of Oil Sands emissions on the boreal forest (Maynard).

13. Prepare and submit a journal article on the influence of elemental sulfur on soil animals. (Maynard, PRUF contract report)

14. Initiate study to determine the physiological response of forest trees to acidic soils. (vice Addison)

15. Determine the relative sensitivities of forest species to acidic soil conditions and initiate a study to determine the physiological basis for sensitivity. (vice Addison)

12. Publications 1985-86:

Apps, M.J., M.J.M. Duke, and B.V. Turner. 1986. Fisson track mapping of black spruce (Picea mariana) twigs. Journal of Radioanalytical and Nuclear Chemistry. (in press)

Huebert, D., S.J. L'Hirondelle, and P.A. Addison. 1985. Growth and physiological response on net $CO_2$ assimilation in the lichen Evernia mesomorpha Nyl. New Phytologist 100:643-651.

Kennedy, K.A. and P.A. Addison. 1986. Some considerations for the use of visual estimates of plant cover in biomonitoring. Journal of Ecology. (in press)

Kennedy, K.A., P.A. Addison, and D.G. Maynard. 1985. Effects of particulate elemental sulphur on moss. Environmental Pollution Series A 39:71-77.

L'Hirondelle, S.J. and P.A. Addison. 1985. Effect of $SO_2$ on leaf conductance, xylem tension, fructose and sulphur levels on jack pine seedlings. Environmental Pollution Series A 39:343-386.

Maynard, D.G. and P.A. Addison. 1985. Extraction and determination of elemental sulfur in organic horizons of forest soils. Canadian Journal of Soil Science 65:811-813.

Maynard, D.G., J.W.B. Stewart, and J.R. Bettany. 1985. The effects of plants on soil sulfur transformations. Soil Biology and Biochemistry 17:127-134.

Mitchell, M.J., M.B. David, D.G. Maynard, and S.A. Telang. 1986. Sulfur constituents in soils and streams of a watershed in the Rocky Mountains of Alberta. Canadian Journal of Forest Research. (in press, April 1986)

13. 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.

14. Resources 1986-87:

| | | | |
|---|---|---|---|
| PYs: | Prof.: | Apps | 0.2 |
| | | Feng | 0.1 |
| | | Maynard | 0.6 |
| | | Sidhu | 0.3 |
| | | Zoltai | 0.1 |
| | | Vice Addison | 0.7 |
| | Tech.: | Radford | 0.6 |
| | | Ridgway | 0.7 |
| | | Fairbarns | 0.3 |
| | Total: | | 3.9 |
| | Term/Student: | | 0.3 |

O & M: 12 K

Capital: 7 K (autosampler ICP-AES)

15. Signatures:

Investigator

Program Director, Protection

Investigator

Regional Director General

Investigator

Investigator

Investigator

Investigator

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 23, 1986

1. Project: Environmental Effects of Toxic Substances and Vegetation Management

2. Title: Environmental impact and residue chemistry of forestry herbicides

3. New: Cont.: X 4. No.: NOR-7-04

5. Study Leader: S.S. Sidhu, J. Feng,

6. Key Words: Herbicides, forest system, persistence, degradation, adsorption, desorption, environmental impact, residue chemistry

7. Location of Work: Region wide

8. Problem Analysis:

Herbicides, as well as nonchemical methods of weed control such as site scarification, prescribed burning, mechanical and manual treatments provide a wide range of options for forest weed management. Even though the effectiveness of herbicides for control of weed species in forestry has been recognized since the introduction of the phenoxy herbicides, their use in forestry has lagged far behind that of agriculture. At present, forestry use of herbicides in Canada is less than 0.5% of the total used in agriculture. The limitation in the use of herbicides as a silvicultural tool is to some extent a result of the lack of information available on the environmental effects of these compounds in the natural environment. While various herbicides have been tested by CFS over the last several decades, herbicide studies have never constituted a top priority in forest management research activities. In addition, the agrochemical industry has never had a research and development program of any duration for forestry use of herbicides in Canada.

Currently, the Forest Pest Management Institute (FPMI) of CFS, as a National Institute, has the mandate to conduct herbicide research for forest resource management in Canada. The aims of FPMI's Herbicide Research Project are to accelerate the development of new herbicides, to refine and improve methods of utilizing existing products, and to improve application technology and formulation characteristics to enhance effectiveness of the herbicides while minimizing the impact on the forest ecosystem.

One of the major areas of concern, with significant data gaps, is the fate of herbicides entering the forest ecosystems. Available information on residue chemistry and environmental impact of forest herbicides under Canadian climatic conditions, particularly in the boreal forest, is very limited. Therefore, NoFC proposes to carry out research, relevant to the Western and Northern Region, on the persistence, mobility, degradation, and fate of forest herbicides and their metabolites in the terrestrial environment. In addition, attempts will be made to assess the impact of herbicide application on the plant community as a whole to evaluate the influence of this silvicultural practice on plant community structure and forest productivity. These studies are essential if sufficient information is to be generated to make informed decisions regarding the use of herbicides in this region.

In order to avoid fragmentation of environmental impact and residue research studies, NoFC will ensure that the data collected is available to FPMI, provincial governments, and the public. Also, the information obtained from this study will be integrated into vegetation management guidelines/prescriptions to be developed through a parallel study on "Field Testing and Evaluation of Forestry Herbicides" in NOR-10. Initially, three major herbicides, namely Roundup, Velpar, and Garlon, will be investigated.

9. Study Objectives:

1. Determine the fate of herbicides in the forest ecosystems, by studying persistence, lateral and downward movement, degradation, and adsorption/desorption characteristics in regionally important forest soils under laboratory and field conditions.

2. Evaluate the impact of herbicides on the structure, composition, and dynamics of forest plant communities, including mycorrhizal aspects.

3. Provide federal, provincial, and industrial resource managers in the region with advice on the environmental effects of the use of herbicides in forestry applications.

10. Goals for 1985-86:

1. Review available published and unpublished literature on the use of herbicides in forestry applications. (Sidhu)

2. Set up liaison with scientists at FPMI, universities and provincial institutions who are involved in herbicide research. (Sidhu)

   a. Review available literature on current techniques in the analysis of herbicides and herbicide residues.

   b. Review and develop field sampling design and procedures to sample vegetation and soils.

   c. Review and develop the capability of NoFC to analyze for proposed herbicides and herbicide residues.

3. Prepare detailed plan of the study to determine the direct environmental effects of herbicide applications in natural forested areas for implementation. (Sidhu)

4. Collaborate with Manitoba Environment's herbicide project which is part of Canada-Manitoba Forest Renewal Agreement. (Sidhu)

Added Goals: Goals 5-7 with the arrival of a PDF (Chakravarty) in August, 1985.

5. Review literature on the effect of hexazinone (Velpar and Pronone), glyphosate (Roundup), and Trichlopyr (Garlon) on mycorrhizae. (Sidhu, Chakravarty)

6. Prepare a research proposal for the study of effects of herbicides on mycorrhizae associated with white spruce and lodgepole pine in controlled and field conditions. (Sidhu, Chakravarty)

7. Isolate and culture common mycorrhizae associated with Pinus contorta and Picea glauca. (Chakravarty)

8. Initiate experiments on the effect of hexazinone on in vitro and in vivo growth of mycorrhizae associated with Pinus contorta and Picea glauca. (Chakravarty)

9. Establish field plots on an aspen cutover site selected for the study of environmental impact of mechanical, manual, chemical silviculture site preparation methods. (Sidhu)

10. Contribute to workshops on "Toxic chemicals: Management in the prairie region". (Sidhu)

11. Prepare plans for an interdisciplinary research on vegetation management under the Canada/Alberta Agreement. (Sidhu)

12. Prepare draft of publication as Information Report prepared under a PRUF contract. (Malik and VanderBorn)

11. Accomplishments in 1985-86:

1. Reviewed available published and unpublished literature on use of herbicides in forestry applications.

2. Established liaison with scientists at FPMI, EPS, AFS, BCMF, University of Alberta, Alberta Environment, University of Guelph, University of Toronto, Canadian Forestry Centres at MFC, GLFC, and NeFC and industry.

   a. Reviewed available literature on current techniques in the analysis of Roundup and Velpar.

   b. Reviewed and developed field sampling design and procedures for vegetation and soils.

3. Prepared a detailed plan of a benchmark study to determine direct environmental effects of vegetation management techniques (chemical herbicides, mechanical, manual) in natural forested areas.

4. Collaborated with Manitoba Environment in herbicide project which is a part of Canada-Manitoba Forestry Renewal Agreement. Provided liaison to FPMI, provided methods to sample vegetation, soils, and air for herbicide deposits and herbicide residues.

5. Reviewed literature on the effects of herbicides including hexazinone (Velpar and Pronone), glyphosate (Roundup), and Trichlopyr (Garlon) on mycorrhizae.

6. Prepared a research proposal for the study of effects of selected herbicides on mycorrhizae associated with lodgepole pine and white spruce.

7. Isolated and cultured common mycorrhizae (Hebeloma crustuliniforme, Laccaria laccata, Suillus tomentosus, Thelephora amanicanum and T. terrestris) associated with Pinus contorta and Picea glauca.

8. Initiated experiments to study the effects of hexazinone on in vitro and in vivo growth of mycorrhizae associated with 2 tree species (see 7).

9. Established field plots on an aspen cutover, the site of a benchmark study, for the study of environmental impacts of mechanical, manual, and chemical methods of vegetation management. Initiated sampling vegetation for pretreatment assessments.

10. Contributed to 3 workshops on Toxic Chemical Management. The results would be used in formulating DOE integrated policy and setting priorities for managing toxic chemicals in the prairie region.

11. Prepared detailed plans for an interdisciplinary research for vegetation management under the Canada-Alberta Forest Resource Agreement in cooperation with NOR-10 and AFS.

12. Prepared a publication draft for an Information Report entitled "The need for herbicides in forest resource management". The report has been reviewed and is with the editor. The publication is based on a report produced under a PRUF grant to the University of Alberta.

12. Goals for 1986-87:

1. Establish field vegetation sample plots on Procter & Gamble FMA southwest of Grande Prairie in cooperation with NOR-10 for Methods-I and Method-II in the benchmark study area. (Sidhu)

2. Sample vegetation and soils for pre-treatment application data for Methods-II and possibly Method-I. (Sidhu, Feng)

3. Sample vegetation and soil (and possibly water) for pre-herbicide application for herbicide residue analysis for Method-II. (Sidhu, Feng)

4. Sample vegetation and soils from post-treatment data for Method-II plots and possibly for Method-I plots. (Sidhu, Feng)

5. Sample vegetation, soils, water, and deposition plates for pest-herbicide application and residue data. (Sidhu, Feng)

6. Develop and establish herbicide residue chemical laboratory, streamline analytical methods for hexazinone and initiate analyses of samples collected during summer 1986. (Feng)

7. Continue to provide federal, provincial, and industrial resource managers in the region on the environmental effects of the use of herbicides in forestry application. (Sidhu, Feng)

8. Continue to participate in ECW and CFS Weed Management Coordinating Committee. (Sidhu, Feng)

9. Complete experiments on the effects of hexazinone and Roundup on in vitro growth of 5 species of mycorrhizae and prepare draft manuscript for publication by March 1986. (Sidhu, Chakravarty)

10. Complete experiments on the effects of hexazinone on plant growth and survival of naturally occurring and artificially innoculated mycorrhizae associated with P. contorta and Picea glauca. (Chakravarty)

11. Prepare a draft for publication of results of experiment in No. 10 (January 1987). (Sidhu, Chakravarty)

12. Plan and initiate experiments on the effect of hexazinone of mycorrhizae in pine and spruce seedlings under aseptic conditions. (Sidhu, Chakravarty)

13. Plan for experiments to study the effects of hexazinone on microflora populations in control plots and plots treated with hexazinone. (Chakravarty)

13. Publications 1985-86:

Nil

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. (For Environmental Implications of herbicide application, also see NOR-10 & NOR-36-02-01).

15. Resources 1986-87:

| | | | |
|---|---|---|---|
| PYs: | Prof.: | Sidhu | 0.7 |
| | | Feng, J. | 0.8 |

| | | |
|---|---|---|
| Tech.: | Fairbarns | 0.7 |
| | Milward | 1.0 |
| | Feng, C. | 1.0 |
| Total: | | 4.2 (In addition a PDF (Chakravarty) contributes to this study). |
| Term/Student: | | 1.8 (0.6 from Agreement) |

O & M: 10 K (+40 K from NOR-36-02)

Capital: 100 K (Agreement see NOR-36-02-01B)

16. Signatures:

Investigator

Program Director, Protection

Investigator

Regional Director General

Investigator

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 14, 1986

1. Project: Regeneration and Plantation Management

2. Title: Chemical controls of pests and vegetation in managed forests

3. New: Cont.: X 4. No.: NOR-10-04

5. Study Leader: J. Drouin

6. Key Words: Efficacy, spraying toxicology, pesticides, registrations, residuals, formulations, herbicides, pheromones

7. Location of Work: Prairie Region

8. Study Objectives:

   1. To develop control methods and assess needs on the use of herbicides and pesticides and evaluate pheromones as a tool in forest management.

   2. Conduct pesticide efficacy trials for various dosages, formulations and timing and to determine percent mortality of host species.

   3. Provide data to aid registration recommendations for selected chemical products.

9. Goals for 1985-86:

   1. Continue assessment and monitoring of established herbicide plots in Alberta/Manitoba as per ECW (Western) protocols - continue field tests with Velpar Liquid at Faust, Slave L., Grande Prairie, Edson and with Garlon (XRM-4021) at Calling Lake; with hexazinone granular 10G at Faust - all for conifer release.

   2. Assist Dupont Canada/Alberta Forest Service for vegetative assessments at Calling lake hexazinone aerial spray and spot gun application in accordance with protocols - assume lead in test plots being discontinued by Dupont at Calling Lake.

   3. Continue evaluation of pheromones with National Research Council and PFRC.

      a. Monitor pine shoot moth Rhyacionia buoliana distribution and spread.

b. possibilities of sex-attractant development for shoot pine terminal weevils.

4. Continue with strong support from /with FPMI, ECW, ECPUA and as Summarizer and Chairman for Silviculture Section (ECW Western).

Added Goals:

5. Assist on Grande Prairie vegetation management project.

6. Herbicide tours - demonstrations with AFS.

7. Calling Lake vegetation assessments with Dupont.

8. Review, edit publications by Malik/Van DenBorn/Radvanyi/Hiratsuka.

9. Perform duties as President of Entomological Society of Alberta.

10. Accomplishments in 1985-86:

1. Continued assessments, monitoring, final measurements of established herbicide plots in Alberta using guidelines/techniques of 1, 2, 3-5 year measurements established by ECW (Western). Continued with field tests of Velpar "L" with exact-delivery spot gun application at Grande Prairie, Economy Tower Supplemental on May 6. (10-69)

2. Due to general policy directive - all aerial applications in the province were cancelled in the spring. Proposed test w/Garlon (triclopyr) at Grande Prairie was cancelled on agreement with FPMI priorities. A large aerial trial at Calling lake with Pronone 10/5 G was rescheduled for ground application (Pfizer Canada) on June 10-15. Assisted Pfizer with Pronone 10/5 G w(hexazinone) trial applied June 10-11 at 1, 2 and 4 kg a.i./ha, replicated 3x, w/control for each dosage. Plot size was 2 ha (100 x 200) (21 plots) including 4-50 x 100 m plots, with 20 subplots, crop tree centered, circular at 2 m radius, centre staked. Crop trees were tagged sampled measured, recorded as per ECW protocols/guidelines. Prevegetation assessment taken June 11-15 while crop response/efficacy were assessed Aug. 25. Preliminary results indicate good to excellent controls at 1 and 2 kg a.i./ha (10-69).

3. Continued evaluation of pheromones with National Research Council at Saskatoon with Dr. E.W. Underhill, Dr. H.R. Wong and C. Rentz on Petrova metallica to complete biology, as well as biology on Protecteras spp. feeding on Manitoba Maple seeds and laterals in Alberta and monitoring of the pine shoot moth Rhyacionia buoliana with sex attractant recently developed by T.G. Gray (PFC, Victoria) and on the larch casebearer Coleophora laricella. No pine shoot moth were recovered in Alberta and Manitoba. No larch casebearer recovered in in Alberta. In Manitoba, large numbers (1114) of what was tentatively identified as larch case bearer adults. We are awaiting positive identification from Ottawa. (Reports on P. metallica and Proteoteras spp. will follow shortly) indicating spread/distribution has not occurred in either Manitoba and Alberta - both from USA or Ontario/B.C.

a. Monitor spread/distribution of R. buoliana - pine shoot moth 4 @ Porcupine Hills, 4 @ Belly River, Alberta and Piney, Manitoba - No adults recovered - Report to follow. (10-67)

b. Monitored spread/distribution & field test attractants for larch Casebearer, (C. laricella). 6 @ Castle Mountain, Alberta, 6 @ Sprague, Manitoba - No adults recovered in Alberta. Large numbers of adults were tentatively identified as casebearer from Sprague - no positive identification from Ottawa to date.

c. Monitored peak emergence of P. metallica (pitchnodule maker) at Hinton to complete biology by obtaining mated adult-egg laying and emergence (6 traps) - Report to follow. (10-66)

d. Monitored emergence of Proteoteras acsculana on M-maple to obtain eggs and biology as well as unknown seed feeding Proteoteras spp. Report to follow.

e. Collected, identified, reared and obtained distributions of Pissodes terminalis on pines in Saskatchewan/Manitoba/Alberta to obtain parasitism, distribution and damage estimates in Alberta - report to follow on pine terminal weevil. (10-68)

4. Continued close ties with FPMI, as Chairman and Summarizer for Expert Committee on Weeds, Silviculture Section (Western). Organized, chaired a meeting of representatives (industry, governments, federal/provincial, chemical companies) to ECW Silviculture on July 9 for prairies and B.C.: main topic protocols/guidelines for herbicide research in western regions; and technical papers session at December 2-5 ECW meeting 1985, need for more abstracts - agenda proposals, Feed, food and fibre registration. As member of planning/organization committee attended 5 meetings as Forestry representative set up agendas, set up registration of silviculture group, maintained strong ties w/ECPUA, Agric. Canada registrations.

   Continued as Forestry representative for Western Committee on Crop Pests for the Western Forum, as Sub Committee Chairman for berry crops Greenhouse Ornamental shade shelterbelts, house and home greenhouse plants, as well as seasonal wood and timber structures.

Added Accomplishments:

5. Assisted L. Brace, Coordinator on top priority Vegetation Management Project at Grande Prairie starting in August with work plan objectives experimental design, personnel lists and materials required, permits and draft design. In September assisted in field baseline layout of blocks, lines and sub-plot layout, forms for vegetative assessment of the entire primary test site by September 30, including 936 sub-plots located/marked. Pre-treatment assessment to continue before chemical treatment by fall 1986. This project superceded planned monitoring or proposed herbicide work at Grande Prairie/Slave Lake/Calling Lake.

6. Conducted tours (2) talks/demonstration on herbicides w/D. Paver, Slave Lake, Alberta Forest Service re-controls, dosages, timing,

efficacy, ECW protocols, spot-gun applications at strawberry Creek and Faust plots, as well at Swan Hills (AFS aerial sprays) on August 26, September 5 and July 11, to Forestry, Industry and Chemical companies.

7. Assisted Dupont on tour at Calling Lake Velpar "L", G ground and aerial applications, for industry, governments, private, and AFS personnel.

8. Reviewed, edited, publications/reports on Herbicides (Malik - VanderBorn), Hare control (Radvanyi), Vegetation Management Industrial (Alberta Environment), pest leaflets on Silverleaf and Rusts.

9. As president Entomological Society of Alberta, organized, conducted three executive meetings and one annual meeting in Lethbridge with proceedings for the presentation of papers by members of the Society.

11. Goals for 1986-87:

1. Summarize and publish the results of efficacy and crop tolerance experiments established in Alberta and Manitoba since 1980. (10-75)

2. Prepare final report on use of pheromones for assessing populations of Petrova metallica. (10-66).

3. Prepare file report on distribution and spread of pine shoot moth (Rhyacionia buoliana). (10-67) (Completed Jan. 6/86)

4. Obtain additional data for Saskatchewan and Manitoba. Include jP terminal weevil in both cases. Prepare report for prairie region on abundance and control possibilities for wP weevil, root collar weevil and terminal weevil. (10-68) (Completed Jan. 14/86)

5. Conduct small scale screening trials for efficacy and crop tolerance on FPMI priority-rated herbicides. (10-69)

6. Maintain strong contact with FPMI and participation in ECW, ECPVA, and WCCP re herbicides. (10-70)

7. Continue field evaluation of herbicides for site preparation and conifer release at the Grande Prairie benchmark site and for conifer release at the Calling Lake site (Co-op AFS, Dupont - Pfizer). (10-71).

8. Complete studies of biology and taxonomy of seed eating Proteoteras spp. Prepare final report. (10-65)

12. Publications 1985-86:

Drouin, J.A. 1985. Expert Committee on Weeds Research Report Vol. 3 Western Canada Section, Edmonton pp. 215-242.

Drouin, J.A. 1985. Annual revision of insect pests and controls on berry crop. In WCCP Report (1985). 5 pp.

Cerezke, H.F., J.A. Drouin, and B. Neill. 1985. Annual revision of insects pests and controls on shelterbelts, ornamentals and shrubs. In WCCP Report (1985). 15 pp.

Cerezke, H.F. and J.A. Drouin. 1985. Insect pests and controls in seasoned wood and timber structures. In WCCP Report (1985). 3 pp.

Soehngen, U., M. Steiner, and J.A. Drouin. 1985. Annual revision of insect pests and controls on houseplants and on greenhouse woody ornamentals and crops. In WCCP Report (1985). 17 pp.

Drouin, J.A. 1985. Expert Committee on Weeds proposed recommendations 1985. ECW (Western Canada), Edmonton, pp. 303-309.

13. Environmental Implications:

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

1. All experimental herbicide applications have been done under permits issued by Alberta Environment, Environmental Protection Services (Pollution Control Division), and the studies are registered with FICP.

2. Experimental plots are very small (1/10 acre).

3. Either the plots are distant from any water bodies or there was a buffer zone of 30-50 m between the plots and a water body.

4. No federal funding was involved in herbicide applications or in locating the plots.

5. Plots are being monitored over long term to assess the effects of herbicide application on vegetation and forest crop species.

6. Methods of application included back pack spray, spot-gun spray or as grid balls. As a result, no aerial drift of herbicides was expected or observed.

14. Resources 1986-87:

| | | |
|---|---|---|
| PYs: | Prof.: | 0.0 |
| | Tech.: Drouin | 1.0 |
| | Total: | 1.0 |
| | Term/Student: | 0.0 |

O & M:

Capital:

15. **Signatures:**

Investigator

Program Director, Resources

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 7, 1986
Revised: March 20, 1986

1. Project: Forest Insect and Disease Surveys and Management Systems

2. Title: Forest Insect and Disease Surveys

3. New: Cont.: X 4. No.: NOR-11-01

5. Study Leader: H.F. Cerezke and B.H. Moody

6. Key Words: Detection, appraisal, distribution, parasites, hosts, damage, predators, biological control, hazard, susceptibility, stability, management, parks, recreation, symptoms, damage, effluents, easement atmosphere

7. Location of Work: Region wide

8. Study Objectives:

   1. To gain an improved knowledge of forest insects and diseases in the region for the purpose of minimizing damage to trees and shrubs attributable to these organisms and to provide an advisory service to management agencies and the public, and to contribute to FIDS national overview of important pest conditions and to compile pest loss data to support FORSTATS.

   2. To support research and plant quarantine activities with historical records, collections, and observations.

   3. To contribute to the acid rain national early warning system ARNEWS, to detect acid rain damage to the forest in the region.

   4. Provide management agencies with diagnostic impact and appraisal services relating to effects of insects, diseases, climate influences, and pollutants on trees and shrubs and other types of vegetation.

9. Goals for 1985-86:

   1. Survey, map, and report on major forest pests of the region, i.e. mountain pine beetle, forest tent caterpillar, spruce budworm, jack pine budworm, dwarf mistletoe, and needle cast or needle rust (Moody).

2. Conduct special surveys for particular pests or of designated areas. (Moody, Cerezke).

3. Compile and publish an Information Report on the forest pest situations in the region for 1984 and make predictions for 1985. Draft copy of the report will be sent to FIDS coordinator in Ottawa for national compilations. (Moody, Cerezke).

4. Provide pest extension service and technology transfer to various client agencies and general public. (Moody, Cerezke, FIDS staff)

5. Represent NoFC and CFS on various provincial, regional, and national forest insect and disease committees and advisory groups. (Moody, Cerezke)

6. Organize and conduct annual interagency FIDS review and planning meeting with representatives (contact persons) from three prairie provinces, the Northwest Territories and Parks Canada (Prairie and Western Region). (Moody, Cerezke)

7. Publish Forestry Report on FIDS. (Moody, Cerezke)

8. Publish Forest Management Notes on forest pest conditions and forecast for each of the prairie provinces and the NWT. (Moody)

9. Complete and submit first draft of a standard survey methodology manual suitable for the region. (Moody)

10. Collaborate with Bill Ives and Dick Wong and provide assistance with photography and insect collection for the pictorial guide to forest and shade tree insects of the prairie provinces. (Moody).

11. Establish plots to contribute the national program to detect early signs of acid rain (pollutants) damage to the forests. (Moody)

12. Provide functional guidance for NOR-36-04 Forest pest management and damage appraisal (Manitoba), Development Agreement for surveys of forest pest conditions and their damage, and in providing pest control advisory services and technology transfer. (Moody)

10. <u>Accomplishments in 1985-86</u>:

1. Aerial and ground surveys were conducted and areas of tree mortality or moderate-to-severe infestations were mapped of major forest pests (spruce budworm, mountain pine beetle, spruce beetle, forest tent caterpillar, and jack pine budworm) in the three prairie provinces and the Northwest Territories. Aircraft time for surveys is largely provided by outside agencies.

2. Many special surveys for particular pests or of designated areas were conducted and reports prepared. Examples are as follows:

a. Special surveys were conducted for overwinter survival and brood-gallery development of mountain pine beetle in southwestern Alberta, and several national parks.

b. Conducted field experiments to test spruce budworm pheromones in two types of traps (Pherocon 1CP and Multipher traps) for use in monitoring budworm populations.

c. Surveys to detect new or introduced pests also included baited traps for possible introduction of gypsy moth and the European pine shoot moth. One male gypsy moth was trapped in Sherwood Park in 1984 but none in 1985. Elm bark beetle surveys were conducted with Alberta Environment and Alberta Agriculture but beetles were not detected in Alberta.

d. Special pest surveys were conducted in three forest nurseries, jack pine regeneration, white spruce plantations, and jack pine seed orchard in Saskatchewan and pine plantations in Manitoba.

e. Nematode infested logs were collected in Manitoba and sent for identification of the Pinewood nematode. Report prepared for Ottawa.

3. Compiled and published Information Report on the forest pest situations in the region for 1984 and made predictions for 1985. Draft copy of the report was sent to Ottawa for FIDS national report.

4. Pest extension services were provided and about 2000 inquiries were processed. Information booths on tree pests were displayed to the general public, on numerous occasions, and pest leaflets and other material were distributed.

   a. Workshops, lectures, and talks on forest pests were presented on 30 occasions, e.g. to Parks Canada staff, courses sponsored by Alberta Agriculture, staff of tree nurseries, AFS staff, Parks and Recreation, etc.

   b. T.V., radio, and newspaper interviews were given on pest problems.

   c. Open House displays and advice on pests.

5. Represented NoFC and CFS on various committees and advisory groups:

   a. Representation and report prepared for the Alberta Pest Control Advisory Council.

   b. Representation and two reports prepared for the Forest Pest Control Forum (Ottawa).

   c. Also provided representation and reports for:

      - Manitoba DED Advisory Committee
      - Saskatchewan Advisory Council - Plant Disease (Saskatoon)

- Saskatchewan Advisory Council - Insect Control (Saskatoon)
- DED Advisory Council - Saskatchewan (Regina)
- Alberta Horticultural Environment Subcommittee (Edmonton). Herb Cerezke served as secretary 1985.
- Alberta Extension Horticultural Committee (Red Deer)
- Western Forest Insect Work Conference (Colorado) Ben Moody served as Secretary/Treasurer

6. Annual interagency FIDS review and planning meeting was conducted in March 1985 at NoFC with representations from three prairie provinces, the Northwest Territories and Parks Canada.

7. First draft of Forestry Report almost completed.

8. The forest pest conditions and forecast for each of the prairie provinces and the NWT were distributed in the form of File Reports.

9. First draft of a standard survey methodology is being prepared.

10. Collaborated with Bill Ives and Dick Wong and provided assistance with photography and insect collections for the illustrated report "A pictorial guide to the forest and shade tree insects of the prairie provinces".

11. Established and sampled 10 permanent plots under the acid rain national early warning system (ARNEWS) and foliage and soil samples are being chemically analyzed through NOR-7. These plots are distributed as follows: 4 in Manitoba, 2 in Saskatchewan and 4 in Alberta.

12. Provided functional guidance to FIDS projects under the Canada-Manitoba Forest Renewal Agreement (NOR-36-04), and assistance by the transfer of FIDS Ranger, Mike Grandmaison to Winnipeg.

Added Accomplishments:

13. Formulated and wrote Insect and Disease Projects under the Canada-Alberta and Canada-Saskatchewan Forest Resource Development Agreements.

11. Goals for 1986-87:

1. Survey, map, and report on major forest pests of the region, i.e. mountain pine beetle, spruce beetle, forest tent caterpillar, spruce budworm, jack pine budworm, dwarf mistletoe, and needle cast or needle rust. (Cerezke and FIDS technical staff))

2. Conduct special surveys for particular pests or of designated areas. (Cerezke, Moody, and FIDS technical staff)

3. Compile and publish an Information Report on the forest pest situations in the region for 1986 and make predictions for 1987. Draft copy of the report will be sent to FIDS coordinator in Ottawa for national compilations. (Cerezke, Moody,)

4. Provide pest extension service and technology transfer to various client agencies and the general public. (Cerezke, Moody, FIDS staff)

5. Represent NoFC and CFS on various provincial, regional, and national forest insect and disease committees and advisory groups. (Cerezke, Moody, and FIDS staff)

6. Organize and conduct annual interagency FIDS review and planning meeting in March with representatives (contact persons) from three prairie provinces, the Northwest Territories and Parks Canada (Prairie and Western Region). (Cerezke, Moody,)

7. Complete material for review and publish Forestry Report on FIDS. (Moody, Cerezke)

8. Complete and submit first draft of a standard survey methodology manual suitable for the region. (Moody)

9. Survey plots established under the national program to detect early signs of acid rain (ARNEWS) (pollutants) damage to the forests with NOR-7. (Cerezke, Moody and FIDS technical staff)

10. Provide functional guidance for I & D projects under the 3 FRDA Agreements in the prairie provinces. (Cerezke)

12. Publications 1985-86:

Moody, B.H. and H.F. Cerezke. 1985. Forest insect and disease conditions in Alberta, Saskatchewan, Manitoba and the Northwest Territories in 1984 and predictions for 1985. Inf. Rep. NOR-X-269.

Moody, B.H. and H.F. Cerezke. 1985. Contribution In: Forest Insect and Disease Conditions in Canada. 1984. Compiled by E.S. Kondo and R.G. Taylor. Environ. Can., Can. For. Serv., Ottawa.

Cerezke, H.F. and other members of TULC. 1985. Trees in the Urban Landscape. Alta. Agric. Publ. 40 p.

Unpublished Reports:

Cerezke, H.F. 1985. Report to Environmental Committee of Alberta Horticultural Advisory Committee.

Cerezke, H.F., Drouin, J., Neill. 1985. Revisions for 1986 Western Committee Crop Pests publication.

Cerezke, H.F. 1985. Mountain pine beetle outbreak in Alberta and Saskatchewan, 1976-1985.

Emond, F.J. 1985. Pest extension report. File Report.

Emond, F.J. 1985. Insect and disease surveys of provincial tree nurseries. File Report.

Emond, F.J. 1985. Insect and disease conditions in Waterton, Banff, Jasper, Kootenay, Yoho and Elk Island national parks, 1985. File Report.

Gates, H. 1985. 1985 Spruce budworm pheromone trapping and larval wash for 1986 forecast. File Report.

Gates, H. 1985. Forest pest conditions in the Northwest Territories, 1985. File Report.

Gates, H. 1985. Forest insect and disease surveys in Wood Buffalo and Nahanni national parks, 1985. File Report.

Grandmaison, M. 1985. Pest conditions in Riding Mountain National Park, 1985. File Report.

Moody, B.H. 1985. Report on the spruce budworms in the prairie provinces and the Northwest Territories 1985. Report prepared for the 12th Annual Forest Pest Control Forum, Ottawa.

Moody, B.H. 1985. Report on the status and control of other pests in the prairie provinces, 1985. Report prepared for the 12th Annual Forest Pest Control Forum, Ottawa.

Moody, B.H. 1985. Status of major forest insects and diseases in the prairie provinces and the NWT, 1984-85. Contribution to report to working group on forest insect and diseases, North American forestry Commission, October 1985.

Moody, B.H. 1985. Highlights of forest insect and disease research in the prairie region. Contribution to the Canadian report to the North American Forestry Commission, October 1985.

Still, G.N. 1985. Microcomputer mapping program for forest pests infestation. Program.

Still, G.N. 1985. Insect and disease conditions in Alberta, 1985. File Report.

Tidsbury, C. 1985. Spruce budworm in Saskatchewan, 1985 and forecast for 1986. File Report.

Tidsbury, C. 1985. Jack pine budworm in Saskatchewan, 1985 and forecast for 1986. File Report.

Tidsbury, C. 1985. Forest tent caterpillar infestations, 1985 and defoliation forecasts for 1986. File Report.

Tidsbury, C. 1985. Insect and disease conditions in Prince Albert National Park, 1985. File Report.

13. 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.

14. Resources 1986-87:

| | | | | |
|---|---|---|---|---|
| PYs: | Prof.: | Cerezke | 0.5 | |
| | | Moody | 0.3 | |
| | Tech.: | Emond | 1.0 | |
| | | Still | 1.0 | |
| | | Grandmaison | 1.0 | (Manitoba District Office) |
| | | Tidsbury | 0.7 | |
| | | Gates | 1.0 | |
| | Total: | | 5.5 | |
| | Term/Student: | | 1.2 | |

O & M: $37,000

Capital:

15. Signatures:

Investigator

Investigator

Program Director, Protection

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 7, 1986

1. Project: Forest Insect and Disease Surveys and Management Systems

2. Title: Sawfly systematics

3. New: Cont.: X 4. No.: NOR-11-02

5. Study Leader: H.R. Wong

6. Key Words: Tenthredinoidea, Nearctic Region, distribution, hosts, keys, life history, morphology, new genera, new species, biogeography, revision, Symphyta, evolution, phylogeny

7. Location of Work: Edmonton, Alberta

8. Study Objectives:

   1. To maintain taxonomic expertise on sawflies of Canada at the national and international level.

   2. To study morphology, evolution and biogeography of the economically more important sawfly genera which may ultimately lead to their revision in North America.

9. Goals for 1985-86:

   1. Identify larval and adult sawflies for research personnel, institutions, and laboratories.

   2. Review for the Canadian Entomologist, a manuscript of nearly 400 pages submitted for publication.

   3. Complete review and submit for publication "Larvae of the North American genera of Diprionidae (Hymenoptera: Symphyta)" for review by the technical board.

   4. Continue supervising the research of the visiting scholar from the Forest Research Institute, Chinese Academy of Forestry, Beijing, People's Republic of China.

10. Accomplishments in 1985-86:

1. Identified over 1000 larval and adult sawflies for regional clients and reviewed 2 manuscripts for the Proc. Entomological Society of Washington.

2. Reviewed a monograph of nearly 400 pages for publication in the Memoirs of the Entomological Society of Canada.

3. The manuscript "Larvae of the North American genera of Diprionidae (Hymenoptera: Symphyta)", has been reviewed by the technical board and two outside reviewers and has been submitted to Can. Ent.

4. A paper with the visiting scholar from the Forest Research Institute, Chinese Academy of Forestry, Beijing, People's Republic of China entitled "Colonization of lodgepole pine stumps by ants (Hymenoptera: Formicidae in Hinton, Alberta" was presented at the 33rd Annual Meeting of the Entomological Society of Alberta.

11. Goals for 1986-87:

1. Identify larval and adult sawflies for research personnel, institutions, and laboratories.

2. Publish "Larvae of the North American genera of Diprionidae (Hymenoptera: Symphyta)".

3. Identify 250 specimens of Pristiphora for the Systematic Entomology Laboratory, USDA, Washington, D.C. and prepare a report on any new species.

4. Supervise the research of the visiting scholar from the Chinese Academy of Forestry, Beijing, People's Republic of China until departure in August.

5. Prepare and submit for review a paper on the "Colonization of lodgepole pine stumps by ants (Hymenoptera: Formicidae) in Hinton, Alberta".

12. Publications 1985-86:

Wong, H.R. 1985. Observations on the life history and habits of Nematus calais Kirby (Hymenoptera: Tenthredinidae) defoliating willows in Alberta (Abst.). Proc. Ent. Soc. Alberta 32:9.

13. 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.

14. Resources 1986-87:

PYs: Prof.: Wong 0.3

Tech.: 0.0

Total: 0.3

Term/Student: 0.3

O & M: $1,000

Capital:

15. Signatures:

Investigator

Program Director, Protection

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 7, 1986
Revised: March 20, 1986

1. Project: Insects and Disease Management Systems and Surveys

2. Title: Biological assessment of insects injurious to trees and forests

3. New: Cont.: X 4. No.: NOR-11-03

5. Study Leader: H.F. Cerezke

6. Key Words: Forest habitats, plantations, seed orchards, shelterbelts, tree nurseries, damage impact, integrated control, population monitoring, insect ecology and behavior, bark beetles, woodborers, budworms, seed and cone insects, regeneration pests, pheromones

7. Location of Work: Region wide

8. Study Objectives:

   1. To investigate the distribution, abundance, damage impact, hazard, and control strategies of important forest insect problems within the region.

   2. To provide technology transfer and information services to clientele concerning insects, diseases and other damage agents and their effects on stand management and in the urban landscape.

9. Goals for 1985-86:

   1. Continue representation on MPB Technical Committee and provide input into CAN/US MPB Action Plan as required.

   2. Complete the analyses of MPB trap catch data collected in 1984 and prepare first draft report with co-workers from University of Calgary titled: "Attractiveness of structural analogs of brevicomin to mountain pine beetle in field bioassay studies in southwestern Alberta, 1982 to 1984".

   3. Complete the analysis of MPB rearing experiment on jack pine and summarize in report format. (Likely a note in Can. Entomol.)

4. Prepare final reports of the following three studies:

   a. Impact studies of the jack pine budworm in the Nisbet Prov. Forest, Saskatchewan (For. Management Note or short journal publication).

   b. Surveys of the spruce budworm populations and damage in Riding Mt. National Park (Inf. Rep.).

   c. Control studies of seed and cone insects in mature white spruce trees with carbofuran near Grande Prairie, Alberta (journal publication).

5. Continue cooperative field studies with Drs. Wieser and Dixon at Univ. Calgary and Alberta Forest Service on MPB pheromone testing and applications.

6. Provide consultory and technology transfer services to clientele as requested.

7. Sumarize data and prepare first draft report of MPB studies with co-workers Drs. H. Wieser and E. Dixon, Univ. Calgary, titled: "Mountain pine beetle attack density pattern on semiochemical-baited and unbaited lodgepole pine in southwest Alberta".

10. Accomplishments in 1985-86:

1. a. Attended and reported at a MPB Technical Committee review meeting in Cranbrook, B.C., September, 1985

   b. Participated in a field tour in Idaho/Montana to view Lp/MPB management strategies July 1985; organized under Can/US MPB Action Plan.

2. All measurements of MPB trapped in 1984 were completed and statistical analyses were completed on most 1983 and 1984 data. Some tables and graphs were prepared with co-workers at Univ. Calgary and a first draft manuscript was started titled: "Attractiveness of structural analogs of brevicomin to MPB in field bioassay studies in southwest Alberta, 1982-1984. (Co-authors: Wieser, Dixon, Ibrahim and Cerezke).

3. Analyses were completed on all data but no separate report was prepared. Instead the data will likely be combined with results from a similar study that compared MPB attraction to three pine hosts: lodgepole, jack and limber pines. Results of the latter study were summarized and presented at the Ann. meeting of the Entomological Soc. Alta, Oct./85. Paper titled: "Attack pattern and brood productivity of the MPB on three pine hosts".

4. a. Report on jack pine budworm impact studies was re-written for presentation at Jack Pine Budworm Workshop to be held Jan. 14-15, 1986 in Winnipeg. Paper titled: "Impact studies of the jack pine budworm, Choristoneura pinus pinus, in Nisbet Provincial Forest, Saskatchewan".

b. Revisions for report on spruce budworm studies in Riding Mt. National Park are underway.

c. Paper on control studies of seed and cone insects was reviewed, revised, and now with editor in final draft form for Inf. Report.

5. In cooperation with Drs. H. Wieser and E. Dixon, U. of C. (funded by Alberta Forest Research Dev. Funds), four field experiments were attempted with pheromone tests, three on MPB and one with spruce beetle:

a. Several chemical compounds tested for attraction to MPB as bait in traps; trap catch data are likely too low to yield useful results because of declining populations overall.

b. Two "best" compounds were field-tested at three different release rates to determine field response to MPB; again trap catch may be too low to provide meaningful results.

c. Several pheromone blends were tested in limber pine stands for attraction to MPB in three replicated plots and four sampling periods. Data measurements are incomplete and not summarized. Catches of MPB are adequate to yield meaningful results.

d. Known pheromone bait formulations were field-tested as bait in traps for spruce beetle attraction in a latin square design north of Manning, Alberta. Catch results were very low for one of several reasons; placed out in field too late for beetle flight, poor response to existing pheromone, or population too low.

6. Important consultory and technology transfer services have included: provided information and advise on woodborers in export lumber for major company; participated in MPB training session to Jasper Park warden staff; participated in two review meetings on MPB with Alberta For. Ser.; gave lecture on seed and cone insects to U. of A. forestry students; participated in two seminars on major forest insects for Manitoba and Saskatchewan forestry staff; assembled an open-house display on MPB pheromones; served on advisory committee for U. of A. graduate student; provided information (spruce beetle, spruce budworm, decays, blowdown) to consulting forester to incorporate into a long-term management plan of overmature Sw along lower Liard R., NWT; and jointly prepared on outline with B. Miyagawa (AFS) of proposed MPB review publication for Alberta.

7. Prepared first draft of proposed journal article titled: "Mountain pine beetle attack density pattern on semiochemical-baited and unbaited lodgepole pine in southwest Alberta", by H. Cerezke, H. Wieser and E. Dixon.

8. Accepted responsibility as an Associate Editor of the Canadian Entomologist.

11. Goals for 1986-87:

1. Complete final draft copies of the following in publishable format:

   a. Impact studies of jack pine budworm in the Nisbet Provincial Forest, Saskatchewan; to be presented at Jack Pine Budworm Workshop Jan. 14-15, 1986 in Winnipeg and likely printed in a Proceedings of the workshop.

   b. Surveys of spruce budworm populations and damage impact in Riding Mt. National Park, 1979-80; Inf. Rep.

   c. Control studies of seed and cone insects in mature white spruce trees with carbofuran near Grande Prairie; Inf. Rep.

2. Complete first draft copies and submit for review the following manuscripts; first three are proposed journal articles; d) will be presented as a paper by E. Dixon at Canadian Chemical Conference, June 1986 in Saskatoon, Sask. Likely author/co-authorship are indicated.

   a. Mountain pine beetle attack density pattern on semiochemical-baited and unbaited lodgepole pine in southwest Alberta. (Cerezke, Wieser, Dixon)

   b. Attractiveness of structural analogs of brevicomin to MPB in field bioassay studies in southwest Alberta. (Wieser, Dixon, Ibrahim, Cerezke)

   c. Attack pattern and brood productivity of the MPB on three pine hosts. (Cerezke)

   d. Probing the receptor site for the aggregation pheromone exo-brevicomin in MPB (Dixon, Ibrahim, Castro, Wieser, Cerezke)

3. Continue representation on MPB Technical Committee and provide input into CAN/US MPB Action Plan as required. Attend MPB/Lodgepole pine field trip in Okanagan area of BC in 1986 as a planned tour of the Action Plan.

4. Complete measurements and analyses of 1985 MPB pheromone data.

5. In cooperation with co-workers, Wieser and Dixon at U of C, conduct three field trials for attractiveness of pheromone compounds to MPB and to spruce beetle, to evaluate these materials for detection/monitoring tools.

   a. Test and compare the effectiveness of two bait formulations in traps for MPB detection and monitoring at low population levels.

   b. Test attractiveness to MPB of several lure formulations in traps. This goal is contingent upon securing two suitable MPB infestation sites in eastern B.C. for testing with cooperation of B.C. Forest Service.

c. Conduct a repeat of the 1985 field test of pheromone compounds for attractiveness to the spruce beetle.

6. Contribute to proposed Alta. Forest Service publication: "Mountain pine beetle in Alberta--a decade of infestation, 1977-1986".

7. Provide technology transfer and information services to clientele as requested, and carry out duties required for an Associate Editor of Can. Entomol.

12. Publications 1984-85:

Unpublished Reports:

Cerezke, H.F. 1985. Report to Technical Committee on mountain pine beetle.

Cerezke, H.F. 1985. Attack pattern and brood productivity of the MPB on three pine hosts. Paper presented at annual meeting of the Entomological Society of Alberta, Lethbridge, Oct. 1985. Abstract to be printed in 1985 Proceedings.

13. 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.

14. Resources 1986-87:

| | | | |
|---|---|---|---|
| PYs: | Prof.: | Cerezke | 0.5 |
| | Tech.: | | 0.0 |
| | Total: | | 0.5 |
| | Term/Student: | | 0.3 |

O & M: $6,000

Capital:

15. Signatures:

H. J. Cerezke
Investigator

Program Director, Protection

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 7, 1986

1. Project: Forest Insect and Disease Surveys and Management Systems

2. Title: Forest insect diagnostic and biosystematic services

3. New: Cont.: X 4. No.: NOR-11-04

5. Study Leader: H.R. Wong and W.G.H. Ives

6. Key Words: Insects, larvae, damage, hosts, parasites, biological control, galls, seasonal occurrence, distribution, nomenclature, taxonomy, identification, reference collection, insectary, life history

7. Location of Work: Edmonton, Alberta

8. Study Objectives:

   1. Provide diagnostic and biosystematic services to clients, in-service personnel, outside agencies, and scientists engaged in biological and taxonomic research on insects.

   2. Maintain and improve the regional collection of insects and mites.

   3. Initiate biological and ecological studies of forest insects that cause economic damage in the Canadian prairies.

9. Goals for 1985-86:

   1. Provide diagnostic and biosystematic services for the more difficult determinations on mature and immature insects damaging forest and shade trees. (Wong)

   2. Maintain and improve reference collection of insects and mites. (Wong)

   3. Provide information and specimens to scientists engaged in taxonomic and biological studies. (Wong)

4. Determine the spread of introduced insects in the Canadian prairies. (Wong)

5. Determine the species of ants attacking lodgepole pine stumps in the Hinton area of Alberta. (Wong)

6. Continue the preparation of the pictorial guide to the forest and shade tree insects of the Canadian prairies by:

   a. Identifying immature and mature insects and obtaining the necessary photographs.

   b. Conducting a literature review of the forest insects of this region.

   c. Prepare text and figures for the guide. (Ives, Wong)

7. Prepare for publication a manuscript on Petrova albicapitana (Busck) and Petrova metallica (Busck) (Lepidoptera: Tortricidae) in Pinus contorta stands of Alberta with J.A. Drouin and C.L. Rentz. (Wong, Drouin)

8. Prepare for publication a Forest Management Note on the major insects attacking poplar stooling beds in the nurseries of the Canadian prairies. (Wong, Emond)

10. Accomplishments in 1985-86:

1. Determined several thousand insect specimens in the mature and/or immature stages submitted to the Northern Forestry Centre and handled over a thousand enquiries from in-service personnel, clients, outside agencies, and scientists.

2. a. Over two hundred specimens determined by specialists in Ottawa and by myself have been incorporated into the insect reference collection.

   b. Over four hundred specimens collected by personnel of the Insect and Disease Survey were reared, in which over one hundred and fifty were overwintered to obtain biological information and specimens for the reference collections.

   c. Over 1000 specimens were pinned, spread, labelled, or preserved for the reference collection.

3. Biological information and/or specimens were provided to:
   Dr. Ichiji Togashi, The Ishakawa Ag. College, Japan.
   Dr. I.D. Lafontaine, Biosystematic Res. Institute, Ottawa.

4. a. A survey was made in 1985 for the following introduced insects, which have entered southeastern Manitoba in recent years.

   - The distribution of the introduced pine sawfly, which was first collected in 1983, has not extended its range beyond Bird's Hill Provincial Park near Winnipeg, Manitoba.

- The European spruce sawfly present since 1969, has been collected as far north as Silver Falls, Manitoba.

- Larvae of larch casebearer, present since 1965, was not collected in 1985 in Manitoba. Pheromone traps placed in the Sprague area of Manitoba, however collected a number of adults, which appear to be the larch casebearer. These were sent to Ottawa for confirmation.

- The mountain ash sawfly collected at Falcon Lake, Manitoba in 1984 was absent in this area in 1985.

- A single male of the Gypsy moth was captured in a pheromone trap in Sherwood Park, Alberta in 1984. Numerous pheromone traps set out in this area in 1985 failed to collect any males of this species in this area in 1985.

b. The European pine shoot moth present in Ontario and British Columbia is still absent in Alberta.

5. Ten species of ants were observed colonizing lodgepole pine stumps in the Hinton area, Alberta. The species Myrmica incompleta Provancher, Formica subnuda Emergy, and Camponotus herculeanus (Linnaeus) were the dominant species. The slave species were Formica neorufibarbis Emergy and Formica fusca (Linnaeus). The species Formica dakotensis Emergy was a temporary parasite of Leptothorax muscorum (Nylander). The other species were Formica obscuriventris Mayr, Formica opaciventris Emergy and Formica cinerea Mayr.

6. Accomplishments in the pictorial guide to the forest and shade tree insects of the Canadian prairies are as follows: (1) identifying and rearing of over 4500 specimens, (2) preparation of over 2000 specimens for photographing, (3) overwintering of over 1000 specimens, (4) preparation of over 3500 slides of insects and their damage, (5) preparation of additional 40 color plates and the improvement of the many previous 60 plates, and (6) preparation of the text for an additional 30 plates making an approximate total of 60 completions.

7. The manuscript "Petrova albicapitana (Busck) and Petrova metallica (Busck) (Lepidoptera: Tortricidae) in Pinus contorta stands of Alberta" has been accepted for publication in the Canadian Entomologist.

8. Figures for the note on the major insects attacking poplar stooling beds in nurseries of the Canadian prairies has been prepared and the text is being written.

11. Goals for 1986-87:

1. Provide diagnostic and biosystematic services for the more difficult determinations on mature and immature insects damaging forest and shade trees. (Wong)

2. Maintain and improve reference collection of insects and mites. (Wong)

3. Provide information and specimens to scientists engaged in taxonomic and biological studies. (Wong)

4. Determine the spread of introduced insects in the Canadian prairies. (Wong)

5. Continue the preparation of the pictorial guide to the forest and shade tree insects of the Canadian prairies by:

   a. Collecting and identifying immature and mature insects required to complete the guide and obtaining the necessary photographs.

   b. Conducting a literature review of the forest insects of the region for sections not yet written.

   c. Prepare most of the remaining text and figures for the guide. (Ives, Wong)

   d. Rearing insects collected in 1985 and 1986 for positive identification. (Ives, Wong)

   e. Submit majority of write-ups for review. (Ives, Wong)

   f. Begin preparing camera-ready plates for pictorial guide during winter of 1986-87. (Ives, Wong)

12. Publications 1985-86:

Wong, H.R.; Drouin, J.A.; Rentz, C.L. 1986. Petrova albicapitana (Busck) and Petrova metallica (Busck) (Lepidoptera: Tortricidae) in Pinus contorta stands of Alberta. Can. Ent.117:1463-1470.

Drouin, J.A.; Wong, H.R. 1985. Life history and distribution of Petrova metallica (Lepidoptera: Tortricidae) in Alberta. (Abst.) Proc. Ent. Soc. Alberta 32:8.

13. 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.

14. Resources 1986-87:

PYs: Prof.: Wong 0.7
Ives 0.5

Tech.: 0.0

Total: 1.2

Term/Student: 1.3

O & M: $3,000

Capital:

15. Signatures:

Investigator

Program Director, Protection

Investigator

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 7, 1986
Revised: March 20. 1986

1. Project: Forest Insect and Disease Surveys and Management Systems

2. Title: Damage appraisal of major forest pests

3. New: Cont.: X 4. No.: NOR-11-05

5. Study Leaders: W.J.A. Volney and B.H. Moody

6. Key Words: Damage, appraisal, impact, hosts, forest pests, management, mortality, growth loss

7. Location of Work: Prairie provinces, Northwest Territories

8. Study Objectives:

   1. To determine the significance of specific forest pests in terms of measured damage to trees and forest stands.

   2. To develop or modify appraisal methods for assessment of losses caused by forest pests; and to provide information on forest depletion that can be used in the national forest statistics data program.

   3. Design forest pest management systems which optimize the return from stand management activities.

9. Goals for 1985-86:

   1. Remeasure 37 impact plots and assess damage by the mountain pine beetle in the national parks. Establish additional plots if required.

   2. Prepare first draft of a literature review on the effects of major forest pests on tree mortality and growth in the forests of the region.

   3. a. Remeasure for the fourth year, 17 spruce budworm impact plots in Manitoba, assess data, and prepare report.

      b. Assess for the second year damage caused by the jack pine budworm in 10 permanent plots in Manitoba in collaboration with NOR-36-04 Development Agreement, Pest Management Program.

c. Reassess dwarf mistletoe impact plots in Saskatchewan and establish additional plots if required.

4. Continue to investigate the use of remote sensing techniques as a tool to assess pest damage in cooperation with project NOR-4 and FIDS project at Petawawa.

5. Continue to develop effective working relationships with officials of provincial and industrial forest resource management agencies.

10. Accomplishments in 1985-86:

1. Tree condition was re-assessed for the fifth year on 37 impact plots for damage caused by the mountain pine beetle in pine stands in the national parks (Yoho (6), Kootenay (6), Waterton (25)). The outbreak has collapsed in many stands and a report is in progress.

2. Work on the first draft of a literature review of the effects of major forest pests on tree mortality and growth in the forests of the region has been slow, and the draft should be completed in 1986.

3. a. Defoliation and tree mortality caused by the spruce budworm were assessed on 13 impact plots located in white spruce/balsam fir stands on Hecla Island and in the Whiteshell provincial forest, Manitoba. The budworm outbreak is declining and a report is being prepared.

b. Assessed for the third year damage caused by the jack pine budworm in 10 permanent plots near Grand Rapids, Manitoba. The data are being analyzed. This is in collaboration with the Forestry Branch, MDNR.

c. Reassessed five dwarf mistletoe impact plots in the Nisbet Provincial Forest, Saskatchewan.

4. Continued to give support to work on the use of remote sensing for pest damage surveys being conducted at PNFI, Petawawa and at the Canada Centre for Remote Sensing.

5. Participated in several meetings with regional forestry personnel to discuss enhancement of pest depletion loss figures and damage assessment.

Added Accomplishments:

6. Two computer programs: 1) A MPB Hazard Rating System; 2) FIDS damage surveys; developed in the U.S. have been adapted and modified to meet local climatic, environmental, and pest conditions.

7. Prepared report on jack pine budworm outbreak history, impact, and damage, and FIDS sampling and predictive methods for Manitoba proceedings on jack pine budworm, Jan. 14, 1986.

8. Most of the data on the spruce budworm damage assessment during the 1955-69 Namew Lake, Manitoba outbreak have been received, sorted, and are being analyzed.

11. Goals for 1986-87:

1. Remeasure 37 impact plots and assess damage by the mountain pine beetle in the national parks and write report. Collect data on seed viability and availability. Establish additional plots if required. (Moody)

2. Complete draft of a literature review and submit for review on the effects of major forest pests on tree mortality and growth in the forests of the region (Inf. Rep.). (Moody)

3. a. Remeasure 13 spruce budworm impact plots in Manitoba, assess data, and write report. (Moody)

b. Assess for the fourth year damage caused by the jack pine budworm in 10 permanent plots in Manitoba and complete report. (Moody,)

c. Reassess dwarf mistletoe impact plots in Saskatchewan and establish additional plots if required and prepare a Forest Management Note. (Moody)

4. Provide functional guidance and supervision on studies initiated under the Federal-Provincial Forest Resources Development Agreements in the Western and Northern Region and provide input for the FIDS annual report, as required. (Volney, Moody)

5. Continue to investigate the use of remote sensing techniques as a tool to assess pest-caused damage to the forests; in cooperation with project NOR-4 and FIDS project at Petawawa. (Moody)

6. Continue to develop effective working relationships with officials of provincial and industrial forest resource management agencies. (Volney, Moody)

7. Participate in studies to provide a quantitative description of the relationship between major insect pest populations and stand volume losses. (Volney)

8. Participate in studies which will permit the design of a pest management system for the jack pine budworm. (Volney)

12. Publications 1985-86:

Unpublished Reports:

Moody, B.H. 1984. Computer and statistical analysis of the mountain pine beetle damage data from the Rocky Mountain National Parks. File Rep.

13. 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.

14. Resources 1986-87:

| | | | |
|---|---|---|---|
| PYs: | Prof.: | Volney | 0.5 |
| | | Moody | 0.5 |
| | Tech.: | Szlabey | 1.0 |
| | Total: | | 1.8 |
| | Term/Student: | | 0.3 |

O & M: $5,000

Capital:

15. Signatures:

Investigator

Program Director, Protection

Investigator

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 7, 1986

1. Project: Forest Insect and Disease Surveys and Management Systems

2. Title: Forest tree rusts of western North America

3. New: Cont.: X 4. No.: NOR-11-06

5. Study Leader: Y. Hiratsuka

6. Key Words: Cronartium, Pucciniastrum, Peridermium, Melampsora, Chrysomyxa, cytology, morphology, taxonomy, Uredinales inoculation experiment, pathogenicity, resistance, genetic improvement, host parasite relationship

7. Location of Work: Edmonton (laboratory, greenhouse, and mycological herbarium), western North America with particular emphasis on northern region (field)

8. Study Objectives:

   1. To study biology, pathology, host-parasite relationship, inoculation techniques, and resistance screening methods of western gall rust to contribute to the genetic improvement programs and management of lodgepole and jack pines in the prairie provinces.

   2. To study pathology, taxonomy, morphology, and life-cycle of forest tree rusts, especially those of pine stem rusts of Canada and related species in the world aiming to compile a definitive manual of forest tree rusts in Canada and a monograph of pine stem rusts.

9. Goals for 1985-86:

   1. Continue investigation of western gall rust study in conjunction with the genetic improvement program of lodgepole and jack pine. A part of the work is expected to be supported by the fund made available by the Alberta Forest Service (Forest Research Branch) through the University of Alberta.

      a. Continue to collect scions of field resistant and susceptible lodgepole pine from 4 Alberta locations and graftings will be planted in a field at NoFC.

b. The following publications will be prepared:

- Western gall rust (Information Report)
- Histopathology of western gall rust (journal paper)
- Resistant reactions of two Asian hard pines to western gall rust (journal paper)
- Inhibition of spore germination of Endocronartium harknessii by four fungicides (journal paper)

c. Attempt to establish genetically identical young plants of lodgepole and jack pines by: tissue culture plantlets, rooted hypocotyl, or excised embryo methods to test existence of western gall rust races.

d. Tissue culture of lodgepole and jack pines will be established for the study of host-parasite interactions.

e. Axenic cultures of western gall rust will be established for future studies.

2. Examine pine stem rust samples collected during the professional development leave (1983-84). Two journal papers will be prepared on morphology and cytology of Asian pine stem rusts.

3. Complete an Information Report entitled "Impact of pine stem rusts of hard pines in Alberta and the Northwest Territories--10 year plot study" with Drs. Powell and van Sickle.

10. Accomplishments for 1985-86:

1. Western gall rust study in conjunction with the genetic improvement program of lodgepole and jack pine. This work is partly supported by the fund made available by the Alberta Forest Service (Forest Research Branch) through the University of Alberta.

a. A total of 320 graftlings from scions obtained from 80 trees in 4 Alberta locations (Hinton, Jasper, Grand Prairie, Nojack) were planted in the field at NoFC for future investigation. Half (40) of the original trees were field resistant (no gall), and the other half were susceptible (multiple galls). They will be used for future investigations.

b. Publications listed in 9-1.b. are in different stages of preparation.

c. Excised embryo method to propagate genetically identical lodgepole pine plantlets was tried successfully.

d. Several tissue cultures originated from young lodgepole pine seedling tissues were started.

e. First round of attempts to obtain axenic cultures of western gall rust failed.

2. Pine stem rust samples collected during the professional development leave (1983-84) were examined. A journal paper on the cytology of an autoecious species (Peridermium yamabense) was prepared and accepted in Mycologia. A paper on morphology of several Asian pine stem rusts requires more information to be completed.

3. An Information Report entitled "Impact of pine stem rusts of hard pines in Alberta and the Northwest Territories--10 year plot study" with Drs. Powell and van Sickle is in an advanced stage of preparation.

11. Goals for 1986-87:

A. Western gall rust study

1. Continue investigation of early infection symptoms in relation to resistant symptoms and gall formation with lodgepole and jack pines.

2. Complete an Information Report on western gall rust for publication.

3. Continue to improve methods to vegetatively propagate lodgepole and other hard pines.

4. Continue to explore sure and easy techniques to establish and maintain tissue cultures of lodgepole and jack pines.

5. More attempts will be made to establish axenic cultures of western gall rust and other pine stem rusts.

B. Taxonomy and biology of forest tree rusts

6. Publish an Information Report entitled "Impact of pine stem rusts of hard pines in Alberta and the Northwest Territories - 10 year plot study" with Drs. Powell and van Sickle.

7. Examine and identify a pine stem rust from Mexico.

8. A short term (2 weeks) field trip to the People's Republic of China to collect and examine pine stem rusts will be planned if outside financial assistance (NSERC) is available.

9. Start organizing IUFRO "Rusts of Hard Pines" Working Party meeting to be held in Alberta in 1989 as the chairman of the organizing committee.

12. Publications 1985-86:

Allen, E. 1985. Infection of young seedlings of lodgepole pine by Endocronartium harknessii. (M.Sc. Thesis, University of Alberta, supervised by Y. Hiratsuka).

Allen, E.; Hiratsuka, Y. 1985. Infection of young lodgepole pine seedlings with Endocronartium harknessii. (Abst.) Am. Phytopath. Soc. Ann. Meet., Aug. 1985, Reno, Nevada. Phytopathology 75:1279.

Hiratsuka, Y. 1985. Cytology of an autoecious soft pine blister rust (Peridermium yamahense) in Japan. (Abst.) Am. Phytopath. Soc. Ann. Meet., Aug. 1985, Reno, Nevada. Phytopathology 75:1279.

Hiratsuka, Y. Cytology of an autoecious soft pine blister rust (Peridermium yamabense) in Japan. Mycologia (In press).

13. 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.

14. Resources 1986-87:

| | | |
|---|---|---|
| PYs: | Prof.: Hiratsuka | 0.7 |
| | Tech.: Maruyama | 0.7 |
| | Total: | 1.4 |
| | Term/Student: | 0.3 |

O & M: $5,000

Capital:

15. Signatures:

Investigator

Program Director, Protection

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 7, 1986

1. Project: Forest Insect and Disease Surveys and Management Systems

2. Title: Forest diseases: Research and technical transfer services

3. New: Cont.: X 4. No.: NOR-11-07

5. Study Leader: Y. Hiratsuka

6. Key Words: Mycology, herbarium, culture collection, nomenclature, identification, tree diseases, forest pathology, Armillaria root rot.

7. Location of Work: Northern Forestry Centre

8. Study Objectives:

   1. To conduct tree disease identification and taxonomic service, and to maintain and upgrade a disease reference collection (Mycological Herbarium) and a fungus culture collection.

   2. To conduct investigations of selected forest tree diseases of the region.

9. Goals for 1985-86:

   1. Complete the first draft of an information publication on major tree and shrub diseases of the prairie provinces and start editorial and review processes.

   2. Continue investigation of Armillaria root rot disease of intensively managed conifer forests. Two short journal papers and a Ph.D. thesis (by Mr. K. Mallett) are expected to be completed. If the Alberta government grant (AFDRTF) will be extended for 1985-86, further investigation on biological species verification and pathogenicity studies will be continued.

   3. Continue investigation of blue stain fungi and other microorganisms associated with mountain pine beetle with Drs. Tsuneda (Tottori Mycological Institute) and Ayer (U of A Chemistry). Host a visiting scientist, Dr. K. Suzuki (University of Tokyo) supported by NSERC Strategic Grant through the University of Alberta. Dr. Suzuki will

investigate water relationships of mountain pine beetle-attacked trees with possible cooperations of Drs. Swanson, Addison, and Dymock (NoFC) as well as Drs. Ayer and Higginbotham (U of A).

10. Accomplishments for 1985-86:

1. Significant progress has been made to produce the first draft of the book. Several sample pages and plates have been reviewed by the outside agencies and specialists for making the final decisions on format and contents.

2. Armillaria root rot study

   a. Sporophores (mushrooms) were produced abundantly in the field in 1985, and as a result, we were able to compare their morphology and evaluate the taxonomy of forms found in Alberta and other provinces in western Canada. The main type of mushrooms associated with mortality of young conifers was confirmed as Armillaria ostoyae (Romagn) Herink (=Armillaria obscura (Pers.) Herink). This species probably corresponds to two of the "biological species" (I and "foothill type") recognized in Alberta. Another common type of mushroom mainly associated with broadleaf trees seems to match with the description of A. borealis Marxmuller et Korhonen. At least one and probably two more morphologically distinct groups of mushrooms, possibly representing separate taxonomic species, were also collected.

   b. During 1985 season, about 150 diploid and more than 100 haploid cultures were obtained from Alberta, Saskatchewan, and Manitoba for cultural, pathological and genetic studies to further delineate biological and taxonomic species that exist in the prairie provinces.

   c. A journal paper on a new detection technique (trap log method) is in press (Can. J. For. Res.) and another journal paper on the nature of black line between different biological species has been submitted (Can. J. Bot.).

   d. Following papers on Armillaria root rot were presented at scientific meetings:

      - Mallett, K.I.; Hiratsuka, Y. 1985. Pathogenicity of Alberta isolates of the Armillaria mellea complex. Am. Phytopath. Soc., Reno, Nevada.

      - Suzuki, K.; Mallett, K.I.; Hiratsuka, Y. 1985. Changes in water potential components in lodgepole pine seedlings inoculated with Armillaria mellea. Am. Phytopath. Soc., Reno, Nevada.

      - Hiratsuka, Y.; Mallett, K.I.; Maruyama, P.J.; Hwang, S.F.; Mugala, M. 1985. Taxonomy and nomenclature of Armillaria mellea complex in Alberta. Pl. Path. Soc. Alta., Lethbridge, Alta.

3. Microbiological and pathological investigation of trees attacked by mountain pine beetle.

   a. To monitor physiological changes in trees after beetle attack, heat-pulse velocity equipment (Dr. R. Swanson) and Scholander pressure bomb (for pressure-volume curves) (Dr. K. Suzuki) were used. Eight unattacked trees (four trees in each of two locations) were selected. Two trees in each location were baited with a commercially prepared mountain pine beetle pheromone lure (Phero-Tech, Vancouver) supplied by Dr. H. Cerezke of the Canadian Forestry Service. One tree in each location was caged up to 2.5 m to prevent beetle attack, and one tree in each location was untreated. Three sets of probes were implanted in each tree, and xylem sap flow was monitored from July 16 to September 27. Branch samples were collected four times (July 16, August 1, September 4, and October 3) and pressure-volume curves were obtained.

      No attack occurred on four trees in one location, but two pheromone-baited trees in another location were selectively attacked (about 200 and 60 attacks, respectively) around July 31 to August 2.

      Results of the heat-pulse velocity readings and pressure-volume curves indicated that definite physiological changes occurred within 2 to 3 weeks after beetle attack. This period corresponds to the beginning of visible blue stain symptoms in the water-conducting sapwood of the attacked trees.

      The results were presented at the Phytopathological Society of Alberta meeting. Suzuki, K.; Swanson, R.H.; Maruyama, P.J.; Hiratsuka, Y. 1985. Pathophysiological investigations of trees attacked by mountain pine beetle.

   b. Metabolites isolated from blue stain fungi and other fungi were bioassayed to detect possible pathotoxin(s) involved in the mortality of trees attacked by mountain pine beetle.

11. Goals for 1986-87:

   1. Publication of an illustrated book of the tree diseases of the prairie provinces.

      a. Final decisions on the format, selection of diseases, photographic processes etc. will be decided.

      b. Rough draft of the book will be prepared by May 1986 for review.

      c. Final camera ready manuscript with color balanced plates will be produced by 1 December 1986 for the publication before the end of 1986-87 fiscal year.

2. Disease identification and taxonomic service.

   a. Provide diagnostic and identification service of tree and shrub diseases.

   b. Maintain and upgrade the Mycological Herbarium and a fungus culture collection.

3. Armillaria root rot investigation.

   a. Initiate a collaborative research on epidemiology and damage impact assessment with Dr. P. Blenis of the University of Alberta.

   b. Continue inoculation experiments to determine pathogenicity and host preference of main biological species identified in the region.

   c. Conduct extensive mating tests using haploid cultures obtained from the field and known haploid tester cultures sent by experts to determine biological species exist in the region.

   d. Conduct morphological examinations of sporophores (mushrooms), rhizomorphs, hyphae etc. to determine taxonomic species of Armillaria mellea complex exist in this region.

   e. Conduct cytological examinations of various diploid and haploid isolates to clarify nuclear cycle of the group.

4. Microbiological and pathological investigation of trees attacked by mountain pine beetle.

   a. Continue investigation of metabolites produced by main blue stain fungi for possible pathotoxin involvement (with Dr. W. Ayer, Dept. of Chemistry, University of Alberta).

   b. Continue monitoring physiological status of beetle attacked trees observed 1985 season during the spring of 1986 (2 attacked and 2 un-attacked trees). Heat pulse velocity measurements (with Dr. R. Swanson) and examination of microflora (associated with trees attacked by mountain pine beetle) will be conducted.

12. Publications 1985-86:

Mallet, K.I.; Hiratsuka, Y. 1985. Pathogenicity of Alberta isolates of the Armillaria mellea complex. Am. Phytopath. Soc. Ann. Meet., Reno, Nevada (Abst.). Phytopathology 75:1278.

Mallett, K.I.; Hiratsuka, Y. 1985. "Trap log" method to survey the distribution of Armillaria mellea in forest soils. Can. J. For. Res. (In press).

Suzuki, K.; Mallett, K.I.; Hiratsuka, Y. 1985. Changes in water potential components in lodgepole pine seedlings inoculated with Armillaria mellea. Am. Phytopath. Soc. Ann. Meet., Reno, Nevada (Abst.). Phytopathology 75:1339.

Tsuneda, A.; Mallock, D.; Hiratsuka, Y. 1985. Ascospore morphology and germination in Scopinella species. Trans. Mycol. Soc. Japan. 26:221-229.

13. Environmental Implications:

The NoFC Environmental Screening Committee has evaluated the study 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.

14. Resources 1985-86:

PYs: Prof.: Hiratsuka 0.3

Tech.: Maruyama 0.3

Total: 0.6

Term/Student: 0.0

O & M: $8,000

Capital:

15. Signatures:

Investigator

Program Director, Protection

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 7, 1986

1. Project: Forest Insect and Disease Surveys and Management Systems

2. Title: Effects of ice-nucleating agents on canker, dieback, and mortality of juvenile forest trees and amenity species

3. New: Cont.: X 4. No.: NOR-11-08

5. Study Leader: H. Zalasky

6. Key Words: Canker, dieback, mortality, juvenile trees, amenity species, ice nucleating agents, frost, frost damage, fungal succession, remedial measures, technical transfer

7. Location of Work: Northern Forestry Centre, Edmonton, intensively managed forest stands, provincial nurseries, and homeowners in our region

8. Study Objectives:

   1. To determine the effects of INA and microclimate on cold tolerance of seedlings and juvenile trees and use knowledge gained to develop more effective overwintering guidelines and to enhance field performance.

   2. Investigate the use of non INA agents or competition to control populations of INA on the phylloplane of trees and neutralize their mediation in frost.

   3. Assemble photos and photograph trees and parts of trees to illustrate the effects of frost damage and demonstrate how to diagnose symptoms even though they have been initiated in past years to aid in remedial measures of growth problems, undesirable multileadering or stunting.

   4. To investigate red belt symptoms, winter browning, bark discoloration, and subsequent severe defoliation and changes in refoliation patterns.

9. Goals for 1985-86:

   1. Prepare and submit for review a draft of "Bacterial ice nucleating patterns, chemical, morphological, and INA changes".

2. Prepare and submit for review illustrative and text material for a frost damage diagnostic report.

3. To initiate a manuscript on "the effects of INA bacteria, yeast, and fungi on conifer seedling mortality".

4. To initiate a manuscript on "the effects of INA organic substances on conifer seedling mortality".

5. Identify control factors for INA organisms.

6. Determine bio-control measures for specific INA organisms.

7. Advisory and consulting services on the health of trees and shrubs, identification, and professional service.

8. Publish abstract and present poster session paper on "Bud defects in winter damaged Colorado spruce" at Olympia Washington International Forest Disease Work Conference and at Lethbridge, Alberta, Alberta Plant Pathology Work Conference.

10. Accomplishments for 1985-86:

1. "Bacterial ice nucleating patterns, chemical, morphological, and INA changes" with the author.

2. "Diagnosis and recognition of winter damage in trees" typed and reviewed once.

3. "The effects of INA bacteria, yeast, and fungi on conifer seedling mortality" was not initiated.

4. "The effects of INA organic substances on conifer seedling mortality" was not initiated.

5. Control factors for INA microorganisms were studied by a screening method of non-INA microorganisms and amino acids. Seventy-six non-INA microorganisms and 91 combinations of non-INA and INA microorganisms were tested on containerized lodgepole pine and white spruce seedlings stored for 9 wk at -1°C. In addition 7 non-INA amino acids and 189 combinations of non-INA amino acids (1% solution, 1/10 dil, and 1/100 dil) and INA microorganisms were tested on stored seedlings. The non-INA control factors identified were species and strains of microorganisms and three types of amino acids.

6. Non-INA strains of Corynebacterium flaccumfasciens controlled 5 out of 6 INA bacteria, fungi, and yeast. C. flaccumfasciens had 21 Non-INA strains rated 1:3 as very good to good in the control of INA storage microorganisms: Corynebacterium poinsettiae, Fusarium oxysporum var. redolans, Fusarium solani, Hansenula mrackii, and Pichia fermentans. Pediococcus bacteria and 1/100 dil of tyrosine were highly specific for the control of INA Botrytis cinerea. The ratio of Non-INA to INA activity in strains of Corynebacterium flaccumfasciens, C. poinsettiae and Hansenula mrackii was 1:1 and usually dropped to 1:3 when paired with INA storage microorganisms. Pairing strains of

Non-INA C. flaccumfasciens with storage Botrytis cinerea resulted in 100% INA.

7. Processed 24 homeowner calls, 21 nursery calls, 26 technological calls affecting various government and industrial agencies outside and within the region, and 8 scientific consultations, and reviewed 5 scientific papers.

11. Goals for 1986-87:

1. Complete review processes for diagnosis and recognition of winter damage in trees.

2. Attempt to document results of experiments in 5 and 6. File Report.

3. Terminate study.

12. Publications 1985-86:

Zalasky, H. Bud defects in winter damaged Colorado spruce. Proceedings of the thirty-third annual International Forest Disease Work Conference, Olympia, Washington, September 24-27, 1985. p. 110.

13. 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.

14. Resources 1986-87:

| | | |
|---|---|---|
| PYs: | Prof.: Zalasky | 1.0 |
| | Tech.: | 0.0 |
| | Total: | 1.0 |
| | Term/Student: | 0.0 |

O & M:

Capital:

15. Signatures:

Investigator

Program Director, Protection

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 31, 1986

1. Project: Development Agreements

2. Title: Regeneration 2. Hare damage assessment and technology transfer (Manitoba)

3. New: Cont.: X 4. No.: NOR-36-01-4A (NOR-36-07-2)

5. Study Leader: L. Brace (See NOR-10-03)

6. Key Words: Hare damage, stand susceptibility ratings, workshops, technology transfer

7. Location of Work: Winnipeg, throughout Manitoba

8. Study Objectives:

   1. To act as a Scientific authority for a R&D contract designed to assess stand susceptibility to hare damage of planted and natural seedlings.

   2. To hold workshops designed to permit technology transfer in the fields of silviculture with special emphasis on natural and artificial regeneration.

9. Goals for 1985-86:

   1. A meeting of the CFS's Regional Reforestation Technical Committee will be held in Brandon, Manitoba in June 1985. The focus of this workshop is plantations of spruce and pine established in the Spruce Woods and Turtle Mountain Forest Reserves between 1904 and the present.

10. Accomplishments in 1985-86:

    1. CFS's Regional Reforestation Technical Committee met as planned and minutes of the meeting and field tour were prepared and submitted to Committee members and NoFC's Senior Regional Advisory Committee.

11. Goals for 1986-87:

    1. A meeting of the CFS's Regional Reforestation Technical Committee will be held in Prince Albert, Saskatchewan in June 1986. The focus of this workshop will be on ways of assessing and treating highly productive backlog sites including the development and discussion of specific prescriptions.

12. Publications 1985-86:

Nil

13. 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.

14. Resources 1986-87:

PYs: Prof.: 0.0

Tech.: 0.0

Total: 0.0

Term/Student: 0.0

O & M:

Capital:

Grants & Contributions: CFS $1,250/$1,250 Manitoba

15. Signatures:

Investigator

Supervisor

Technical Advisor

District Manager

Program Director, Resources

Program Director, Development

Regional Director General

OPERATIONAL PLAN
1985-1989

| Goals | 1985-86 | 1986-87 | 1987-88 | 1988-89 | Total $ |
|---|---|---|---|---|---|
| 1. | Hold a workshop on regeneration through the auspices of CFS's Regional Reforestation Technical Committee (see 10-3MA). | Continue. | Continue. | Continue and Terminate. | |
| | $2.5 K CS | $2.5 K CS | $2.5 K CS | $2.5 K CS | $10 K CS |
| 2. | | | Act as a Scientific authority for a R&D contract to assess stand susceptibility to hare damage of natural and artifical seedlings (see 10-1MA). | Continue and Terminate | |
| | | | $60 K CS | $60 K CS | $120 K CS |
| Total: | $2.5 K CS | $2.5 K CS | $62.5 K CS | $62.5 K CS | $130 K CS |

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 29, 1986

1. Project: Development Agreements

2. Title: Forest Vegetation Management: Environmental Impacts and Residue Chemistry of Forestry herbicides

3. New: X Cont.: 4. No.: NOR-36-02-1B

5. Study Leader: S. Sidhu

6. Key Words: Vegetation management, manual, chemical, mechanical, herbicide residues, persistence adsorption, residue chemistry.

7. Location of Work: NoFC, Grande Prairie Forest

8. Study Objectives:

   1. Develop environmental impact and residue data on herbicides used operationally for vegetation control in Alberta;

   2. Determine the fate of herbicides in the forest ecosystem, by studying persistence, lateral and downward movement, degradation, and absorption/desorption characteristics in selected forest soils under field and laboratory conditions;

   3. Evaluate the influence of herbicide application and other silvicultural practices on the structure, composition and dynamics of forest plant communities;

   4. Determine the influence of herbicide application and other silvicultural practices on the long term stability of nutrient balance and the biological (mycorrhizal associates, N-fixation, decomposition) control of tree nutrition.

9. Goals for 1985-86:

   1. Review field location sites in cooperation with AFS and CFS participants and help select primary test site.

2. Prepare a general experimental design and finalize field location of treatment blocks on primary test site at Grande Prairie, in cooperation with AFS Research Branch and CFS NOR-36-02-1 project leader.

3. Locate and mark sub-plots and sample sub-plots (5m X 5m) to monitor environmental affects of treatments.

4. Initiate pretreatment assessment of vegetation and soils on Method-II plots.

10. Accomplishments in 1985-86:

1. Field locations for primary experimental site were reviewed and the Grande Prairie site selected in August, 1985.

2. A general experimental design for the field study was prepared in cooperation with silviculture study NOR-36-02-01 leader and AFS.

3. Treatment plots and sample plots were located and marked in Methods I and II.

4. Sample sub-plots were marked in Blocks 3 of Method-II and vegetation and soil sampling initiated.

11. Goals for 1986-87:

1. Complete layout of sample plots and sub-plots in Method-I and Method-II Blocks.

2. Sample vegetation and soils for pretreatment data in Method-I and Method-II.

3. Design a method to collect herbicide deposition data and soil residue data specific to the selected herbicide.

4. Collect vegetation and soil samples for residue analysis as required for Method-II plots.

5. Initiate processing and residue analysis of vegetation and soil samples.

6. Summarize field data and prepare field plans for 1987-88.

12. Publications 1985-86:

New study - Nil.

13. Environmental Implications:

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

This project has been reviewed by a CFS Peer Review Panel (Jan/Nov., 1985) and by the Research Management Division and the Chemicals Branch, Pollution Control Division of Environment Alberta and can only proceed after satisfying both federal and Provincial permit requirements, which address environmental concerns in particular.

14. Resources 1986-87:

| | | | |
|---|---|---|---|
| PYs: | Prof.: | 0.0 | (A-base Feng J., Sidhu, Chakravarty (PDF)) |
| | Tech.: Feng, C. | 1.0 | (A-base Milwood, Faribarns) |
| | Total: | 1.0 | |
| | Term/Student: | 0.0 | |

O & M: 40.0 K

Capital: 100.0 K

Grants & Contributions:

15. Signatures:

Investigator

Supervisor

Technical Advisor

Program Director, Development

Alberta Agreement Manager

Program Director, Forest Protection

Regional Director General

OPERATIONAL PLANS - NOR-36-02-03
1986-1991

| Goals | 1986-87 | 1987-88 | 1988-89 | 1989-90 | 1990-1991 |
|---|---|---|---|---|---|
| 1. | Complete layout of sample plots and sub-plots in Methods I & II and terminate. | | | | |
| 2. | Sample plots of Method-II for pre-treatment data on vegetation. Synthesize pre-treatment field data. | Continue. Sample plots for 1 year post-treatment data. Synthesize post-treatment data for 1st year. | Continue. Sample plots for 2nd year post-treatment data. Synthesize post-treatment data for 2nd year. | Continue. Sample plots for 3rd year post-treatment data, synthesize post-treatment data for 3rd year. Terminate. | Report (A-Base and terminate. |
| 3. | Design methods to collection herbicide deposition data and soil residue data. | Evaluate based on data collected. | Report on methodology | | |
| 4. | Collect samples of vegetation and soils samples for residue analysis as required for Method II. Begin analysis. | Continue, synthesize preliminary results. | Continue, report early results. | Continue, report on 2 years' data. Terminate. | Final report-terminate. (A-Base). |
| 5. | Summarize field data and prepare plans for 1987-88. | Continue and prepare plans for 1988-89. | Continue and prepare plans for 1989-90. | Prepare 1st draft of final report. Terminate. | Report and terminate. (A-Base). |

Projected Resources Agreement by Budget years ($ K)

| | 1986-87 | 1987-88 | 1988-89 | 1989-90 | Total |
|---|---|---|---|---|---|
| PY's (Tech.) Term | 1.0 | 1.0 | 1.0 | - | 3.0 |
| PY (con-tract) | 0.6 | 0.6 | - | 0.4 | 1.6 |
| O & M | 40.0 | 30.0 | 20.0 | 20.0 | 110.0 |
| S P.Y. | 18.0 | 18.0 | - | 10.0 | 46.0 |
| Term Salary | 38.8 | 38.8 | 38.8 | 38.8 | 155.2 |
| Capital | 100.0[1] | - | - | - | - |
| Total | 196.8 | 86.8 | 58.8 | 68.8 | 411.2 |

[1]1986/87 $100K capital for purchasing HPLC and accessories.

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 29, 1986

1. Project: Development Agreements

2. Title: Forest pest management and damage appraisal (Alberta)

3. New: X Cont.: 4. No.: NOR-36-02-4

5. Study Leader: P. Amirault

6. Key Words: Damage appraisal, diagnostic and advisory services, forest management, forest pests, forest pest surveys, hazard rating, pest impact, technology transfer

7. Location of Work: Northern Forestry Centre; Alberta-wide

8. Study Objectives:

   1. To identify when and where damage by forest pests may occur, and to rank stands according to potential losses.

   2. To determine how and to what extent pest damage affects forest resource users and management plans.

   3. To provide technology transfer, training, and diagnostic and advisory services to AFS staff and other forestry personnel in the province.

   4. To develop or improve FIDS methods to assess population and infestation levels of forest pests.

9. Goals for 1985-86:

   Nil - New study--see accomplishments below.

10. Accomplishments in 1985-86:

    1. The study was initiated on July 8 and three contractors were hired in mid-October on 75 day contracts.

    2. Twelve stands were measured for inclusion into the mountain pine beetle hazard rating program. The program to sort data and 'rate' stands was entered on the computer and made operable. This was a continuation of a study initiated by Ben Moody.

3. Branches of white spruce and jack pine were examined for egg masses and the presence of second-instar spruce and jack pine budworm larvae. Results of these examinations provide information for the annual FIDS report.

4. The study leader undertook a literature search of several of the more important forest pests in the province. The information gathered will serve as a reference for workshops, inquiries, and other forms of information exchange.

5. I made several field visits in an advisory capacity as a result of requests from AFS regional personnel.

6. A diologue between the CFS and AFS was opened on the subject of improving the information on forest insect and disease problems collected from the AFS's permanent sample plots. The study leader Ben Moody and Bob Miyagawa (AFS) have developed suggestions for improving the recording of insect and disease damage on permanent sample plots.

7. Thirty copies of the book 'Insects Harmful to Forest Trees' by R. Martineau (1984) have been purchased for distribution to AFS regional staff.

8. Represented the NoFC at the Cone and Seed Pest Working Group meeting in Quebec City in August, and presented a paper on the 'Control of Tamarack Seed and Cone Insects'.

11. Goals for 1986-87:

1. To measure (up to 20 more) stands as part of the mountain pine beetle hazard-rating program and to analyze data from these and previous measurements. The results should indicate which hazard-rating system should be applied to lodgepole pine stands in southwestern Alberta.

2. To complete and assess a dwarf mistletoe detection programme, which has been begun by the AFS in the Bow-Crow Forest.

3. To implement the use and assess the operability of, damage codes which have been developed for AFS (Timber Management Branch) to assess tree conditions when remeasuring permanent sample plots in mature stands. To instruct the people doing the remeasurements in the identification of insect and disease problems.

4. To develop a program to assess insect and disease problems affecting trees on permanent sample plots which have been established (by the Research Branch of AFS) in immature stands. The actual assessments will be made by the study leader and his assistant during this (86-87) field season.

5. To assist AFS personnel in initiating surveys to detect and appraise low population levels of spruce and jack pine budworms in Alberta.

6. To maintain contact with forestry personnel in the province and to help them in becoming familiar with insect and disease problems by conducting workshops, making visits in response to inquiries, and by distributing information.

7. To provide diagnostic and advisory services as requested.

12. Publications 1985-86:

Nil - New study.

13. 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.

14. Resources 1986-87:

| | | | |
|---|---|---|---|
| PYs: | Prof.: | Amirault | 1.0 |
| | Tech.: | | 0.0 |
| | Total: | | 1.0 |
| | Term/Student: | | 0.0 |

O & M: 6.0

O & M: Contract 61.0

Capital:

Grants & Contributions:

15. Signatures:

Pete Amirault
Investigator

Supervisor

Technical Advisor

Steve Price
Alberta Agreement Manager

Program Director, Forest Protection

Program Director, Development

Regional Director General

CANADIAN FORESTRY SERVICE

STUDY STATEMENT

1986-87

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Responsibility Centre: NORTHERN FORESTRY CENTRE

Date: January 30, 1986
Revised: March 20, 1986

1. Project: Development Agreements

2. Title: Insect and disease investigations (Saskatchewan)

3. New: X Cont.: 4. No.: NOR-36-03-8

5. Study Leaders: W.J.A. Volney and B.H. Moody

6. Key Words: Damage appraisal, impact, host, forest pests, special surveys, management, mortality, growth loss

7. Location of Work: Saskatchewan wide

8. Study Objectives:

   1. To develop methods for predicting short and long-term impacts of pest(s) including damage appraisal; on forest resource uses, values, management plans and operations. To determine how and to what extent pest damage affects forest resource users and management plans. To evaluate or develop methods to manage pest-susceptible forests and pest populations to limit forest damage to tolerable levels.

   2. To provide diagnostic and advisory services regarding tree and shrub insects and diseases in the province.

   3. To conduct special surveys and studies of particular pests or of designated areas.

9. Goals for 1985-86:

   Nil, new study (see accomplishments below).

10. Accomplishments in 1985-86:

    1. Conducted insect and disease assessments in 3 specific Prince Albert Pulp Company plantations.

    2. Provided diagnostic and advisory services on tree and shrub pests.

11. Goals for 1986-87:

1. Survey of plantations or young stands adjacent to spruce budworm and jack pine budworm infestations. (ID-1 Impact) (Tidsbury)

2. Establish 30 plots in young and mature stands and assess for pest damage. (ID-1) (Moody)

3. Initiate studies which will permit a quantitative description of the relationship between jack pine budworm populations and individual tree growth losses. (ID-1) (Volney)

4. Initiate studies which will lead to the design of efficient survey methodologies for jack pine budworm populations and their feeding. (ID-1) (Volney)

5. Assess records on Saskatchewan's forest resources for their historical content and value in guiding future studies. (ID-1) (Volney).

6. Examine and conduct pest surveys in a limited number of DPRR Plantation Permanent Assessment Plots. (ID-3 Special Pest Surveys) (Tidsbury)

7. Conduct workshops and training sessions on forest pests for DPRR field staff. (ID-2 Advisory) (Moody, Volney)

8. Provide financial support to the production of a Disease Pictorial Guide. (ID-2)

9. Provide diagnostic and advisory services on tree and shrub pests. Identify the resource managers and meet with them to discuss their needs with respect to pest management in their jurisdiction. (ID-2) (Volney)

12. Publications 1985-86:

Tidsbury, C. 1985. Spruce budworm in Saskatchewan, 1985 and forecast for 1986. File Report

Tidsbury, C. 1985. Jack pine in Saskatchewan, 1985 and forecast for 1986. File Report.

Tidsbury, C. 1985. Forest tent caterpillar infestations, 1985 and defoliation forecasts for 1986. File Report.

13. Environmental Implications:

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

14. Resources 1986-87:

PYs: Prof.: 0.0 (Volney 0.5, Moody 0.2 A-base)

Tech.: 0.0 (Tidsbury 0.3, A-base)

Total: 0.0

Term/Student: 0.0

O & M: $13,000

Contract: $18,000
$20,000 Publ. on Disease

Grants & Contributions:

15. Signatures:

Investigator

District Manager

Investigator

Program Director, Development

Program Director, Forest Protection

Regional Director General