

FRDA Research Memo

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Miscellaneous

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A Summary of Vegetation Management Research 1993/94

Compiled by
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INTRODUCTION

Vigorous noncrop vegetation can significantly reduce survival and growth of crop seedlings on many sites in British Columbia. Managing noncrop vegetation is important to the establishment of crop seedlings. Research will help acquire, communicate, and apply information central to the success of plantation establishment through the use of vegetation management. This research report provides a summary of active research projects being conducted in the province with the support of the Canada-British Columbia Partnership Agreement on Forest Resource Development. The projects address one or more of the following general topic areas:

- 1: Prediction and diagnosis: studies dealing with plant community development following disturbances, and with the effects of neighbouring vegetation on seedling performance or microenvironmental conditions;
- 2: Management options: studies examining the effectiveness of treatment options; and
- 3: Environmental impacts: studies dealing with the impacts of vegetation management treatments on nontimber

resources and the protection of habitat. Increasingly, vegetation management treatments are considered within the context of entire treatment regimes (Integrated Vegetation Management). There are other silvicultural treatments that are not directed specifically at competing vegetation, but which impact on a conifer seedling's ability to compete with other vegetation, and may thus be labeled vegetation management techniques. Many activities such as harvesting, site preparation, fertilization, and manipulation of planting stock characteristics are aimed at the establishment and growth of a vigorous crop, well suited to compete with noncrop vegetation.

Brief project summaries, arranged according to topic area, are presented in this memo. Further project details are available from project leaders (whose addresses are included at the end of this memo) or from Dr. Phil Comeau, Ministry of Forests, Research Branch, 31 Bastion Square, Victoria, B.C. V8W 3E7.

Mention of trade names or products does not constitute endorsement by the authors, the B.C. Ministry of Forests, or Canadian Forest Service.
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PREDICTION AND DIAGNOSIS

BC-FR10 EFFECTS OF COMPETING VEGETATION ON GROWTH AND SURVIVAL OF ENGELMANN SPRUCE SEEDLINGS

PROJECT LEADER:

P.G. Comeau, Research Branch, Victoria

OBJECTIVES:

Information on the effects of neighbouring vegetation on the growth and survival of crop seedlings will support operational vegetation management decisions. Competition indices are needed to evaluate the need for vegetation management treatments and to rank sites requiring treatment in the Interior Cedar-Hemlock Zone. This study will develop and test methods for assessing vegetation competition in young Engelmann spruce plantations.

PROGRESS:

Five installations were established in the Arrow Forest District in 1988 and four in the Revelstoke Forest District in 1989. During 1992, three installations in the Arrow District and two installations in the Revelstoke District were remeasured, and Engelmann spruce were tagged and measured. Vegetation assessments were completed in July 1992 and seedling remeasurements were finished in September 1992. Vegetation has been manually removed from around some seedlings to examine growth response when released from competition. Vegetation assessments were completed prior to treatments each year. Data have been entered and consolidated into a single dataset. In 1993, the following will be performed: (a) completion of data analysis; (b) development and evaluation of

operational procedures for assessing aboveground competition; (c) development of models for predicting seedling growth and survival; and (d) preparation of a final report.

BENEFITS:

This research and its potential applications will aid in evaluating vegetation management treatments and ranking sites requiring treatment. Models are being developed to help predict responses of Engelmann spruce seedlings to competition and release treatments.

PUBLICATIONS:

- Comeau, P.G. and T. Braumandl. 1993. Characterization of light and competition in mixed-shrub communities in the Interior Cedar-Hemlock zone. FRDA Memo No. 159
- Comeau, P.G., T. Braumandl and C.Y Xie. 1993. Effects of overtopping vegetation on light and on growth of Engelmann spruce (*Picea engelmannii* Parry ex Engelm.) seedlings. Can. J. For. Res. (in press)
- Comeau, P.G. 1992. Effectiveness of repeated cutting treatments on a fireweed community. Expert Committee on Weeds, Research Report, Western Canada Sector Meeting, December 1 - 3. Winnipeg Manitoba/Vol 2:1081
- _____. 1992. Effectiveness of repeated cutting treatments on a mixed-shrub/herb community - Sullivan 1: Expert Committee on Weeds, Research Report, Western Canada Sector Meeting, December 1 - 3. Winnipeg Manitoba/Vol. 2:1081
- _____. 1992. Effectiveness of repeated cutting treatments on a mixed-shrub/herb community - Sullivan 2: Expert Committee on Weeds, Research Report, Western Canada Sector

Meeting, December 1 - 3. Winnipeg
Manitoba/Vol.2:1082

_____. 1993. Competition Indices and
decision making. In: "The Socio-
Economic Realities of Brushing and
Weeding". Proceedings: Northern
Interior Vegetation Management
Association AGM Jan. 20-21 Smithers,
B.C. pp. 5-10

BC-FR11 ASSESSING THE EFFECTS OF FIREWEED AND ASSOCIATED VEGETATION ON PLANTED CONIFER SURVIVAL AND GROWTH IN THE SOUTHERN INTERIOR

PROJECT LEADER:

Suzanne Simard, Kamloops Forest Region

OBJECTIVES:

This project will: (a) determine the ecosystems most susceptible to fireweed domination in the south-central ICH; (b) determine the type of disturbance that enhances fireweed domination; (c) demonstrate the effects of fireweed competition; (d) examine the effects of fireweed on the environment of seedlings; and (e) determine the control level and timing necessary to achieve acceptable conifer survival.

PROGRESS:

This study is divided into three components: (1) a descriptive survey, (2) a factorial experiment, and (3) a neighbourhood experiment. Results from the first component indicated that of the ecosystems surveyed in the ICHwk1, mw2, mk3, SBSwk1 and ESSFwc2, those susceptible to fireweed domination tend to have hygric to subhygric moisture regimes, moderate site disturbance, and Devil's club, lady fern, horsetail, or oak in the understory. The factorial experiment, with two treatments (glyphosate, control) was

established in 1989. At the end of the second growing season, Douglas-fir and spruce seedling survival was 87 and 97%, respectively, in the herbicide-treated areas compared to 59% each in the control. The vigour and diameter of the seedlings in the control was reduced. Fireweed growth was rapid in early spring; growth rates peaked in mid-June and overtopped conifer seedlings.

In 1990 the neighbourhood study was established. In 1991 and 1992, treatments in the factorial and neighbourhood studies were initiated and maintained, and growth and light availability assessments were made. In 1991/92 seedling vigour was evaluated at the beginning and end of the growing season and measurements were taken, including photosynthetically active radiation (PAR). Competition indices were calculated from estimates of percent cover of fireweed, shrubs and other types of vegetation at varying distances from the seedlings. Seedling and competition data were analyzed and a report is being prepared. Climate data for 1992 were retrieved from the micromet station and will be summarized.

BENEFITS:

The information from this study will help determine the levels of control and timing of treatment necessary to achieve good conifer performance. Ecosystems most susceptible to fireweed domination and the types of site preparation treatments that enhance fireweed domination will also be identified. An increased understanding of the competitive interactions between fireweed and conifers will provide a tool for the management of fireweed-dominated sites, and for predicting which sites and site preparation treatments are susceptible. The factorial and neighbourhood experiments are very good demonstration sites and the results of the ecosystem's susceptibility will be incorporated into interpretation guides. Findings will also be released as reports and journal articles.

BC-B03 EFFECTS OF RED ALDER DENSITY ON CONIFER GROWTH AND NITROGEN AVAILABILITY

PROJECT LEADERS:

P. G. Comeau, Research Branch
Brian D'Anjou, Vancouver Forest Region
George Harper, Research Branch

OBJECTIVES:

Long-term studies are required to document the effects of differing amounts of red alder on the growth of conifers, under different site conditions. Installations will be established for research and demonstration of the effects of red alder on conifer growth and nitrogen availability.

PROGRESS:

An additive design is being used to study the effects of five densities of red alder (0, 50, 100, 200 and 400 trees/ha), one density of Sitka alder (200 tph), and one density of bigleaf maple (50 tph) on growth and survival of conifers (Douglas-fir and western redcedar) and on site nitrogen capital. Each treatment will be replicated three times (at different locations), for each of two soil moisture regimes (slightly dry and moist). In addition, two installations will be established to examine the dynamics of mixed stands of Douglas-fir and red alder using a replacement series design with total tree density of 742 trees/ha.

During 1991/92, work included the location of candidate sites for field installations, the layout of three installations, and the installation of microclimate stations. Soil sampling and seedling measurement were completed at the three installations planted with red alder, western redcedar and Douglas-fir in March 1992. Two installations located at Surrey Nursery and Shawnigan Lake were planted in March 1993 and microclimate stations were installed.

BENEFITS:

Results will provide information on the impacts of different densities and proportions of red alder on both conifer and whole-stand yield. Installations will also provide long-term research on the impacts and benefits of managing for a component of alder in conifer stands. Study sites will be useful as demonstration areas in the future, and will provide opportunities for cooperative research.

BC-B16 INVESTIGATIONS OF PLANTING WHITE SPRUCE UNDER A TREMBLING ASPEN CANOPY

PROJECT LEADER:

Craig DeLong, Prince George Forest Region

OBJECTIVES:

Management of hardwoods and softwoods on the same land base has become an important component of forest management in northern B.C. This project will examine the growth of white pine planted under an aspen canopy and compare it to growth in a clearcut environment. Site selection, and appropriate nursery and site preparation criteria will be developed to ensure optimum survival and growth of spruce planted under aspen.

PROGRESS:

The first phase of this project, completed in March 1991, summarized existing underplanting trials and looked at reasons for success or failure. Phase 2 examined the microenvironment under aspen canopies of different structures to determine the conditions under the canopies. Phase 3 was initiated in 1992. This phase involves the development of nursery regimes to adapt tree seedlings to the environment under an aspen canopy

and the monitoring of outplantings of these seedlings under canopies offering the most favourable microclimate. The seedlings will also be compared to ones planted in clearcuts.

BENEFITS:

This study will provide an understanding of the microenvironment under aspen canopies and its effect on spruce seedling performance, thereby ensuring optimum survival and growth of planted white spruce in this environment. It will also summarize existing under-planting trials and determine the reasons for their success or failure.

**BC-B31 PURE AND MIXED
PAPER BIRCH STAND
MANAGEMENT STUDIES IN
THE ICH ZONE IN THE
SOUTHERN INTERIOR OF
BRITISH COLUMBIA:
REGENERATION STUDY**

PROJECT LEADER:

Suzanne Simard, Kamloops Forest Region

OBJECTIVES:

This long-term study will help to determine the effects of species interactions between paper birch and conifer seedlings on the performance of each species, and the effects of species interactions on levels of environmental resources and conditions. Models will be developed to describe the relationships between the performance of each species and the levels of environmental resources and conditions.

PROGRESS:

Three sites were de-stumped and cleared of slash, and treatments were established and permanently marked. Soils were collected and bioassays initiated for the mycorrhizae study. Microclimate

stations and decomposition stations have been installed at all sites. The three sites were planted in May and June 1992. Dead seedlings were subsequently replaced and extra seedlings were planted for the mycorrhizae studies. All seedlings were measured immediately after planting, assessed for condition in the fall, and dead trees marked to facilitate fill-in planting.

Sample preparation was done for the leaf litter decomposition study, and mineral soil and organic matter were sampled and sent to Victoria for analysis. A duff disturbance survey was conducted, the ecophysiology of birch and Douglas-fir seedlings was initiated, and the bioassays of birch and Douglas-fir seedlings were completed.

BENEFITS:

Mixed plantations of paper birch and conifers may reduce the spread of root rot, increase ecosystem productivity, and increase biodiversity. This project will study and quantify the interaction between individual species and the mechanisms underlying those interactions in a variety of mixed stands in the ICH zone. This information will be valuable in predicting stand yield and effects on ecosystem productivity and biodiversity compared with monospecific conifer plantations.

**BC-B35 EFFECTS OF ASPEN
DENSITY AND STOCKING ON
THE PERFORMANCE OF
CONIFEROUS PLANTATIONS
IN THE CARIBOO FOREST
REGION**

PROJECT LEADER:

Teresa Newsome, Cariboo Forest Region

OBJECTIVES:

The effect of aspen density and stocking on plantation performance must be

documented over time to determine if and when stand tending activities are necessary. This study will investigate and quantify the effects of trembling aspen competition on lodgepole pine, identify measures of competition to determine how trembling aspen competition is affecting lodgepole pine survival and growth, and monitor lodgepole pine survival and growth where partial removal is used.

PROGRESS:

Phase 1 is a retrospective study that will provide information from field studies on stands with high aspen densities that may require stand tending to release conifers. Stands were surveyed to determine the variation in growth and condition of conifers growing under different aspen densities and growing without excessive competition. Data collection for this phase is complete. Three sites in the IDFdk and three sites in the SBSdw were sampled. Vegetation, seedling, and light measurements were taken at approximately 50 plots at each site. Data analysis for phase 1 is in progress. An ecological description was done on each site. An annotated bibliography was completed on hardwood-conifer interactions.

Phase 2 involves monitoring and assessing pine seedlings growing with aspen from an initial establishment phase on a site for at least 10 years. Sites for this phase have been selected in areas where relatively dense aspen is expected to occur. Information to be collected includes conifer height growth, diameter and condition, stocking and density of hardwoods and conifers, and average height and percent cover of aspen.

BENEFITS:

This study will provide stand tending guidelines for conifer plantations with hardwood competition. The interaction between aspen and pine will be documented to determine when competition occurs and

at what competition level pine growth is impeded.

**BC-C20 THE EFFECTS OF
DIFFUSE AND SPOTTED
KNAPWEED COMPETITION ON
THE SURVIVAL AND GROWTH
OF LODGEPOLE PINE AND
DOUGLAS-FIR SEEDLINGS**

PROJECT LEADERS:

B. Wikeem, Research Branch, Kamloops
A. Sturko, Range Branch, Kamloops
J. Boateng, Silviculture Branch

OBJECTIVES:

Diffuse and spotted knapweed are spreading. These species are well adapted to forested areas, especially after logging or other disturbances. The potential threat to conifer survival and growth must be studied and, if appropriate, a prevention strategy must be developed. This study will determine the effects of diffuse and spotted knapweed density on the survival and growth of lodgepole pine and Douglas-fir seedlings, and determine the threshold density that results in a decline in the growth and survival of these seedlings.

PROGRESS:

This experiment was initiated in the MS zone in the Kamloops Forest Region since this area is susceptible to knapweed invasion and is also economically important to the forest industry. Conifer response to the treatments will be evaluated by measuring survival, height, and diameter over a period of time. At the end of the experiment, conifers will be excavated and roots weighed to determine the effects of knapweed on root biomass.

BENEFITS:

The results of this experiment will provide a preliminary assessment of the

risk and potential competition of diffuse and spotted knapweed on conifer seedlings. This information will assist in evaluating the potential impacts of knapweed species

on forest regeneration. Findings will be presented through reports, field trips, and presentations.

MANAGEMENT OPTIONS

BC-FR04 TREATMENT DEVELOPMENT FOR REHABILITATION OF ESSF BACKLOG BRUSHFIELDS

PROJECT LEADER:

Craig Sutherland, Cariboo Forest Region

OBJECTIVES:

The objectives of this project are: (1) to document vegetation complexes and their response to site preparation and brushing and weeding treatments; (2) to evaluate site preparation, planting stock and brushing and weeding options for reforesting backlog brushfields in the ESSFh; and (3) to develop treatment guidelines for reforesting backlog brushfields in the ESSFh.

PROGRESS:

In 1988 a problem analysis was completed. This phase of the project assessed the extent of backlog brushfields, looked at the effectiveness of previous rehabilitation practices, and identified research needs. Study sites were selected and a research and demonstration installation was established to evaluate silviculture options for achieving free-growing plantations of interior spruce and lodgepole pine on backlog brushfields in the northern ESSF zone.

Seedling survival and growth and noncrop vegetation frequency, percent cover, and height will be monitored for the

first 5 years of the project. During 1992/93, vegetation and seedling assessments were completed and the data analyzed. The four microclimate station assessments for site preparation treatments were also completed and the environmental data analyzed. A 5th-year report to reflect the information from the various assessments will be published in 1993/94. The demonstration trail developed and signed in 1991/92 has recently been upgraded for future tours.

BENEFITS:

Guidelines of silvicultural treatment options for reforesting backlog brushfields will be developed based on the findings of this project. The project site is useful for demonstrating the efficacy of the treatment options used. Several field tours were conducted for research and operational field staff in 1992/93.

BC-FR06 THE CONVERSION OF MULTISTORIED BRUSHFIELDS TO CONIFEROUS PLANTATIONS - A BENCHMARK EVALUATION OF ALTERNATIVE SILVICULTURAL TREATMENTS

PROJECT LEADER:

Dave Coates, Prince Rupert Forest Region

OBJECTIVES:

Successful conversion of older established brushfields will require that vegetation be removed prior to plantation establishment, and that a treatment be developed to reduce vegetation competition. The resulting conversion must be moderate in cost, silviculturally effective, and conserve or enhance the inherent productivity of the sites. The objectives of this project are: (1) to evaluate the effects and cost of nine stand conversion treatments (and one control); (2) to identify the treatments that favour the establishment, survival and growth of commercial tree species in established brushfields on coastal alluvial sites; (3) to determine the impact of these treatments on the establishment, survival, and growth of commercial tree species; and (4) to determine important changes in the soil properties related to short- and long-term conifer productivity.

PROGRESS:

The project was conducted in a 17-year-old multistoried early seral brushfield on a coastal alluvial site in the CWHws1 variant near Salvus. Five of the treatments being assessed are nonchemical (blading, grass seeding, falling and burning, and girdling with two types of girdlers); the other four use glyphosate (in various combinations of hack-and-squirt and broadcast spraying). A completely randomized design with three replications of the treatments will be used. Fifth-year post-treatment soil sampling was completed in 1992/93.

NOTE: For a variety of reasons, which will be outlined in an upcoming report, none of the treatments applied were successful in converting the area from a multistoried brushfield back to a *viable* coniferous plantation.

BENEFITS:

Due to the abundance of coastal sites requiring this type of treatment, research on feasible methods of stand conversion is

important. As a result of this study, detailed evaluation of alternative stand conversion methods will be available with recommendations provided on the most cost-effective treatment options.

PUBLICATIONS:

Research Memo # 145, Relative costs of red alder-to-conifer site conversion. Project No. 2.06

Internal Reports

- Establishment Report
- 1st-Year Progress Report
- Treatment Effects on Competing Vegetation and Conifer Growth. 1990. 28p.

BC-FR07 DEVELOPMENT OF VEGETATION MANAGEMENT TECHNIQUES FOR SITES PRONE TO SALAL DOMINATION

PROJECT LEADERS:

R.N. Green, Vancouver Forest Region
B.N. D'Anjou, Vancouver Forest Region

OBJECTIVES:

Vigorous after-harvesting growth of salal (*Gaultheria shallon*) can be an impediment to Douglas-fir regeneration of some coastal sites. This regeneration might be improved if salal growth was controlled by site preparation treatments including herbicides and scarification. This study tests a variety of silvicultural treatments aimed at maximizing Douglas-fir regeneration on salal-dominated sites to better understand the role of salal in Douglas-fir regeneration performance.

PROGRESS:

Site preparation treatments were compared at two locations in the CWHxm2 on Vancouver Island (spot scalping, spot mixing and herbicide applications on both sites, and blade scalping and mixed berms

on one site). The sites were slightly to moderately dry, and nutrient-poor to medium. All sites were planted with Douglas-fir. Treatments to reduce salal cover while leaving the forest floor intact showed the most promise for improving Douglas-fir performance on these sites. Treatment response varied considerably with site properties.

The sites were used as demonstration areas; activities included a PHSP course and a formal tour for district and industry participants. This year (1993) is the 7th year of the research trial. Field work will include measurement and assessment of salal and Douglas-fir growth and development. A FRDA memo describing 7-year results is planned for 1993.

BENEFITS:

Recommendations concerning site preparation techniques may improve Douglas-fir regeneration on dry, nutrient-poor to medium Douglas-fir-salal ecosystems.

PUBLICATIONS:

Three FRDA Memos (No. 155, 158 and 194) have been produced.

BC-FR09 SITE PREPARATION AND PLANTING PROCEDURES TO MINIMIZE SEEDLING WATER AND TEMPERATURE STRESS IN BACKLOG AREAS IN THE SOUTHERN INTERIOR

PROJECT LEADER:

T.A. Black, Department of Soil Science,
UBC

OBJECTIVES:

This project examines how various site preparation treatments modify microenvironments of planted Douglas-fir, interior spruce, and lodgepole pine, and observes seedling frost damage, winter desiccation, heat stress, growth, and survival in the various treatments.

PROGRESS:

To study the effects of site preparation treatments such as herbicides, scalping, ripping, and trenching, randomized complete-block experiments were established along an elevational transect at three weather station sites at Fehr Mountain (IDF), Paska Lake (MS), and Tsintsunko Lake (ESSF) in the Kamloops Forest District. Trenching was particularly effective during the first 5 years, with a total mortality of 3%. At the sites in the IDF frost damage and mortality were reduced by treatments that removed soil organic layers (scalping, ripping and trenching). Mortality of Douglas-fir seedlings was much higher than for lodgepole pine. Better growth of both species was attributed to higher levels of soil moisture, while susceptibility to frost and snow damage increased mortality. At the sites in the MS mortality of both the Engelmann spruce and lodgepole pine was low. The ripping treatment resulted in the greatest height and diameter growth for both while trenching did not improve growth. Increased soil moisture following treatment was credited with increased conifer growth in this zone. In the ESSF, mortality of both interior spruce and lodgepole pine was greatly reduced by treatments that removed the organic layer.

Weather stations were established at the three sites in 1986 and plantings were done shortly thereafter. The year-round weather stations measure relative humidity, solar radiation and wind speed. Air temperature at seedling height, soil temperature and soil moisture content are also measured. The weather stations have been visited monthly during the growing

season. All climate data from the data loggers have been verified, analyzed, summarized, and archived. Measurements of rainfall and frost were compared with those from previous years. Observations of winter desiccation and frost damage will be done in spring 1994.

BENEFITS:

This project will provide an archive of high-quality weather data (summer and winter) for high-elevation forest (IDF, MS and ESSF) sites in the Kamloops Forest Region. These data are being used in the interpretation of seedling performance data. This research will also assess the treatments used, based on seedling performance.

PUBLICATIONS:

Fleming, R.L. 1993. Effects of site preparation in Interior Plateau clearcuts on the soil water regime and water relations of conifer seedlings. Ph.D. thesis. April 1993. University of B.C. (Soil Science).

Fleming, R.L., T.A. Black and N.R. Eldridge. 1993. Water content, bulk density and coarse fragment content measurement in forest soils. *Soil Sci. Soc. Am. J.* 57:261-270.

Black, T.A., R.L. Fleming and R.S. Adams 1993. Effects of site preparation treatments on conifer seedling microclimate, mortality and growth in a pinegrass dominated clearcut. (To be submitted to *Can. J. For Res.* in October 1993).

Findings from this project have also been presented in several Research Memos (FRDA Memos 181, 177, 167, 166 and 162).

**BC-FR17 DEVELOPMENT OF
A DATABASE SYSTEM FOR
ENTRY AND RETRIEVAL OF
VEGETATION MANAGEMENT
TRIAL INFORMATION**

PROJECT LEADER:

P.G. Comeau, Research Branch, Victoria

OBJECTIVES:

The purpose of this project is to develop and maintain a database containing information on treatment effectiveness and crop tolerance from research trials with vegetation control techniques conducted in B.C. The database will be developed in collaboration with the ECW Silviculture Subgroup and Agriculture Canada.

PROGRESS:

The database system follows the system developed for the Expert Committee on Weeds. Development of the revised data entry system was initiated in 1990. Modifications were made to the database to accommodate forestry abstracts. In 1993/94, work will focus on modifying, testing, and demonstrating programs for data entry and retrieval, and entering information from past ECW abstracts into the system.

BENEFITS:

End products will consist of a database system including data entry and retrieval programs and a user's manual for the system. Prototype software for retrieving and summarizing database information is finished and is under review. The data have been summarized in the form of draft efficacy tables and was circulated for review in March 1993. These tables will be published in 1993/94.

**BC-FR31 PARTICIPATION IN
THE CRAFTS VEGETATION
MANAGEMENT COOPERATIVE**

PROJECT LEADER:

P.G. Comeau, Research Branch, Victoria

OBJECTIVES:

Participation by the B.C. Ministry of Forests in the Oregon State University CRAFTS Vegetation Management Cooperative facilitates the exchange of information between the province of British Columbia and the Pacific Northwest states.

PROGRESS:

Technical committee meetings and workshops provide opportunities to exchange information on research and operational trials, and to discuss promising new fields of study.

BENEFITS:

CRAFTS publications are distributed throughout B.C. and provide information useful to vegetation management research and extension. Reports are provided following attendance at CRAFTS meetings.

**BC-FR33 EFFECTIVENESS OF
REPEATED MANUAL CUTTING
FOR RELEASE OF
ENGELMANN SPRUCE FROM
MIXED-SHRUB COMMUNITIES
IN REVELSTOKE DISTRICT**

PROJECT LEADERS:

P. Comeau, Research Branch, Victoria
G. Harper, Research Branch, Victoria
C. Thompson, Nelson Forest Region

OBJECTIVES:

Mixed-shrub communities can severely reduce plantation survival and growth in

the Interior Cedar-Hemlock zone of southern B.C. The selection of appropriate treatment options requires information on: (a) the effectiveness of alternative treatments; (b) the effects of differing amounts of vegetation on seedling survival and growth; and (c) the effects of vegetation control on seedling survival and growth. This study will compare the effectiveness of single and repeated manual cutting treatments and a single herbicide (VISION™) application for releasing Engelmann spruce seedlings in the Interior Cedar-Hemlock zone.

PROGRESS:

This project is being conducted at Soards Creek near Mica, B.C. (Nelson Region, Revelstoke District). The study site was mechanically prepared in 1990 and planted with Engelmann spruce in 1991. Plot layout and pretreatment measurement of seedlings were completed during 1991, and treatments including manual cutting and VISION™ herbicide application started in 1992. Vegetation assessments began in July 1992 and will be completed in July of each year. Seedlings have been remeasured in September 1992 and 1993, and will be remeasured in the fall of each year. The study uses a completely randomized design with three replicate 30 x 30m plots for each of the following eight treatments:

1. cutting in spring 1992 only,
2. cutting in summer 1992 only,
3. cutting in spring 1992 and annually,
4. cutting in summer 1992 and annually,
5. cutting in spring and summer 1992 and annually,
6. cutting in spring and summer 1993 and annually,
7. glyphosate (VISION™) herbicide application at 2.1 us ai/ha in August 1992, and
8. untreated control.

The effects of treatments on species cover, height, competition index, irradiance level, and seedling growth will be analyzed. The effects of different amounts of competing vegetation on seedling growth will also be examined. A pilot study was also initiated at Soards Creek to provide

some information on the effectiveness of plastic mulch mats and the effects of manual treatment radius.

BENEFITS:

Results will provide information on the relative effectiveness of single and repeated manual brushing treatments. The study will also provide information on the effects of different amounts of vegetation and vegetation control on seedling survival and growth. Sites will be useful for demonstration purposes. An establishment report will be completed in 1994. Results will also be presented in memos, reports, and ECW abstracts.

BC-FR39 APPRAISAL AND DEVELOPMENT OF BACKLOG REFORESTATION MECHANICAL SITE PREPARATION

PROJECT LEADER:

Lorne Bedford, Silviculture Branch

OBJECTIVES:

Since mechanical site preparation is used extensively in the Prince George Region the relative effectiveness of each method needs to be understood. The specific goals of this project are: (1) to evaluate the relative operational and biological effectiveness of site preparation machines for backlog reforestation; (2) to assist in the modification of existing site preparation equipment and systems, if appropriate; (3) to assist in the development of promising new site preparation machines and systems; and (4) to demonstrate the use of site preparation equipment through audio-visual materials, reports, and workshops.

PROGRESS:

Six installations were established, treated with a range of site preparation techniques (predominately mechanical), and planted. Site preparation treatments made a considerable difference in the amount of competing vegetation on planting spots. A competitive index was used to assess the effectiveness of the different treatments. On brush-prone sites vegetation control was most effective using the Madge, fire, and breaking plow. The TTS Delta, Tuttle plow, and bedding plow were less effective. Differences in treatment types were less important where vegetation was less aggressive although all treatments reduced competition. For longer-term vegetation control, site preparation equipment capable of making mineral-soil capped inverted humus mounds may be an excellent option.

In 1992/93, seedlings and vegetation at two installations were measured and data were entered and analyzed. Two formal workshops were given to present the findings to date. This year, measurements will be made for recompaction, and total and available nutrients for the V-Blade, Madge, bedding plow and the control plots. Weather monitoring stations will be set up for the 5th- and final-year measurements. A 5th-year report on four installations will be completed in 1993.

BENEFITS:

This research will improve understanding of the various mechanical site preparation systems and help in making appropriate decisions on site preparation for specific sites. This project also has excellent value as a demonstration site. Several reports and memos have been produced and videos demonstrating mechanical site preparation principles and machinery are available.

BC-FR40 A COMPARISON OF SEEDING MIXES APPLIED TO SITE PREPARED AREAS FOR VEGETATION CONTROL IN THE WET CLIMATIC ZONE**PROJECT LEADER:**

C.F. Thompson, Nelson Forest Region

OBJECTIVES:

Three common methods of controlling vegetation (burning, mechanical site preparation, and herbicides) are all limited in their application by physical, biological, and sociological constraints. One option is the use of an alternate species to replace native species, and thereby produce an environment favourable to planted seedlings. This project, conducted in the wet region of the Nelson Forest Region, will determine the effects of seeding grass-legume mixes on the cover, height and composition of re-invading vegetation, and on the growth of planted seedlings.

PROGRESS:

Two test sites were established in 1991: one on a mechanically prepared site in the ESSFvc; the other on a medium- to low-impact burn in the ICHwkl. Spruce seedlings were planted at the same time as the seeding was conducted. Assessment of seedlings, vegetation and soil and atmospheric microclimate was done in 1991 and 1992, and will continue in 1993. Three grass-legume mixes and an untreated control are being compared at each location.

BENEFITS:

This project will provide reliable information and guidance on the appropriateness of grass and legume seeding. It will also indicate the compromises involved in the use of the technique. Results will be transferred by means of field visits, reports, workshops, posters, and training sessions.

Interim results have been presented at "Silv-ops '92" (fall 1992) in Creston and at a vegetation management course in Revelstoke (summer 1993).

BC-FR41 CONTROLLING ASPEN REGENERATION IN CUTOVERS BY THE USE OF GIRDLING AND CHEMICAL TREATMENTS BEFORE HARVESTING

PROJECT LEADER:

Bryce Bancroft, Madrone Consultants Ltd.,
Victoria

OBJECTIVES:

This project will provide information on the optimal timing of preharvest chemical and girdling treatments to minimize postharvest aspen suckering. It compares the effectiveness of stem injection with glyphosate and manual girdling at 2 and 4 years before harvest. Parent tree stem density and distribution pattern, and their effect on sucker pattern and distribution will be examined, as will the effect of each treatment on cavity nester excavation and aspen use.

PROGRESS:

Preliminary results showed that all the methods tested have the potential for effective preharvest control of aspen. The study site, in the IDF within the Kamloops Region, has been laid out as a randomized block design with the five treatments (control, girdling at 2 and 4 years, stem injection at 2 and 4 years) replicated three times. Assessments are being made of target stem mortality, sucker density and bird (cavity nester) use. Parent trees were stem-mapped so the effect of their density and distribution pattern can be studied. In

1992, 4th-year remeasurements were made on target stems, suckers in subplots, cavity nesters, and percentage of rot by treatment. The entire block was logged in December 1992 as scheduled.

BENEFITS:

The results will provide resource managers with information on the effectiveness of the two methods and on the effects of timing of preharvest aspen control. This study will also provide useful information for botanists on the mortality of aspen suckers and for wildlife ecologists on the impacts of control on cavity nester use. An in-house report showing preliminary findings will be produced 2 years after harvest. A Land Management report summarizing year-10 results may also be produced.

BC-FR44 OPERATIONAL SITE PREPARATION TRIALS; SUITABILITY AND EFFECTS OF SEEDLING ESTABLISHMENT AND FOLIAR NUTRIENT CONCENTRATION IN THE IDF, MS AND ESSF ZONES

PROJECT LEADERS:

W. R. Mitchell, Kamloops Forest Region
Suzanne Simard, Kamloops Forest Region

This research project is one component of a larger study of operational trials on site preparation, planting stock, and post-planting site maintenance treatments on high-elevation sites in the southern Interior.

OBJECTIVES:

This component study will investigate the effects of pinegrass and forest floor removal on long-term productivity, using mechanical and chemical site preparation.

The specific objectives of this research are: (1) to determine the effects of pinegrass removal (with and without forest floor removal) on performance of planted lodgepole pine seedlings, levels of environmental resources and conditions, and diversity of ectomycorrhizal fungi; and (2) to demonstrate the use of mechanical and chemical site preparation techniques on steep, dry, grassy sites.

PROGRESS:

Pinegrass can compete with conifer seedlings for limited soil water and can increase the risk of frost damage. Removal of pinegrass by mechanical or chemical means has led to successful conifer seedling survival and growth. Since sites are steep, options for site preparation are limited. Scalping and ripping treatments were effective; however, these treatments reduced soil nutrient availability. Forest floor removal may have long-term implications on site productivity, particularly on environmentally limited sites.

This project will test the use of excavator and ground foliar chemical applications. The study site is in the Murray Creek drainage in the Lillooet District in the IDF zone. Soil nutrients from samples were analyzed, chemical site preparation was done, seedlings were planted and initial tree measurements were taken. Survival, condition, and damage assessments were performed. The microclimate station was installed and analysis of data was completed in early 1993. Mycorrhizae root sampling and bioassay soil sampling began in September, with laboratory identification ongoing throughout the winter. Seedling performance is being assessed in terms of survival, growth, xylem water potential, stomatal conductance, and foliar nutrients. Microclimate measurements will include soil and air temperature, soil moisture, and solar irradiance. Soil nutrients, pH, structure, saturated hydraulic conductivity, and moisture retention are also being measured. Mycorrhizal fungi are being

assessed in terms of diversity and rates of seedling infection.

BENEFITS:

The results of this study will provide silviculturists with appropriate methods for preparing steep, dry, grassy sites. In addition, researchers will be better able to predict the impacts of these methods on long-term productivity, based on the underlying seedling responses and environmental effects. Findings will be presented in workshops and reports; these sites will also be used for demonstration and workshops.

PUBLICATIONS:

Third-year results from this project were reported in FRDA Memo No. 178. Fifth-year results will soon be available.

BC-FR56 A COMPARISON OF MULCH MAT AND HERBICIDE TREATMENTS FOR REDUCING GRASS COMPETITION IN THE IDF_{ww}

PROJECT LEADERS:

P.G. Comeau, Research Branch
G. Harper, Research Branch
J. Boateng, Silviculture Branch
B. D'Anjou, Vancouver Forest Region

OBJECTIVES:

In the IDF_{ww}, extensive grass cover develops following harvesting, mechanical site preparation, and removal of shrub cover using herbicides. The presence of grass appears to reduce the survival and growth of planted Douglas-fir seedlings on these sites. The selection of an appropriate treatment option requires information on the effectiveness of alternative treatments.

PROGRESS:

This study will compare the effectiveness of application and timing of hexazinone, glyphosate, and plastic mulch mats for reducing grass competition and improving survival and growth of Douglas-fir seedlings. Two brands (Arbotec "Brush Blanket" and Tredegar "Tree Mat") and two sizes (90 and 120 cm) of mats are being evaluated in this trial. Planting, seedling measurement and treatment application were completed in May 1993. Vegetation assessments were completed in June 1993 and will be repeated in 1994 and 1995. Seedlings were remeasured in October 1993 and will be remeasured annually.

BENEFITS:

Results will provide information on the relative effectiveness of mulch mats and early-season applications of hexazinone and glyphosate, and on the effects of different mulch materials and mulch sizes. Findings will be presented in research memos, research reports and ECW abstracts.

**BC-FR57 MULTIFACTOR
MANUAL BRUSHING STUDIES
IN THE NELSON FOREST
REGION**

PROJECT LEADERS:

J. Pollack, Nelson Forest Region
C. Thompson, Nelson Forest Region
G. Harper, Research Branch, Victoria
P. Comeau, Research Branch

OBJECTIVES:

This three-factor, manual brushing study will examine the effects of season of cutting, duration (i.e., years) of cutting, and treatment radius of manual release treatments on growth of spruce seedlings.

PROGRESS:

A draft working plan for this project has been prepared and one study site has been installed near Trout Lake. Two additional sites will be installed in 1994.

BENEFITS:

The results will provide information on spruce response to time of brushing treatments and will add to basic knowledge on seedling development following manual release treatments. The information will be presented in research memos, research reports, and ECW abstracts.

**FC-FR010 DEVELOPMENT OF
A MYCOHERBICIDE FOR
HARDWOOD AND BRUSH
CONTROL**

PROJECT LEADER:

Ronald Wall, Pacific Forestry Centre,
Victoria

OBJECTIVES:

The fungus *Chondrostereum purpureum* invades tree stems and prevents wound-healing and adventitious shoot growth, thereby reducing regrowth in stumps and increasing mortality when applied to girdled weed trees. This project is dedicated to improving the effectiveness and enabling the registration of the fungus *Chondrostereum purpureum* as a biological control of competing hardwoods and shrubs. Therefore, a product of quantifiable efficacy needs to be developed.

PROGRESS:

This research project consists of :

1. Selection of virulent isolates - These will be tested in parallel laboratory, greenhouse and field tests to measure the predictive value of these tests. The

ability of isolates to produce spores will also be measured under laboratory and field conditions.

2. Development of suitable mass culture and formulation techniques - Presently developed products will be compared in laboratory and small scale field tests after increasing periods of storage at different temperatures and moisture levels.
3. Field tests - Small-scale field tests comparing isolates and formulations will be established. Results from previous tests will be evaluated with respect to herbicidal efficacy and fructification of the fungus.

BENEFITS:

The end result of this research will be the formulation of a virulent strain of *C. purpureum* with known viability after storage, and predictable effectiveness as a mycoherbicide.

**FC-FR011 INHIBITION OF
CALAMAGROSTIS
CANADENSIS BY
RHIZOBACTERIA TO
PROMOTE CONIFER
SEEDLING ESTABLISHMENT**

PROJECT LEADER:

Charles Dorworth, Pacific Forestry Centre

OBJECTIVES:

Canada reedgrass, or bluejoint (*Calamagrostis canadensis*), is a primary impediment to reforestation. Among the available biological controls, deleterious rhizobacteria (DRB) are being investigated by the Pacific Forestry Centre. Plant-growth-promoting bacteria (PGPR) are also being examined.

PROGRESS:

Preliminary work in 1992/93 generated limited collections of bacteria and seeds of various reedgrass clones. Several bacteria that inhibited reedgrass to a limited extent were found and identified. The 1993/94 reedgrass field survey resulted in the collection of a cross-section of rooted plants. This collection was representative of the plant's range in B.C. and the various silvicultural and vegetation management systems in place. Collection and bacterial isolation techniques improved using procedures adapted from cooperating laboratories.

Bacterial isolations were initiated in summer 1993 and have generated more than 500 isolates from one-half of the grass collections. Isolations will be completed by December, 1993. Bioassays to identify and quantify activity of the bacterial isolates as inhibitors of reedgrass and/or plant growth promoters of *Pinus* spp. and *Picea* spp. will be completed by June, 1994. Automated identification of the isolates is proceeding coincidentally with isolation.

During the 1993 field season, samples of grass from which rhizobacteria might be isolated and samples of mature reedgrass seeds for bioassay were collected from the Prince George Region. Specific data will not be available until this year's set of field samples is fully analyzed for bacteria content and the isolates are identified. Further data will become available as the isolates are subjected to bioassay in challenge tests against germinating seeds of *C. canadensis* and conifers. Useful isolates will be modified into forms that can be used as either biological herbicides or to promote growth in seedlings.

BENEFITS:

The result of this research will be preparation of bacteria useful as either DRB or PGPR, along with the protocol for their application to the target plant populations.

PUBLICATIONS:

Dorworth, C.E. 1992. Biological control of weeds using indigenous pathogens, pp. 17-24. *In*: Can. Forest Nursery Weed Mngt. Assoc. Ann. Mtng., (Ed.) G. Shrimpton, B.C. Min. Forests, Victoria, B.C., 103 p.

_____. 1992. Augmentation biological control in Canada's forests, pp. 132-139. *In*: Proc. Forest Biological Control in the Great Plains, (Ed.) Ellen Dix, 1992 July 13 - 16, Bismark, N.Dak., 231 p.

_____. 1992. The case for biological control - Deleterious rhizobacteria as biocontrol agents for *Calamagrostis canadensis*. *In*: The Northern Forest Vegetation Manager, Sept. 1992. Pub. transcript of presentation at the N. Int. Mngt. Assoc. Ann. Mtng., Quesnel, B.C.

_____. 1993. Biological control of forest weeds: on track and on time. *Pesticulars* 12 (1):6 (Abst. of presentation at A.G.M., 1993, Simon Fraser Univ., Burnaby, B.C.)

Winder, R.E., S. Shamoun, and C.E. Dorworth. 1992. Formulation of a potential biocontrol agent for *Calamagrostis canadensis*. Abst. 860 *In*: 1992/93 APS/MSA A.G.M., 1992 Aug. 8-12, Portland, Oreg.

BC-A05 THE EFFECTS OF CATTLE GRAZING, FORAGE SEEDING RATES, BASAL SCARRING AND SHOOT DAMAGE ON FOREST REGENERATION

PROJECT LEADER:

Brian Wikeem, Research Branch, Kamloops

This project consists of two experiments:

1. Effects of cattle grazing and forage seeding rates on conifer survival and growth.

The objectives are to determine the effect of: (a) three forage seeding rates on native vegetation and conifer survival and growth; (b) three levels of grazing intensity on native vegetation, and the survival and growth of conifers; (c) varying seeding rates on plant density and forage production; and (d) changing levels of grazing intensity and forage production through seeding on cattle weight gains.

2. Effects of basal scarring on conifer survival and growth.

The objectives are to determine the effect of: (a) different levels of seedling scarring on tree survival and growth; (b) different levels of shoot removal on tree survival and growth; (c) season of damage on tree survival and growth; and (d) scarring and shoot removal on seedlings of two different age classes.

PROGRESS:

Two years after planting, 37% of the seedlings were damaged by cattle. However, results indicate that cattle grazing did not affect conifer height or diameter. Neither forage seeding nor grazing appeared to affect conifer survival. Trampling damage correlated poorly with pasture utilization but was more related to the number of days of grazing.

Typical grazing injuries (basal scarring, leader damage) were simulated on lodgepole pine seedlings. Both diameter and height growth were most affected when seedlings were damaged after budset. Basal scarring up to 50% of the stem circumference did not affect diameter growth; at 72%, seedling diameter and height growth were reduced compared to the control. Diameter growth was only slightly reduced by 50% terminal shoot removal and by bud removal, although height growth was affected.

This year research will concentrate on completing the conifer and forage sampling and determining cattle weight. All field samples will be processed, the data will be summarized and the preliminary analysis finished. Site maintenance will also be done.

BENEFITS:

The results of this experiment will provide resource managers with guidelines about how forage seeding and cattle grazing affect competing native vegetation and conifer survival and growth; and how basal scarring and leader damage affect the survival and growth of lodgepole pine. Cattle performance will be monitored to establish the combination of seeding and grazing that will best provide benefits to both trees and the livestock industry.

PUBLICATIONS:

FRDA Memos 184, 185, 186, 187 and 188 are available.

**BC-A09 FIELD GUIDE TO
BIOLOGICAL CONTROL OF
RANGE WEEDS IN BRITISH
COLUMBIA**

PROJECT LEADERS:

Allen Sturko, Range Branch, Kamloops
Brian Wikeem, Research Branch, Kamloops

OBJECTIVES:

More than 20 noxious weed species occur over 100 000 ha of forest and grassland range in British Columbia. Once established, these weeds can significantly reduce the forage production capability for cattle and wildlife, reduce the aesthetic value of grasslands and forests, and maintain sites at lower than optimum levels of species diversity. Biological control agents are presently available for many of

these species but little information exists to assist field staff in identifying weeds species, selecting appropriate biological controls, or using these control agents.

The specific objectives of this project are to prepare an illustrated manual to: (a) assist field staff in the identification of noxious range weeds in B.C. and outline the geographical and ecological distribution of each weed species; (b) summarize information on the biology of each weed species; (c) describe existing biological control agents for each weed species at different stages of growth; and (d) provide recommendations on the collection, handling, and distribution of each biological control agent.

PROGRESS:

This project will consolidate existing information from published sources for plant and biological control agent descriptions. Existing photographs of weed species and biological control agents will be used when available, but illustrations are required for some plants and insects.

The research for this project has progressed in phases. The literature review was completed and photographs were sorted and catalogued for the preliminary draft of the manual completed in 1991/92. (A draft manuscript on the biological control of diffuse and spotted knapweed will serve as a pilot for the entire manual.) The next phase of the project will be to produce text for the remaining plant species and complete the photographic work.

BENEFITS:

The illustrated manual resulting from this study will aid field staff in the effective identification of noxious weeds and the release of biological control agents, and in other methods to protect provincial range and forestlands, where these weeds exist.

**BC-C02 A REVIEW AND
ANALYSIS OF LITERATURE**

AND EXPERIENCE ON SHEEP GRAZING AS A VEGETATION MANAGEMENT TOOL IN TEMPERATE FORESTS

PROJECT LEADERS:

B.. Wikeem, Kamloops
C. Sutherland, Cariboo Forest Region
T. Newsome, Cariboo Forest Region

OBJECTIVES:

Prescription grazing by sheep has been used for brushing and weeding on an experimental basis in British Columbia since 1984. Preliminary results suggested that sheep can have a significant impact on herbaceous and shrubby vegetation but few quantitative data existed. Long-term data measuring response for 10 years or more may also be required before definitive conclusions can be drawn. The specific objectives of this study were:

- 1: to review literature on sheep grazing and its applications to forest management in B.C.;
- 2: to summarize local experience in B.C. and abroad regarding livestock management and impacts of sheep grazing on target species and crop trees;
- 3: to redraft existing interim guidelines for sheep grazing as a vegetation management tool in B.C., using the information collected during this project;
- 4: to develop protocols for establishing future sheep grazing trials, including minimum monitoring requirements; and
- 5: to identify information gaps and recommend priorities for sheep grazing research on forest land.

PROGRESS:

Information on sheep grazing and forest management in B.C. has been collected from a variety of sources and analyzed to determine relevance. A draft report summarizing the literature and providing guidelines for operational sheep grazing in plantations is currently under review.

BENEFITS:

Results of this project will help managers select appropriate sites for treatment, assist in technical management of sheep, and provide guidelines for monitoring success. The literature will provide a synthesis of known effects of sheep grazing and assist in developing a research program to improve this vegetation management treatment.

BC-IR03 VEGETATION DEVELOPMENT AND CONIFER GROWTH AFTER CLEARCUTTING AND SLASH- BURNING IN THE SBS AND ESSF ZONES

PROJECT LEADERS:

Evelyn Hamilton, Research Branch
Karen Yearsley, Research Branch

OBJECTIVES:

Little is known about the effects of slash-burning on early forest growth and successional patterns. Because of growing public concerns about forestry practices, this type of information is imperative. The Prescribed Burning Alternatives Task Force report highlights this need. This study will collect long-term data from permanent research sites in the SBS and ESSF zones, analyze and consolidate all vegetation development and conifer seedling response data, and complete the 5th-year report for the SBS and 3rd-year summary for the ESSF data.

A component of this project is an intensive study of the effects of burn severity, initial seedling size and condition, and competing vegetation on planted spruce seedlings in the SBS zone, using data from the Walker Creek site.

PROGRESS:

This project will concentrate on compiling existing vegetation and conifer seedling data from several permanent research sites in the SBS and ESSF zones. All vegetation development and seedling response data will be collected and analyzed. The focus of this research is to determine the patterns of vegetation change over time in terms of species composition, cover, height and volume, and the effect of initial burn severity on these patterns. Effects of vegetation development and burn severity on planted conifer growth and survival will also be evaluated.

The component study is an intensive investigation of the effects of burn severity, initial seedling size and condition, and competing vegetation on planted spruce seedlings in the SBS zone. Fifth-year data from the Walker Creek site will be analyzed and three reports will be prepared for publication. Work will proceed on finalizing the existing report, *Interior spruce performance and vegetation growth in the Sub-Boreal Spruce zone: response to burning*. Two additional reports will be prepared: *Interior spruce performance in the Sub-Boreal Spruce zone: effects of initial seedling size and condition* and *Interior spruce performance in the Sub-Boreal Spruce zone: response to levels of competing vegetation*.

BENEFITS:

Findings will outline the successional dynamics and early conifer seedling growth after burning in SBS and ESSF ecosystems. The results will be communicated through reports and journal articles, field tours, workshops, and presentations.

Fifth-year data from the Walker Creek site will provide information about the relationships between conifer seedling growth and burn severity, vegetation levels, and initial size and condition of seedlings in the first 5 years after planting.

**BC-BL156 OPERATIONAL
SITE PREPARATION AND
PLANTING STOCK TRIALS ON
COOL, DRY IDFdk4 AND
SBSdw1 BACKLOG SITES IN
THE CARIBOO FOREST
REGION**

PROJECT LEADER:

T. Newsome, Cariboo Forest Region

OBJECTIVES:

This site preparation and cattle-seedling interaction trial was established in 1988. The objective of this project is to test options for improving plantation survival and growth on dry, cool IDFdk4 and SBSdw1 backlog sites in the Cariboo, and to establish a demonstration area where operational foresters can view and compare alternative plantation establishment regimes.

PROGRESS:

Fifth-year seedling data were collected in 1992 and a file report summarizing the results is available. A vegetation study was conducted to determine the effects of grazing on the pinegrass community. The results from the seedling and vegetation data will be published in 1994. The next seedling assessment is planned for 1997.

BENEFITS:

The trial will provide long-term evaluation of the silviculture benefits of the site preparation treatments tested and help evaluate the interactions between conifer plantations and cattle grazing. Refor-

estation guidelines for dry, cool IDFdk4 and SBSdw1 backlog sites will be produced.

BC-BL157 HERBICIDE RATE AND TIMING TRIAL ON A FIREWEED DOMINATED BACKLOG SITE IN THE ICHe

PROJECT LEADER:

T. Newsome, Cariboo Forest Region

OBJECTIVES:

This trial will test the efficacy of VISION at three rates on five application dates on a fireweed complex in the ICHe. The objective is to determine the optimum rate and timing of VISION to minimize damage to an existing plantation (brushing tool), and to improve plantation performance through the control of competing vegetation (site preparation tool).

PROGRESS:

A site was chosen in the 100 Mile Forest District and planted with interior spruce in 1977. The site was fill-planted with Douglas-fir in 1986 due to high mortality of the interior spruce seedlings. Herbicide was applied at three rates (3.0, 4.5 and 6.0 L/ha) and at five different times (late July, early August, late August, late September and early October). Measurements of seedling growth response and condition, and assessments of noncrop vegetation will determine the efficacy of treatments.

The 5th-year field data for both vegetation and seedling performance have been collected. A final report will be available in 1994.

BENEFITS:

This trial will provide a long-term evaluation of the silviculture benefits of VISION. Guidelines for the use of VISION

for site preparation, and brushing and weeding in fireweed complexes in the ICHe will be developed. The trial site will also be used as a demonstration area.

BC-BL235 EFFECT OF MANUAL TREATMENT TIMING AND GLYPHOSATE ON NON- CROP VEGETATION AND CONIFER DEVELOPMENT

PROJECT LEADER:

B. D'Anjou, Vancouver Forest Region

OBJECTIVES:

This trial will monitor and compare the development of several species of conifers and noncrop vegetation: (1) with manual cutting treatments throughout the growing season; (2) with a broadcast glyphosate application; and (3) with no treatment.

PROGRESS:

Results to date showed that most noncrop species resprouted vigorously following a single cutting of the above-ground portions of the plant. Cutting provided only a short-term reduction in competition. However, acceptable control of red alder was achieved by manual cutting, especially during the growing season. Late summer broadcast application of glyphosate was more effective than manual cutting for controlling thimbleberry, salmonberry, birch, bigleaf maple and other species.

In 1993, 5th-year remeasurements will be made of vegetation and conifers at three locations: McGuire Creek, Dewdney, and Lillooet Lake.

BENEFITS:

These trials will provide an increased understanding of the response of vegetation to manual cutting and the subsequent growth response of conifers. These results

will be compared to herbicide treatments. Findings will be presented in a memo, report, and presentation.

PUBLICATIONS:

D'Anjou, B. 1990. Effect of manual treatment timing and glyphosate on non-crop vegetation development. FRDA Memo No. 141.

_____. 1990. Growth response of several vegetation species to herbicides and manual cutting treatments in the Vancouver Forest Region. FRDA Report 135.

BC-BL341b REHABILITATION OF SITKA ALDER/FIREWEED DOMINATED BACKLOG SITES

PROJECT LEADER:

D. Lloyd, Kamloops Forest region

OBJECTIVES:

The objectives of this study are to establish a demonstration area to illustrate potential treatment alternatives and to contribute to an improved understanding of the ecosystem's characteristics and treatment response. Specific objectives include:

1. evaluating the effects of mechanical, chemical, manual cutting, burning, seeding and grazing treatments, alone or in various combinations;
2. comparing the performance of Sx planting stock;
3. determining the effect of manual cutting Sitka alder at different phenological periods; and
4. evaluating seedling response and the effectiveness of 3 legume and 11 grass species, individually and in various combinations, in replacing competing vegetation following site preparation.

PROGRESS:

All site treatments were completed in 1991. In 1993/94, the focus will be on monitoring the treatment responses.

BENEFITS:

The results of this study will address questions about rehabilitating this productive ecosystem while providing biological and environmental data to understand the treatment response. Findings will be presented as research notes, and as ECW reports and publications. Field tours will also be conducted. This study will also assist in growth and yield predictions, help improve species selection guidelines, and provide a greater understanding of treatment impacts on site quality.

BC-BL368 LEGUME AND GRASS SEEDING FOR BRUSH CONTROL ON MECHANICALLY PREPARED BACKLOG BRUSH FIELD SITES IN THE CENTRAL INTERIOR ICH AND ESSF

PROJECT LEADER:

O. Steen, Cariboo Forest Region

OBJECTIVES:

There are constraints on the use of treatments such as herbicides and prescribed burning. Mechanical site preparation (scarification) to clear competing brush, followed by seeding of low-growing grasses and legumes is one promising technique for controlling the reinvasion of native brush species. This project will demonstrate and evaluate the effectiveness of grass-clover seeding for controlling competing vegetation and establishing a free-growing crop tree plantation on mechanically scarified sites in the ESSF and ICH.

PROGRESS:

The effectiveness of grass and legume seeding will be evaluated by monitoring vegetation, soil, and crop tree performance on sites seeded in 1988. The three trial sites were scarified and seeded in 1988. Vegetation, soil, and crop tree performance have been monitored annually since 1988. Test sites are in the ICH and in the ESSF. The effectiveness of the following treatments is being tested: (a) seeding at one density of one low-growing grass and clover seed mix; (b) broadcast fertilizer application at one rate and time to improve early growth of clover and grasses; and (c) no treatment (no seeding and no fertilizer).

BENEFITS:

The reports, presentations, and demonstration sites from this project will assist in operational decisions about the suitability and application of grass-clover seeding of scarified sites for brushfield reforestation.

**BC-FRDA 2.12 EFFECT OF
MANUAL TREATMENT TIMING
ON RED ALDER REGROWTH
AND CONIFER RESPONSE:
OKEOVER INLET**

PROJECT LEADERS:

F. Pendl, Vancouver Forest Region
B. D'Anjou, Vancouver Forest Region

OBJECTIVES:

Manual cutting may successfully reduce alder growth, but the timing of cut can have a significant effect on treatment effectiveness. The objective of this project is to assess the effect of timing of manual cutting treatments on red alder and associated species.

PROGRESS:

Brush saws were used to remove a stand of red alder from a Douglas-fir and grand fir plantation. The timing of the treatment varied over the growing season (June to September 1983). Results after the first two growing seasons suggested that alder mortality was highest when cutting occurred late in the growing season. Results in later years showed no difference in alder mortality between cutting periods. However, this was attributed to natural mortality from moisture stress and the presence of a fungal disease that damaged both treated and untreated alder. Douglas-fir (height and stem diameter) and grand fir (stem diameter) growth was enhanced following reduction in alder density by cutting. In 1993/94, 10th-year remeasurements of conifers and red alder will be completed.

BENEFITS:

Red alder can compete with conifers. Since herbicide use is not always possible, other treatments such as manual cutting must be explored as options to reduce alder growth. This study will help improve our understanding of the effect of manual cutting timing on red alder growth, and describe the growth interaction between red alder and Douglas-fir/grand fir plantations. Results from this trial will be included in a FRDA memo summarizing the results from all manual cutting trials completed in the FRDA program.

PUBLICATIONS:

D'Anjou, B. 1990. Growth response of several vegetation species to herbicides and manual cutting treatments in the Vancouver Forest Region. FRDA Report 135.

Pendl, F. and B. D'Anjou 1990. Effect of manual treatment timing on red alder regrowth and conifer response. FRDA Report 112.

ENVIRONMENTAL IMPACTS

BC-FR30 EFFECTS OF DIFFERENT RATES/TIMING OF GLYPHOSATE APPLICATION ON WILLOW IN MOOSE WINTER RANGE IN THE SBS

PROJECT LEADER:

Bryce Bancroft, Madrone Consultants Ltd.,
Victoria

OBJECTIVES:

Information is required on how different rates and timing of glyphosate

applications affect willow species in order to evaluate the potential impacts on browse availability for moose.

PROGRESS:

Two trial sites have been established. On the first site, located near the Rus fire in the Prince George area, a trial was established to examine the effects of three rates of glyphosate application and four times of application. At the second site, near Giscome, the effects of timing were examined using one rate of application on four willow species. The trials follow the standard "level B" protocol, with information on browse, small mammal

damage, and new shoot growth. Assessments were completed prior to treatment in 1988, and again in 1990 and 1991. In 1993, 5th-year assessments were made. Data will be analyzed and a report prepared.

BENEFITS:

A report and ECW abstract will describe how the different rates and timing of glyphosate application affect mortality and growth of willow species, and whether or not different willow species have varying susceptibilities to glyphosate. This information will be used to evaluate the potential impacts of treatments on browse availability for moose.

PUBLICATIONS:

FRDA Memos 150 and 161 are available.

**BC-C21 PROVINCIAL
STRATEGY FOR MONITORING
IMPACTS OF VEGETATION
MANAGEMENT, WILDLIFE
HABITAT AND BIODIVERSITY:
A PROBLEM ANALYSIS**

PROJECT LEADERS:

Sylvia von Schuckmann, MoELP,
Integrated Management Branch
Tony Hamilton, MoELP, Wildlife Branch

OBJECTIVES:

This study will identify information gaps about the impacts of vegetation management treatments on wildlife, wildlife habitat and biodiversity, and use this information to rank research and monitoring requirements. In order to improve operational guidelines, a provincial strategy is required to ensure that research and monitoring is ranked according to new management priorities. Ranking will include identification of species, habitats,

and locations of greatest importance to wildlife and vegetation managers.

PROGRESS:

The problem analysis and ranked list was drafted following a thorough literature review and interviews with silviculture, research, wildlife and habitat managers, and herbicide manufacturers. The problem analysis and the ranked list of ecosystems selected for monitoring is in press.

BENEFITS:

The ranked list will be used to help coordinate future integrated vegetation management research and monitoring throughout the province. Data collected using the Habitat Monitoring Procedures will be incorporated into the new B.C. Environment Wildlife Habitat database.

**BC-IR05 INFLUENCE OF
VEGETATION MANAGEMENT
ON DIVERSITY OF PLANTS,
SMALL MAMMALS, AND
WILDLIFE HABITAT**

PROJECT LEADERS:

T.P. Sullivan and F.L. Bunnell, U.B.C.,
Forest Sciences, Vancouver

OBJECTIVES:

Little information exists on how habitat alteration through vegetation management affects biological diversity in British Columbia. This study will measure the impact of manual and herbicide-induced habitat alteration on species diversity of plants, small mammals, and wildlife habitat. Research will also help determine, from observed impacts, where and how these treatments could be applied to maintain existing diversity over time.

PROGRESS:

This is a 5-year project located in replicated blocks. Nine plantations (three control, three herbicide-treated, and three with manual removal of competing vegetation) have been selected. Pre-treatment sampling began in 1991 and continued during snow-free periods until treatment began in fall 1992. Plant species were sampled within plots and nested subplots. Both presence and absolute volume for each plant species was recorded. Post-treatment vegetation sampling will be conducted each year in July and August for the duration. Pre-treatment volumes of coarse woody debris were sampled in 1992. Measurements were made of diameter, height, and decay class, and will be used to describe habitat structure. Post-treatment sampling will be conducted each year.

Small mammal populations are being intensively sampled at 3-week intervals

from May through October. Continued sampling of these areas into the post-treatment period and further data analysis should assist in clarifying questions about pre-treatment homogeneity of plantations and the influence of manual and chemical vegetation management on habitat structure and small mammals.

BENEFITS:

Due to the present concern for the maintenance of sustainable levels of diversity, forest management must deal with these questions and develop management plans. Results of this study will help minimize the impact of vegetation management practices on biological diversity in plantations. Results will be incorporated into operational publications and journal articles.

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