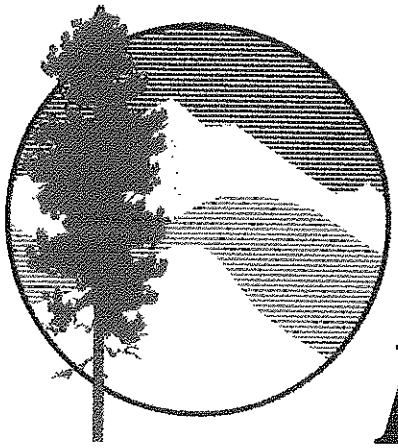

Foothills Forest

1993/94 Work Plan and Budget Submission

Submitted to Forestry Canada
March 1, 1993

FOOTHILLS FOREST
1993-1994 WORK PLAN AND BUDGET

This work plan and budget was prepared by the Project Steering Committee, ratified by the Partners Advisory Committee and approved by the Board of Directors, through an intense series of meetings in late December and January. The Board of Directors approved the plan at their February 8, 1993 meeting.

The work plan is divided into four sections: Staff, Activity Briefs, Budget, Appendix 1. The staff section outlines the general duties of each of the Foothills Forest staff members as well as giving a brief outline of duties in relation to the approved 1993/94 work plan.. All activities approved in this work plan are arranged according to their respective Working Groups, and discussed in the Activity Briefs section. The Budget section contains the "allocated" funds for each project, and Appendix 1 contains a copy of the activity outlines that were used during work plan preparation.

Staff

All positions for the Foothills Forest have been filled. Individuals have prepared work plans in conjunction with the approved 1993/94 work plan with estimates of time required for each individual activity. The following outlines projected staff roles and responsibilities for 1993/94.

Staff Positions:

Administrator/Coordinator

This position will work with the Treasurer to oversee the design and implementation of the budget control and accounting system, building in the checks and balances to ensure fiscal responsibility and control. The incumbent will assist the project steering committee to refine the annual work plan, and oversee the administering of funds. He will assist the Treasurer to develop the Annual Report. The Administrator will also record the minutes of the meetings of the various boards involved with the Foothills Forest.

Primary Responsibilities	Time Allotted ***100%***
Design and Implement Budget Control and Accounting Procedures	
Monitor Budget to Ensure Fiscal Responsibility	
Assist Project Steering Committee in Refining Annual Work Plans	
Oversee Administration of Funds for Foothills Forest Programs	
Assist Foothills Forest Treasurer with Preparation of the Annual Report	
Maintenance of Records for Meetings of the Board, PSC, and PAC	

Operations Forester

The Forester will work closely with Weldwood's operations staff to design, implement and coordinate the field activities upon which most model forest investigations will depend - including field trials and demonstration projects in harvesting, silviculture and wildlife habitat.

Time Allotted

Primary Responsibilities — **80%**

Aspen Regrowth after Mechanical Release of Conifers
Pre-harvest Treatments for Reducing Aspen Response to Cutting
White Spruce Shelterwood Study
Validation of Basal Diameter Ratio CI for Pine/Aspen
Chipper Residue Disposal Impact Study
Understory Preservation in Mixedwoods Study
Environmental Impacts of Forestry Practices on Boreal Mixedwood Ecosystems
Community Forest Inventory Work
Tree Growth/Stand Yield Impacts of Basal Girdling by Rodents
Comparison of Stumpside vs Roadside Delimbing Harvesting Systems
Aspen Regrowth after Chemical Release of Conifers
Effects of Harvesting on Soil, Vegetation, Seedling Performance, and Skidder Mobility
Using Hog Fuel, Sludge, Yard Reclaimer Materials and Boiler Ash to Ameliorate Soils
Steep Slope Logging Evaluation

Secondary/Advisory Responsibilities — **10%**

Project Design for Ecological Classification of Weldwood PSP's
Ecologically based Pre-Harvest Planning
Management Effects on Genetic Diversity of White Spruce and Lodgepole Pine
Spatial Wood Supply Model
Geophysical Timber Avoidance/Salvage
Horse Grazing
Inventory Late Successional and other Special Ecosystems
Carbon Budget
Improve Operational Planning Standards

Other Related Duties — **10%**

Area Familiarization
Review and Revise Deferred Submissions
Review and Revise New Submissions for 1994/95
Attendance at PSC, PAC Meetings
Seminar, Conference Presentations and Meetings
Professional Development

Seconded Forester

The Seconded Forester from Alberta's Department of Environmental Protection will be responsible for the planning, delivery, and technology transfer of specific timber management and reforestation elements of the Foothills Model Forest. Specific activities include the development of a community forest project plan, development of the GIS database, development of integrated resource plans, and acting as a project team member on other related programs or activities.

Time Allotted

Primary Responsibilities — **60%**

Community Forest Development
- *Assist with completion of Digital Inventory for Crown Units E4, E5, E9 and E11*
- *Familiarization with all resource uses in above mentioned units*

- *Determination of data deficiencies in above inventories and commencement of data collection to fill gaps*
- *Complete Review of Existing Community Forest Projects across Canada*
- *Initiate Public Input Sessions in to the Development of a Community Forest*
- *Initiate Development of a Detailed Management Plan for the Community Forest*
- *Incorporation of Urban/Wildland Interface strategies for Forest Protection into Community Forest Planning*

Secondary/Advisory Responsibilities **20%**

Cache Percotte Forest Demonstration Project Revisions for Submission for 1994/95
Cache Percotte Forest Trail/Tour Program Revisions for Submission for 1994/95
Athabasca Mixedwood Demonstration Project
McLeod River Access/Recreation Corridor Management Plan
Ecologically Based Pre-Harvest Planning
Environmental Impacts of Forestry Practices on Boreal Mixedwood Ecosystems

Other Related Duties **20%**

Program Administration
- *Responsible for the continuing function of the Foothills Forest Project Steering Committee*
- *Coordinate Development of Future Work Plans*
- *Invite Revisions or New Activity Outline Submissions for Review and Consideration by the Project Steering Committee*

Technology Transfer
- *Technology Transfer back to the Alberta Forest Service*

Course Assistance through the Forest Technology School as Needed
Professional Development/In-service Training

Biologist

The biologist will work with biologists from both Weldwood and Alberta's Department of Environmental Protection in the collection of data for the validation of wildlife habitat models; in the design, data collection and analysis of research projects on habitat, fish and wildlife; on the development and implementation of integrated management demonstration projects.

Time Allotted

Primary Responsibilities **60%**

Research
- *Elk Study*
- *Pileated Woodpecker Study*
- *Caribou Study*
- *Lichen Study*
- *Furbearer/Mammal Study*
- *HSI Model Testing*
- *Habitat Yield Curves*
- *Habitat Supply Module*
- *Aquatic/ Watershed Studies*
- *Bird Inventories*
- *Wildlife Responses to Partial Cutting in Spruce - McLeod Riparian*

Secondary/Advisory Responsibilities **20%**

Management Effects on Spruce and Pine Genetics
Integration of Wildlife Habitat with Forest Land Mapping
Spatial Wood Supply Model
Snag Dynamics
Watercourse Inventory
Habitat Supply outside of FMA
Minimizing the Effects of Roads
River Corridor Management
Trail Enhancement
Non-timber Valuation
Environmental Impacts of Forestry Practices on Boreal Mixedwood Ecosystems
Community Forest Wildlife Component
Convert Provincial Fisheries Inventory to Digital Format (GIS)
Old Growth Study
Successional Development of Pine Forest Communities
Topography and Drainage as Factors Affecting Mixedwood Forest Succession
Long-toed Salamander Study
Impact of Forest Fragmentation on Arthropod Biodiversity

Other Related Duties **20%**

Weldwood Forest Planning Group - Growth and Yield Strategic Planning
Department of Environmental Protection (Fish and Wildlife)
PSC, PAC and Staff Meetings
Review and Revision of Existing and New Project Submissions
Public Relations/Presentations
Professional Development

Geographic Information Analyst

The Geographic Information Analyst will assist in the design, development, testing, implementation and documentation of a data model for the natural resources information system, and participate in the design and implementation of decision support modules - key building blocks of the integrated resource management planning model which is the end result of the five year program.

Time Allotted

Primary Responsibilities **90%**

Extend and Upgrade Digital Inventory
ArcForest Data Model
GIS System Administration (Tech Transfer)
GIS System Administration (Operational)
Spatial Wood Supply Model
Landscape Planning Model
ArcForest Data Loading
Conversion of Provincial Fisheries Inventory to Digital Format

Secondary/Advisory Responsibilities **10%**

Professional Development/GIS Upgrading

Technology Transfer Officer

The Technology Transfer Officer will coordinate symposiums, workshops and training programs aimed at disseminating information on resource management and the Foothills Forest to practitioners as well as the general public. She will also develop technology transfer proposals, facilitate demonstrations linked to the program, and develop interpretive public information programs based on the program as well as the natural features of the area.

Time Allotted
100%

Primary Responsibilities

Development of and Ecotourism Product for the Foothills Forest
- *Graduate student supervision*
- *Materials Collection (ie. photos, video, etc.)*

Development of Interpretation and Technology Transfer Programs
- *Proposal Development for Western Diversification, Economic Development, etc.*
- *Provincial, National and International Contact List Development*
- *Identify and Assess Commercial Opportunities*
- *Exchange Information for the Purpose of Soliciting Cooperative Activities*

Monitor Direction of Forest Technology Transfer and Public Awareness Initiatives
- *Identify New Opportunities for Foothills Forest Promotion*
- *Prepare Activity Outlines for Review and Approval for Future Years*
- *Track Revenues and Expenditures for each Approved Activity*

Development/Implementation of a Communications Plan for the Foothills Forest
- *Confirmation of Target Audiences to Meet Various Needs of Technology Transfer*
- *Determine and Assess Client Needs/Expectations*
- *Coordinate and Plan Major Symposiums/Workshops*
- *Develop a Listing of Appropriate Conferences for Presentations*
- *Coordinate the Dissemination of Information Relating to the Foothills Forest*
- *Prepare Status Reports on Technology Transfer for Various Foothills Forest Committee's*
- *Develop and Maintain a Listing of Contacts/Techniques Relevant to Resource Management Technology Transfer*

Activity Briefs (*denotes no Foothills Forest dollars required)

1. Resource Information and Planning Systems

Extend and Upgrade Digital Inventory
This is the second year for this activity. $15,000 was allocated under the 1992/1993 work plan. The key to the spatial forest level analysis is a correct and complete inventory. $63,000 has been identified in the 1993/1994 Foothills Forest budget. Weldwood will contribute approximately $400,000 of in-kind support for an ongoing operational inventory program. The AFS will contribute in-kind support for production of the AFORSIM data and delivery of the phase III mylars for an approximate value of $10,000.

Mammal inventories/furbearer response to timber harvesting
The objective of this activity is to expand the small mammal and furbearer inventory programs in place to verify habitat suitability models. Small mammals will be inventoried using snap traps and pit falls. Inventories of furbearers before, during and after timber harvesting will be performed using predetermined track transects. Local trapper participation will be considered

Habitat yield curves
Thirty habitat suitability models were developed by adapting similar models developed elsewhere with expert opinion. This activity will revise the habitat variable information required by analyzing existing data sets available, developing a sampling protocol for new data collection and validating or modifying existing models with the new data. $10,000 is allocated for analyzing existing data sets and developing a sampling protocol.

Project Design for the Ecological Classification of Foothills Forest Permanent Sample Plots
The purpose of this study is to try to determine the best method to classify the existing network of PSP's that exist throughout the Foothills Forest and to design a sampling method for the required field component.

Watercourse Crossing Inventory *
The bulk of this activity has already been completed with remaining work to be wrapped up in 1993. This program is designed to provide a complete stream crossing inventory to help staff document erosion, siltation and fisheries obstructions occurring in the Foothills Forest.

Landscape Planning Module *
This process is linked to the overall creation of the data model and will enable Foothills Forest staff to incorporate visual landscape objectives with other uses during the operational planning process.

Habitat Supply Analysis Outside of Weldwood's Forest Management Agreement Area *
This study will allow the habitat supply analysis project to integrate non FMA areas into the habitat supply analysis for the Foothills Forest area.

Integration of Wildlife Habitat Evaluation with Predictive Forest Land Mapping *
This study, designed to develop and assess methods of integrating wildlife habitat evaluation procedures within the framework of an ecosystem based, predictive forest land mapping system, is already underway with funding from the Canada/Alberta Partnership Agreement.

A/D

(651)

Foothills Forest Activity Outline

Activity number: 1
Prepared by: Sean Curry **Date**: January 7, 1993
Title: Extend and upgrade digital inventory of Foothills Forest
Working Group Coordinator: Sean Curry
Activity contact: Sean Curry
Activity team members:
Confirmed: Tony Sikora AFS, Brian Maier WW
Potential: Dave Morgan AFS
Purpose: Provide a complete spatial inventory for the Foothills Forest area within ARC/INFO
End Results: Goals and Objectives: A spatial database is essential for spatial assessment models. A spatial inventory is the base upon which the majority of all activities rest.
Location: Complete Foothills Forest area.
Methods:
1. Weldwood has an ongoing operational inventory program that will provide some additional data during fiscal year 93/94. The remainder (map attached) will be provided by either digitizing or scanning the AFS Phase III maps and digitizing Weldwood's regenerated stand inventory (RSI) data.
2. The project will consist of two phases, a pilot project to scope-out the process and a production project. The pilot project will be completed on two operating compartments and must be complete by March1, 1993. The production project will address the remaining area, commence May 1 1993 and be completed by September 31, 1993.

The pilot project is designed to address problems associated with those operating compartments that intersect with several townships and those operating compartments which lie within a township. It will also identify bottlenecks and data management problems.
The following data will be provided to the successful bidder:
-1:20,000 base data in ******* format on ****** tape (WW)
-Operating compartment boundaries (digitized by FF at scale of 1:20,00) (WW)
-Database structure (WW)
-Coverage structure and feature codes (WW)
-Phase III mylars showing legal grid, forest cover boundaries, forest cover attributes, hydrogophy and plannimetric data provided by AFS (in-kind contribution)
-Forest cover attributes on tape, provided by AFS (in-kind contribution)
The following is the expected product from the successful bidder:
-Complete coverage within operating compartment edgematched to operating compartment boundary with unique polygon numbers. The phase III data is by township and some operating compartments can cross into four townships. Phase III polygons are unique within each township.
-error free database for each operating compartment with attributes that match polygon numbers
-appropriate ARC/INFO coverage of forect cover boundaries only by operating compartment, legal grid, hydrography or planimetric data is not wanted
Depending on the prices the Phase III data will be either rubber-sheeted to new 1:20,000 base map series on a compartment basis*** or rubber-sheeted to UTM based township coordinates
3. The utility of Weldwood's RSI data (point data) for spatial queries will be examined and it is expected that the data will be loaded and processed to create polygons. Several processing algorithms are available and these will be examined. The point data must be matched to the attribute data, and this must be converted to the appropriate data base strucutre (from RBASE to either INFO or ORACLE)
4. Once a complete coverage has been created the following additional tasks are necessary:

-Phase III inventory must be updated from the year of inventory. This will be accomplished by determining site index at the year of inventory using an existing program in RBASE. This links stand height and stand age to site index after making corrections for years

to breast height. A new base year of inventory will be selected and the Phase III inventory will be "grown" to the new height, using site index. Most of this program exists in RBASE and should be converted to use INFO or ORACLE data.

-yield curves will then be assigned using teh stratification described in the 1991 detailed forest management plan.

-regenerated yield curves will also be assigned to each yield curve.

5. A copy of the forest cover layer will be sent to the AFS

Links to other activities: Essentially any activity that requires a forest cover inventory at any time in the planning horizon.

Time-frame: Fast-track for completion by December 1993.

Budget: (000's)

Item	92/93	93/94	94/95	95/96	96/97	97/98	Source of money
pilot project	10						MF
production project		*					MF
RSI digitizing	O	O					
attribute updating	0	0	0	0	0	0	WW (in-kind)

Status: Pilot project ongoing

* proposals will be evaluated Jan 8th

63,000

3

A/D

593

Habitat Yield Curves
Foothills Forest Activity Outline

Prepared by: Christy Butt **Date:** December 9, 1992

Title Mammal Inventories

Working Group Coordinator ~~Rick Bonar/Kirby Smith~~ Sea Cuny

Activity Contact Christy Butt

Activity Team Members

Confirmed: Christy Butt, FF Biologist
Potential: Alberta Trappers Association, CWS, WHC, Alberta Fish and Wildlife
Local trappers, U of A

Purpose

Expand small mammal and fur-bearer inventory programs (1996)

End Results: Goals and Objectives

-Develop improved resource information to complete existing inventory programs and start new for non-timber resources (Goal 1; Objective 2)

-Develop cooperative management strategies for wildlife by conducting wildlife supply analysis to ensure biodiversity and analyzing wildlife habitat supply and population vulnerability(Goal 4; Objective 5 and 6)

-Integrate timber management activities with other commercial uses by developing an action plan to increase communication, data collection among all commercial users(Goal 7;5)

General Objectives:

Expand small mammal inventories and digitize

Run tracking transects for furbearer species and record associated habitat surveys

Location

We will be concentrating on habitats not already sampled in our existing small mammal plots.

Fur-bearer tracking transects will be located in future compartments scheduled for planning.

Methods

Continue updating furbearer trapper catches for each year.

Set small mammals trapping plots using snap traps and pit falls. Keep a running inventory of amphibians caught in traps.

Mark observed track locations during habitat compartment assessments in winter. Return in summer to record habitat inventory (AVI).

Input collected small mammal population data and furbearer habitat data into database.

Links to other activities

1. Development of fur-bearer inventory programs
2. Completion of timber/wildlife habitat/population modelling process
3. Assessment of wildlife use in operational trials in harvested areas
4. Operational programs to ensure wildlife conservation and biodiversity
5. Improving trapper communication

Time-frame

Small mammal inventories will be conducted each summer for the next 3 summers.

Fur-bearer transects will take place in from 1993 - winter 1996

Data input summer 1996

Budget

Technical data collection will be conducted by existing staff.
Equipment : $400/yr

Summer student/contract to input data for 1 month $2 500

Resources/Contributions

Data presently exists for some habitat types on small mammal populations. Studies on marten habitat use have been studied using U of A grad student.

Status

See above

4/52
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Furbearer Rosponses to Timber Harvest
Foothills Forest Activity Outline

Prepared by: Kirby Smith **Date: 7 January 1993**

Title: Furbearer Responses to Timber Harvest

Working Group Coordinator

Activity Contact: Kirby Smith

Activity Team Members: Arlen Todd, Rick Bonar, Dave Hobson, Kirby Smith, John Frank (ATA)

Purpose

To assess the winter response of furbearers to timber harvest.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest proposal:
Overall Goal - Objectives 1, 2, 6 and 7; Goal 4 - Objective 1, 2, 4, 5, and 6; Goal 9 - Objective 2.

Location

The study would be conducted in 1 location in the McLeod Working Circle and 1 in the Marlboro Working Circle.

Methods

Track counts for furbearer species would be conducted by the Registered Trapper following each fresh snowfall on pre-assigned transects before, during and after clearcut logging.

Links to other activities

The Furbearer study links to:

1. Evaluation of the habitat models and testing of the habitat supply analysis of the Foothills Forest DSS

2. Coarse woody debris/ snag management strategy.

Time-frame

This project could be initiated immediately and continue for the duration of the program.

Budget

ITEM	1993	1994	1995	1996	1997	TOTAL
Fuel	1 000	1 000	1 000	1 000	1 000	5 000
Snowmobile repairs	1 000	1 000	1 000	1 000	1 000	5 000
Contract $	4 000	4 000	4 000	4 000	4 000	20 000
Total	6 000	6 000	6 000	6 000	6 000	30 000

Resources/Contributions

The Registered Trappers would conduct the bulk of the field work at very low cost.

Status

Habitat Yield Curves
Foothills Forest Activity Outline

Prepared by: Rick Bonar **Date:** November 16, 1992

Title Habitat Yield Curves

Working Group Coordinator ~~Rick Bonar/Kirby Smith:~~ Sean Curry

Activity Contact Rick Bonar.

Activity Team Members

Confirmed: Rick Bonar
Potential: Dr. Jim Beck, Richard Quinlan, Sean Curry, Hugh Lougheed, Christy Butt, Model Forest Biologist, AFS, Alberta FMA holders.

Purpose

Develop data-based yield curves for habitat variables needed to implement the wildlife habitat supply analysis module of the Foothills Forest Decision Support System.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 2 - Objective 1; Goal 3 - Objective 5; Goal 4 - Objectives 1, 5-6, 8.

General objectives:

1. Revise list of habitat variable information needed to run all HSI habitat models.
2. Analyze existing data sets to extract habitat variable yield curve information (PSP data, RSI data, AFS fuel inventory data, etc.
3. Develop sampling protocols and a work plan to obtain data to augment existing information and provide data to develop new yield curves where needed.
4. Collect data and prepare yield curves.
5. Incorporate revised yield curves into wildlife habitat supply analysis module of Foothills Forest DSS.

Location

Additional data could be collected in conjunction with re-measurement of the existing Weldwood PSP system, new PSPs established in Crown Management Units and protected areas, ecological classification field plots of PSP system or other areas, and habitat measurement plots installed for various wildlife research initiatives.

Data may also be available on a shared cooperative basis from other partners in Alberta. For example, inventory/PSP data sets administered by the AFS and other FMA holders may be available to develop a set of provincial yield curves.

Methods

Develop sampling protocol based on literature review and use protocol whenever new data is being collected. Most sampling would be piggy-backed on to other programs, such as the before/after monitoring connected to the Demonstration Projects. A limited sampling program to obtain statistically

significant sample sizes may be necessary for some variables and stand types.

Links to other activities

The habitat sampling program links to:

1. All of the Demonstration Projects.
2. Evaluation of habitat models and testing of the habitat supply analysis module of the Foothills Forest DSS.
3. Several technology transfer and public information components: data-based habitat yield curves should have wide applicability to other wildlife habitat supply uses in other areas. These could include other Model Forest sites, and other FMA areas in Alberta.

Time-frame

This activity will start in the winter of 92-93 with: confirm habitat variables; develop sampling protocol; assess suitability/availability of existing data bases; develop action plan. Preliminary yield curves should be developed by the end of 1993, and refined as additional data becomes available.

Budget

ITEM	92/93	93/94	94/95	95/96	96/97	TOTAL
Data/sampling protocol	2,000					2,000
Existing data transcription		10,000	5,000			15,000
Develop preliminary yield curves		10,000				10,000
Data collection			5,000	5,000	5,000	15,000
Revise yield curves			5,000		10,000	15,000
TOTAL	2,000	20,000	15,000	5,000	15,000	57,000

The budget and study assumes most expenses are related to contributions in kind of existing staff or the Foothills Forest biologist, estimated at a daily charge of $200. This activity could also be done by contract or temporary hire, and possibly through a master level graduate student. Depending on the work plan and availability/condition of existing data, costs could be considerably less than estimated.

Resources/Contributions

Data may be contributed as in-kind from several sources in addition to existing Foothills Forest data sets. Funds to develop protocols, analyze data, and develop yield curves may be available from other partners. There is no confirmed funding.

Status

This activity is essential to the successful implementation of the wildlife habitat supply analysis module of the Foothills Forest DSS. We could do HSM with estimated yield curves, but could have no confidence in the results. Preliminary curves are needed before any HSM can be done (as examples or the process), and data-based curves are needed before HSM is used to develop management objectives and strategies.

A/D

3

Foothills Forest Activity Outline

Not budgeted $5,000

Activity number: 10
Prepared by: Sean Curry **Date:** January 7, 1993
Title: Project design for an ecological classification of Foothills Forest's PSPs
Working Group Coordinator: Sean Curry
Activity contact: Sean Curry
Activity team members:
Confirmed: Harry Archibald AFS, Ian Corns Forestry Canada
Potential:
Purpose: In order to improve our understanding of growth and yield and silvicultural treatment response an ecological stratification of the existing databases is required. The purpose of this activity is to determine the best method to classify the existing PSP's throughout the Foothills Forest area and design a sampling plan for the field component.
End Results: Goals and Objectives: Goal 2 - Objective 1; Goal 3 - Objective 4; Goal 9 - Objectives 1,2,3,4;
Location: Meetings in Hinton and Edmonton
Methods: Examine existing data sources and map based products (ELC, PLC) and determine best way to stratify PGS plots. Determine appropriate number of field samples required for each strata to collect additional data on floristic vegetation and coarse woody debris .
Links to other activities: Prerequisite for activity 10a and"Developing growth curves based on ecological boundaries".
Time-frame: Completion by February 15, 1993.
Budget: (000's)

Item	92/93	93/94	94/95	95/96	96/97	97/98
sample design	5					

Status: Active

digitize existing ELC & data

from hard w number 9

A/D

530

Activity Number: 13 Filename (mfa-3-1.wp)

Prepared by: Brian Maier Date: November 16, 1992

Title: ArcForest data model

Working Group Coordinator: Sean Curry

Activity Contact: Brian Maier

Activity Team Members:

Potential:
Confirmed: Bob Willing (WW), Harold Hunt (ESRI), GIS Analyst

Purpose

To provide a stable, consistent format for storing resource information. A data model allows applications and models to be developed using available information and ensures compatibility between applications.

End Result

Directly addresses Goal 3, objective 1. The data model and system (incorporated in the ESRI tool, ArcForest) will provide the base for achieving all of Goal 3 (decision support systems).

Location N/A

Methods

ArcForest will be the software tool to manage the resource information base associated with the model forest. The GIS Analyst, B. Maier, B. Willing and H. Hunt will all be actively involved in configuring the current version of ArcForest to fit the data needs of the Foothills Forest.

Unknown information needs could be determined through a series of workshops held at Weldwood or FTS. The workshops would be open to all interested. The activity team will determine the data model necessary to address those needs. The data model will address information requirements for planning, record-keeping and mapping. The information workshops will be coordinated by Weldwood staff.

ESRI will provide some assistance in modification of ArcForest for the Foothills Forest. Some expenses incurred by ESRI will be covered by Weldwood as part of their historic agreement. ESRI will provide ArcForest to the Foothills Forest at one-half the market rate as per agreements negotiated by Doug Walker and Keith Jones.

ESRI holds a meeting of ArcForest users twice a year, to consider additional features and discuss any other potential improvements.

Documentation and implementation of the data model will be the primary focus of the Foothills Forest GIS analyst, once the hardware and software is setup (Activity _____).

Links

Early progress is necessary on this activity as the data model provides the framework for building the information necessary to accomplish most of the activities in the model forest proposal.

Timeframe

to Mar 93: document data model, become familiar with ArcForest
1993: begin customizing of the tools; target complete implementation by year end

Budget

Item	92/93	93/94	94/95	95/96	96/97	Total
ArcForest licence (support)		21,000 5,000	5,000	5,000	5,000	21,000 20,000
Travel (ArcForest mtg)		1,500	1,500	1,500	1,500	6,000
TOTAL		27,500	6,500	6,500	6,500	47,000

Resources/Contributions

ESRI is contributing $21,000 as a 50% reduction in the market cost of ArcForest. In addition, in-kind support in terms of Harold Hunt's time for some modifications is anticipate. Weldwood will cover the cost of one of the two ArcForest meetings held in Toronto.

Attempting to get FTS support (meeting room and lunches) for the workshops.

Status

Weldwood has made a start on the definition of a data model for it's operating area. Additional input is required for the expanded area (or a least a review of the current model, it may/may not be appropriate for the Foothills Forest). The workshop series will begin in January 1993.

ESRI is sending a demo version of ArcForest by the end of 1992 for us to start to learn how the system works.

A/D (3)

547

Activity Number: 15(a) Filename (mfa-3-0.wp)

Prepared by: Brian Maier Date: November 13, 1992

Title: GIS System Administration (Tech Tsf)

Working Group Coordinator: Sean Curry

Activity Contact: Brian Maier

Activity Team Members:

Potential: Jim Friesen/Ross Risvold (FTS), FFC GIS Analysis
Confirmed:

Purpose

To ensure the hardware and software is in place to manage the resource information necessary to achieve the model forest goals and objectives in the area of technology transfer.

End Result

Directly addresses Goal 15, obj 3 (GIS DSS training), which encompasses several target groups for extension-type training identified in Goal 13, obj 1 & 2.

Training in the use of GIS for management of resource information as well as using GIS as a tool for answering questions related to resource management is the goal of the TT component of GIS System Administration. The Forest Technology School will be set up as a fully functioning training venue in natural resource applications resulting from model forest initiatives.

Location Forest Technology School, Hinton.

Methods

The resource data base and decision support systems developed under the Foothills Forest will be located on the unix platform. The proposed GIS activities were designed to fully integrate with, and complement, the existing unix database and network already in place at Weldwood of Canada.

The GIS component has two streams: (a) operational and (b) technology transfer. The GIS installation proposed for the operational components of the Foothills Forest will be located at Weldwood of Canada. The technology transfer stream will be located at the Forest Technology School.

The technology transfer configuration includes the purchase of a unix data server which will provide the computing power to run up to 10 DOS-based PC's in a laboratory environment. As well, the digitizers and other devices allow the laboratory to act as a full service GIS training centre. In addition, the budget includes dollars to network the Forest Technology School with Weldwood of Canada to allow the School to tap into the operational GIS applications used by Weldwood. In this way, GIS students use real data and real applications to learn how GIS can be used in an operational setting. Each installation can use the other as a backup for critical data, and for processing power when needed.

The proposed capital budget includes these items:

a) Sun SPARCstation model 30

e) cabling to build network

b) 5 GB disk storage
c) modem
d) 5 tablet sized digitizers
f) networking software
g) 10 DOS-based PC's
h) network link between FTS and Weldwood

The expense (annual) items included are:

a) Arc/Info Educational Lab Kit (includes up to 20 licenses for all ESRI products and 2 full sets of documentation).
b) Sun hardware maintenance agreement.
c) Potentially an ArcForest licence depending on the arrangements made with ESRI and Weldwood.

Links

System should be in place by March 31, 1993. The system setup will be a high priority for the GIS Analyst.

Timeframe

Budget

Item	92/93	93/94	94/95	95/96	96/97	Total
Sparc 10 Computer	30,000					30,000
Disk space	7,000					7,000
Modem	2,000					2,000
Digitizers	14,000					14,000
Network Cabling	1,500					1,500
10 PC stations	60,000					60,000
WW/FTS Network		20,000				20,000
Arc/Info Lab Kit	25,000	25,000	25,000	25,000	25,000	125,000
Oracle (Run time) (Support)		1,500 300	300	300	300	1,500 1,200
Oracle (Development) (Support)				9,600 1,400	1,400	9,600 2,800
Laser Printer (Support)		4,500 750	750	750	750	4,500 3,000
SUN O/S Support	3,600	3,600	3,600	3,600	3,600	18,000
ArcForest						
TOTAL	173,100	55,650	29,650	40,650	31,050	330,100

Resources/Contributions

Revenue from courses, BSRI

Status No action.

A/D (3)

730

Activity Number: 156

Filename: (mfa-3-0a.wp)

Prepared by: Brian Maier

Date: November 13, 1992

Title: GIS System Administration (Operational)

Working Group Coordinator: Sean Curry

Activity Contact: Brian Maier

Activity Team Members:

Potential:
Confirmed: B. Willing (WW), FFC GIS Analyst

Purpose

To ensure the hardware and software is in place to manage the resource information necessary to achieve the model forest goals and objectives.

End Result

Direct addresses integration of all information collected as part of Goal 1 (Resource Inventories); provides the basis for attaining Goal 3 (Decision Support Systems).

Location Weldwood Forest Operations/Forest Planning Group

Methods

The resource data base and decision support systems developed under the Foothills Forest will be located on the unix platform. The proposed GIS activities were designed to fully integrate with, and complement, the existing unix database and network already in place at Weldwood of Canada.

The GIS component has two streams: (a) operational and (b) technology transfer. The GIS installation proposed for the operational components of the Foothills Forest will be located at Weldwood of Canada. The technology transfer stream will be located at the Forest Technology School.

The operational configuration includes the purchase of a unix data server, which will provide the necessary computing power to allow many simultaneous users of the system. In addition, it will provide the storage space necessary to compile a resource data base for both model forest and other planning activities. The proposed capital budget for the operational GIS component includes:

a) Sun SPARCstation model 41
b) 2.5 GB of disk storage
c) networking software for (d)
d) PC/X-terminal for the model forest biologist
e) 4mm Tape backup unit
e) cabling for network connections to the existing Weldwood unix network.

Expense (annual) items covered include:

a) Arc/Info 3-node lock license (and support).
b) Lease of an electrostatic plotter.
c) Sun hardware maintenance agreement.

Links

Hardware and software should be in place by Mar 31, 1993. The first task of the GIS Analyst will be to install the system, make sure all the components work, install all software and tie into the existing Weldwood unix configuration.

Timeframe

Budget Approval Dec 8
Purchase Orders Submitted Dec 10

Purchase Arrivals:	Sparc10	Feb 28	Arc/Info Licence	Jan 15
	Plotter	Dec 15	Sun Operating Sys.	Feb 28
	Disk Drive	Jan 10		
	Tape Drive	Jan 10		
	Biol PC	Jan 20		
	Network stuff	Jan 10		

check with #13

Budget

Item	92/93	93/94	94/95	95/96	96/97	Total
SPARC10	30,000					30,000
Disk Storage	7,000		5,000			12,000
Tape Backup	3,000					3,000
IRM PC/X terminal	6,000					6,000
Network Cabling	500					500
ESRI Licence Support	5,000 ~~27,300~~	5,000	5,000	5,000	5,000	25,000 27,300
Sun O/S Maintenance	2,100	2,100	2,100	2,100	2,100	10,500
Oracle (Support)		9,200 1,600	1,600	1,600	1,600	9,200 6,400
Spreadsheet/WP	2,000	100	100	100	100	2,400
Plotter Lease	9,000	21,600	21,600	21,600	21,600	95,400
TOTAL	91,900	39,600	35,400	30,400	30,400	227,700

Resources/Contributions

Weldwood has a postscript laser printer that the new system can use for word processing and other outputs. Weldwood also has an 8-pen color plotter that can be used as a backup system for obtaining map outputs when necessary. Well documented and tested system administration procedures are in place. Until an additional Oracle database development verion is obtained, the Foothills Forest can use one of the run-time versions already purchased by Weldwood.

Status No activity yet.

#19(a) 740 A/D (3)

Wildlife Habitat Supply Analysis DSS Module
Foothills Forest Activity Outline

Prepared by: Rick Bonar **Date:** December 21, 1992

Title Habitat Supply Module

Working Group Coordinator ~~Rick Bonar/Kirby Smith.~~ Sean Conny

Activity Contact Rick Bonar.

Activity Team Members

Confirmed: Rick Bonar, Richard Quinlan, Kirby Smith, Jim Beck
Potential: Model Forest Biologist, Wildlife Habitat Canada, Canadian Wildlife Federation, Canadian Wildlife Service, Forestry Canada, other industry.

Purpose

Complete development of the wildlife habitat supply analysis process started in 1988 as part of the overall Foothills Forest DSS. The module will be used to evaluate various management alternatives and assist with developing wildlife habitat and population objectives for the Foothills Forest.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 3 - Objective 1, 5; Goal 4 - Objectives 1-8; Goal 7 - Objective 2; and aspects of the Demonstration Projects, Goals 17-21.

Forest-level process:

1. Convert remaining preliminary HSI models to GIS format (4 prototype models have been developed by Tom Moore of Forestry Canada).
2. Complete report of preliminary HSI models started in 1990.
3. Pilot study of GIS versions of habitat models on 6 Compartments with several alternative forest management scenarios, including a report.
4. Configure forest-level models to fit DSS framework.
5. Use module to develop integrated objectives for habitat management as part of the overall Foothills Forest IRM Strategy.
6. Develop complimentary population models and link to habitat supply analysis models to extend the module capability to integrated habitat/population objectives and management strategies.
7. Develop a module to project supply of ecosystem or stand types linked to wildlife community information (to add the community level to the system).

Operational process:

1. Develop a process to transfer forest-level objectives to operational planning, including operational guidelines and objectives.
2. Develop a GIS application to determine current HSI and project HSI for alternative management plan proposals.

Location

The habitat module will be applicable for the entire Foothills Forest area. The process should have broad application in other areas. Species models may be transferable to other areas, with no modification or with minor configuration for local conditions. The framework for the system can be used to modify current models or add new ones.

Methods

This activity builds on the process started in 1988, with methods outlined in the 1990 progress report. More detailed methods will be developed as part of the Activity Plan.

Links to other activities

This activity links to habitat yield curves, habitat model evaluations, digital inventory, and spatial forest projections in DSS. The habitat module is an integral part of the overall Foothills Forest DSS. It will be used to evaluate and form part of many other Activities.

In order to make forest-level habitat projections, some sort of spatial projection capability will be needed in the forest projection module, to simulate layout of future harvest patterns.

Time-frame

The study started in 1988. Conversion of remaining HSI models to GIS is scheduled in the 1992/1993 Annual Work Plan. The pilot study with Forestry Canada and the preliminary habitat model report should be completed by summer 1993. Calibration of the forest level models cannot be undertaken until the spatial forest projection module of the DSS is available and the spatial inventory is completed. This is expected by approximately 1994.

Budget

ITEM	92/93	93/94	94/95	95/96	TOTAL
Convert models to GIS	15,000				15,000
Pilot study		10,000			10,000
Habitat model report	2,000	500			2,500
Configure forest-level process		5,000	15,000	10,000	30,000
Integrate population models			10,000	10,000	20,000
Operations application		2,000	5,000		8,000
Total	17,000	7,500	30,000	20,000	85,500

The budget assumes that most of the work will be undertaken by existing staff, particularly the model forest biologist and GIS analyst. Conversion of models to GIS format will be done by contract, and some other aspects may also be suitable for contract. Integration of population models with the habitat models may be a suitable project for a graduate student.

Resources/Contributions

A funding application to Wildlife Habitat Canada to support this activity is pending resolution. It was inadvertently dropped from the Wildlife Habitat Canada process in November 1992 and may not be considered again until April 1993. Other potential partners for this project include other forest industry companies in Alberta, who may be interested if the process is transferrable to their interests.

Status

Conversion of habitat models to GIS is part of the approved 1992/1993 Annual Work Plan. The Habitat Models report is approximately 50% complete. The pilot study of spatial habitat supply analysis has been initiated, with little progress. Forest-level use of the habitat supply module will not occur until spatial inventory and projection modules are available. An operational application can be developed before this occurs.

#4 1 $25,000 AD 520

ECOLOGICALLY BASED PRE-HARVEST PLANNING

Prepared by: David Presslee DATE: November 23, 1992
Contact: David Presslee

Team Members: Weldwood PHA Task Force (David Presslee, Brian Maier, Morris Archibald, Dan Rooks, Rob Stauffer, Sean Curry, Hugh Lougheed, Daryl Farquarson, Rick Bonar), Howard Anderson (FTS), Keith Branter (AFS), Tony Sikora (AFS), Ian Corns (CFS).

Purpose: To develop an ecologically based pre-harvest planning system.

- model forest can develop but not implement

Goals and Objectives:

Planning for successful reforestation requires the integration of both silviculture and harvest planning. This is often difficult because a large number of variables have to be considered to produce a plan that is both biologically sound, environmentally acceptable and economically reasonable. Without a systematic approach, essential elements may be neglected or overlooked altogether.

An ecologically based pre-harvest planning process will provide a systematic framework to link the silviculture and harvesting planning so that the timber and non-timber management objectives for the area are translated into site specific operations. In addition to this, the Pre-harvest Assessment could provide a basis for future technical and environmental audits.

Location: Throughout the Foothills Model Forest.

Methods:

1. Define the role of the Pre-harvest Prescription and its relationship to other Forest Plans. Determine "what data is required for the PHP, how should this data be collected, and how should the final Pre-harvest Plan be presented ".

2. Ecologically based standards (eg. stocking, species, etc.) and management interpretations (eg. harvesting, site preparation, vegetation competition, protection, wildlife, fisheries, recreation, etc.) will be developed for each ecological association described in the Foothills Model Forest to aid is prescription preparation. These interpretations will be correlated across all Ecoregions within the Model Forest.

3. In 1993 a trial will be undertaken in conjunction with the McLeod, Berland, Athabasca, Robb, and Cache Percotte demonstration areas, as well as, selected areas planned for harvest on Weldwood's Forest Management Area. This will provide case studies to operational evaluate and demonstrate the site classification system and the Pre-harvest Assessment and Prescription procedures.

Methods (con't)

4. Following the 1993 field season, a review of the Pre-harvest Assessment and Prescription procedures and the site classification system will be undertaken. Potential problems with the site classification system with be identified and forwarded to the working group extending the site West-central Alberta Field guide. Revisions will be made to the data collection procedures, and format of the Pre-harvest Prescription if required.

5. If the trial proves to be successful, operational implementation of the Pre-harvest Assessment and Prescription process will begin in the 1994 field season for all areas logged in 1995 and beyond. To implement this program, a phase in period may be required.

6. Develop procedures for environmental and technical audits (1995). Conduct environmental and technical audits starting in 1996.

Links to Other Activities:

This activity will improve resource information to assist in implementing an ecologically based silviculture and harvest planning process (Goal 1), assist in improving the extended ecological classification system for West-Central Alberta by verifying the format and coverage (goal 2, project 2.1), provide integration of the silviculture and harvest planning (Goal 11, Project 3.6), provide a framework for environmental and technical audits (Goal 23), and provide a demonstration of ecologically based silviculture and harvest planning in conjunction with the McLeod, Berland, Athabasca, Robb and Cache Percotte Demonstration Projects (Project 17, 18, 19, 20, 21).

Time-Frame:

The identification of data needs and data collection procedures and the completion of a field trial will be completed by August 1993. If the trial is successful, operational implementation of the Pre-harvest Assessment process will begin in the 1994 field season. If this program becomes operational, technical audits will be completed on approximately 10% of the blocks starting in 1996.

Budget:

ITEM	92/93	93/94	94/95	94/96	96/97	TOTAL
PHA procedure and format development Staff-time: Contract:	2000 5000					
Develop Management Guidelines and Interpretations Staff Time: Consultant:	5000					
PHA/PHP Trial (10500 ha): ~~Site Classification~~ Consultant: PHA/PHP preparation Staff Time:		75000 5000				
Review Site Classification and PHA/PHP Procedures Staff-time: Consultants:			3000 5000			
PHA/PHP Training Extension Consultant:			10000			
Operational Implementation (if trial is successful): Staff-Time: Consulting:			(5000) (75000)	(5000) (75000)	(5000) (75000)	
Develop and Trial Technical Audits (if trial is successful) Staff-time:					(5000)	(5000)

12,000 80,000 18,000

(80,000) (80,000) (85,000)

10 75 15 = $100,000

Resources and
Contributions: Weldwood of Canada Ltd., Hinton Division, Forest Technology School, Alberta Forest Service, Forestry Canada.

Weldwood of Canada will contribute staff time and transportation. If the trial proves to be successful, Weldwood will incorporate this planning process into its operational planning.

The Forest Technology School, Alberta Forest Service and Forestry Canada will provide technical and profession expertise to critically review the approach undertaken.

Status:
This activity is already in progress and will continue during the term of the model forest proposal.

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Research

638

Strategic Timber Supply and Blocking Model
Foothills Forest Activity Outline

Prepared by: Hugh Lougheed

Date: 6 January 1993

Pursue something on short time line → develop detailed plan

Title: Strategic Timber Supply and Blocking Model

Working Group Coordinator: Sean Curry

Activity Contact: Hugh Lougheed

Activity Team Members:
Confirmed: Hugh Lougheed, Sean Curry, Brian Maier, Rick Bonar, Eugene Wilson
Potential: Dr. Jim Beck (UofA), Prof. Glen Jordan (UNB), FC

Purpose:

Develop an integrated wood supply and block-generating model to be used in evaluating long-term wood supply. Blocking is required to adequately determine realizeable wood supply and to perform habitat supply analyses for wildlife having spatial habitat requirements.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 3, Objectives 1,2,4,5; Goal 10, Objectives 3,5; Goal 15, Objective 3.

General Objectives:

Develop a spatial wood supply model capable of recognizing alternate scheduling units. An integrated blocking model will enable alternate blocking strategies for varying forest conditions to be strategically evaluated for impact to wood supply. Habitat supply analyses would be performed on periodic spatial inventories generated by the wood supply model.

Location:

To be determined. Final installation at Weldwood GIS.

Methods:

Needs assessment (problem analysis).
Evaluate existing models for applicability to identified needs.
Develop prelimminary system design for both wood supply and blocking models.
Develop prototype software for both models.
Prototype evaluation.
Final system development.
Installation and verification.
Sign off.

Links to other activities

This activity forms the basis for the ability to accurately forecast forest structure over time and thus provide the basis for evaluating impacts to resource values using assessment models, as described in the Foothills Forest DSS Framework diagram.

Budget

ITEM	92/93	93/94	94/95	95/96	96/97	Total
Analyst		15000	15000			30,000.00
Programmer		18000	18000			36,000.00
Travel		3000	3000			6,000.00
Misc.		2000	2000			4,000.00
Total	0.00	38,000.00	38,000.00	0.00	0.00	76,000.00

The analysts time is estimated to be four man-months, with 12 man-months for a programmer.

Resources/Contributions

No cooperators at this time.

Status

Not submitted for Board of Director approval in the 1992/93 work plan.

Approved 93/94

No Foothills Forest Money

5 A/D

already done

Habitat Yield Curves
Foothills Forest Activity Outline

Prepared by: Christy Butt **Date:** December 9, 1992

Title Watercourse Inventory

Working Group Coordinator Sean Curry

Activity Contact Christy Butt

Activity Team Members

Confirmed: Christy Butt, Brian Maier, Rick Bonar

Purpose

Accelerate stream crossings inventory program to document erosion, siltation and fish obstructions (1992).

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothill Forest proposal:

-accelerating development of improved resource information (Goal 1; Obj 2)

-develop a DSS for a total concept operational planning system(Goal 3;Obj 4)

-developing cooperative management strategies for angling management and improving timber management standards for stream crossings (Goal 5; Obj 2 and 3)

-developing new techniques for timber harvesting to improve crossing structures and impacts of roads (Goal 10; Obj 2)

Location

All roads on the Foothills Forest region registered under Weldwood's License of Occupation.

Methods

Inventories were taken at stream crossings; this included all fish bearing creeks and rivers and some intermittent and ephemeral streams.

Inventory at each site included; type of crossing, creek velocity and substrate, wildlife observations (including fish) obstructions, status of embankment or any erosion and recreational use.

Data will be digitized into GIS

Stream crossings will be prioritized to identify locations needing improvements

Future inventory data may be collected using GPS

Links to other activities

The watercourse inventory links to;

1. Fisheries habitat inventory programs
2. Watercourse crossing programs (improving standards, buffer management, erosion control..)
3. Acquisition of GPS
4. Dss operational planning an integrated resource management projects

Time-frame

Spring 1993 to complete UTM Grid Coordinated for each location. Digitizing data will occur after ArcForest has been integrated into GIS system. Update inventory as new roads are built.

Budget

Most work will be through contributions of existing staff.
Time includes 1 week to complete UTM locations and file data sheets and slides. Digitizing and inputting will take at least 3 weeks. Updating the information will take 1 week/year

Status

Inventory of stream crossings on roads is 98% complete.

A/D (3)

690

Activity Number: 17 Filename (mfa-3-5.wp)

Prepared by: Brian Maier Date: November 13, 1992

Title: Landscape Planning Module (GIS)

no cost staff time only

Working Group Coordinator: Sean Curry

Activity Contact: Brian Maier

Activity Team Members:

Potential: FERIC (check this with Bob Udell)
Confirmed: T. Mulvihill (WW), Terry Turner (AFS)

Purpose

Linked to the data model, this module will enable visual landscape objectives to be integrated with other resource objectives in the operational planning process.

End Result

Specifically addresses Goal 3, objective 3 (develop a landscape planning module using DEM model). Once developed, this tool can be very useful in assisting with Goal 10 objective 4 (road planning) and Goal 18, objective 1 (aesthetic landscape harvest plan for Berland caribou demonstration area).

Location N/A

Methods

This activity has two distinct components: DEM data loading and planning module development.

DEM data can be purchased from the government of Alberta. Conversion to Arc/Info TIN coverages is best done under contract due the volume of data and processing required to get it into that form. Recommend that data loading and conversion be done on an incremental basis, starting with a small pilot project. A process for loading (consistent with ArcForest) can be prototyped.

Development of the planning module involves several steps:

a) the activity team will determine the specific objectives for the landscape planning module (what is the extent of the module: is it a block design/layout tool or DSS?)
b) assess user needs for the system (ie: what kind of user interface is required, what linkages are necessary to thematic coverages, etc)
c) determine what information (if any) should be retained after the "analysis" (do the results of this exercise need to be tracked, passed to other DSS modules, stored?)

Links

Timeframe

Budget

Item	92/93	93/94	94/95	95/96	96/97	Total
Acquire DEM data	15,000					15,000
Data conversion	12,000					12,000
Module development		?	?			
	27,000					27,000

Resources/Contributions

Weldwood has already budgetted for the DEM data acquisition and data conversion for its FMA. Look to AFLW to contribute DEM data for the mapsheets not included in the FMA. Weldwood contract with Timberline for data conversion can likely handle the additional mapsheets.

Status

#19 (b) NO A/D

Wildlife Habitat Supply Analysis outside Weldwood FMA
Foothills Forest Activity Outline

Prepared by: Rick Bonar **Date:** December 21, 1992

Title Habitat Supply outside FMA

Working Group Coordinator Rick Bonar/Kirby Smith.

Activity Contact Rick Bonar.

Activity Team Members

Confirmed: Rick Bonar, Richard Quinlan, Kirby Smith
Potential: Model Forest Biologist, W.A. Switzer Provincial Park, coal mines, FTS, Alberta Forest Service, Wildlife Habitat Canada, Canadian Wildlife Federation, Canadian Wildlife Service, Forestry Canada, other industry.

Purpose

Use the wildlife habitat supply analysis process to integrate non-Weldwood FMA areas into the habitat supply analysis for the Foothills Forest.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 3 - Objective 1, 5; Goal 4 - Objectives 1-8; Goal 7 - Objective 2; and aspects of the Demonstration Projects, Goals 17-21.

1. Obtain digital inventory for all areas, including W.A. Switzer Provincial Park, coal mines, Cache Percotte Forest, and Crown Management Units.
2. Use the habitat supply analysis module, coupled with projected changes to these areas, to forecast habitat supply, related to the overall Foothills Forest habitat supply.

Location

All areas within the Foothills Forest but outside the Weldwood FMA.

Methods

This activity builds on the process started in 1988, with methods outlined in the 1990 progress report. More detailed methods will be developed as part of the Activity Plan.

Links to other activities

This activity links to habitat yield curves, habitat model evaluations, digital inventory, and spatial forest projections in DSS, and the integration of other uses within the Foothills Forest. It is needed to develop forest-level habitat supply projections and objectives for the overall Foothills Forest IRM strategy.

Time-frame

Obtain digital inventory in 1993, and use the process in 1994/1995. Results can be used on a stand-alone basis (eg a forecasted habitat supply for a discrete area such as Switzer Park or a coal mine) and

as part of the overall habitat supply analysis (eg Switzer Park will contribute ??% of the Foothills Forest elk habitat).

Budget

The budget is not described in detail, because much of the inventory requirement overlaps with Activity 1 under Resource Inventories. The underlying concept is that a complete digital inventory of the Foothills Forest is required to do forest-level habitat supply analysis, and further that a projection of proposed management activities is needed to forecast future habitat supply. An example of projections might be a schedule for pit opening and retirement on a coal mine, coupled with the plan for revegetating each area.

Resources/Contributions

The major cost of this activity is digital inventory. The habitat supply analysis process is being developed as part of another activity, and projections of management activities can be obtained as an in-kind contribution from partners. Partners could also be asked to provide the digital inventory for their area as part of their contribution (eg ask coal mines to provide inventory for their lease area).

Status

This Activity is still at the concept stage. However, Foothills Forest digital inventory and the habitat supply analysis module are underway as part of other activities.

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Research

INTEGRATION OF WILDLIFE HABITAT EVALUATION WITH PREDICTIVE FORESTLAND MAPPING

Foothills Forest Activity Outline

PREPARED BY: John Kansas **DATE:** November 19, 1992

TITLE: Integration of Wildlife Habitat Evaluation with Predictive Forestland Mapping

WORKING GROUP COORDINATOR: Unidentified

ACTIVITY TEAM MEMBERS:

Confirmed: John Kansas (Sentar Consultants Ltd.)
Ian Corns (Canadian Forestry Service)

Potential: Rick Bonar (Weldwood of Canada Ltd.)
Alberta Research Council
Hughes Aircraft Canada Ltd.
Other Forest Company Partners
Wildlife Habitat Canada

PURPOSE:

To develop and assess methods of integrating wildlife habitat evaluation procedures within the framework of an ecosystem-based, predictive forestland mapping system.

GOALS AND OBJECTIVES:

The overall goal of this study is to assess the pros and cons of evaluating wildlife habitat using an integrated (ecological) approach at operational mapping scales.

Four specific study objectives have been identified, as follows:

1) To critically assess the practical and theoretical aspects of integrating wildlife resource values into large-scale ecological and predictive forestland mapping.

2) To assess the applicability of a variety of wildlife habitat evaluation and large-scale resource mapping approaches.

3) To assess the implications of spatial data uncertainty in terms of wildlife evaluation results and its potential effects on decision making in an integrated resource planning context.

4) To review and report on cost-effective approaches to integrating wildlife habitat evaluation as an integral component of predictive forestland mapping.

Location

The location of this study is not yet confirmed. Since the study was originally designed to evaluate the utility of the NAIA predictive forestland mapping system for wildlife habitat evaluation, the study site must be in an area where Phase 2 (Proof of Concept) mapping has or will be conducted. John Kansas and Ian Corns are currently assessing potential sites for the modelling and testing phases of the study. Initial discussions were held with Rick Bonar of Weldwood in September, 1992 regarding potential sites within the Foothills Forest, leading to Mr. Bonar's request for this Activity Outline.

Overview of Methods

The following methods will be employed:

- A North America wide literature review is currently being conducted on the topic of wildlife habitat evaluation approaches in the context of large scale (operational) landscape mapping.
- A featured species (e.g. elk, caribou) Habitat Evaluation Procedures (HEP) model will be implemented using the NAIA forestland mapping product as an evaluation framework. The same model will also be implemented using a traditional, thematic (forest cover versus ecosystem association) approach to habitat modelling.
- The results of each model will be tested using appropriate field inventory techniques (e.g. pellet group counts, winter track counts).
- The cost-benefit of each approach to habitat assessment will be evaluated in light of accuracy of the current habitat suitability model results, ability to predict future (potential) landscape conditions and wildlife attributes,

mapping costs, ease of integration into broader integrated planning systems (e.g. timber supply models) etc..

- An assessment of methods of integrating wildlife habitat values into NAIA and other digital forestland mapping and evaluation approaches will be conducted. This will be facilitated through a technical workshop with forest planners, forest ecologists, wildlife habitat specialists and digital mapping experts.

Links to Other Activities

This project links to the following activities in the Foothills Forest proposal:

Activities and Deliverables

1. Project 3: Decision Support Systems: By assessing the utility of an ecological approach to wildlife habitat modelling, improvements may be achieved within Activity #7. This is especially possible for aspects of habitat modelling that require predictions of understory conditions over extended time periods.

Research

1. Project 2: Ecosystem Classification: The practical utility of the NAIA approach from a wildlife habitat perspective will be assessed.

2. Project 4: Wildlife and Terrestrial Ecosystems: Depending on the study area location chosen, this project has potential to enhance any one of the projects outlined in Activities 1 through 7. Ability to confidently predict ecosystem associations , along with the dynamic eco-processes that sustain them, undoubtedly improves a biologist's ability to evaluate wildlife habitat suitability and potential. The challenge lies in assessing how much better an ecological approach is to wildlife habitat evaluation and whether the costs outweigh the benefits from an overall integrated planning perspective.

Time Frame

The literature review and pre-planning stages of this project began in October of 1992. Upon selection of a study site, habitat modelling approaches will be implemented. Preliminary modelling will be completed by April of 1993. Model results will be tested in the field during the spring and summer of 1993. A winter field season will be considered if additional funds or manpower is secured. A final report will be completed by April of 1994.

Preliminary Budget

ITEM	92/93	93/94
Professional/Technical Fees	32,000	35,000
Transportation	800	2,000
Accomodation/ Subsistence	400	1,000
Computer Costs	4,500	1,000
Photos/Maps	300	200
Reporting	500	750
Communication	500	500
Field Equipment Rental		2,250
TOTAL	39,000	42,700

Resources/Contributions

To date, a total of $64,000 have been secured for this project through the Canada/Alberta Partnership Agreement in Forestry. To complete this project to the level outlined in this submission, a total of $17,700 in additional monetary and/or in-kind contributions is required.

Status

This project is underway, and requires a commitment from a forest company that has interest in taking NAIA to the Phase 2 level. Selection of a study area will be completed within the next month in order to proceed with preliminary modelling in the New Year.

A/D

Foothills Forest Activity Outline

Activity number: 6
Prepared by: Sean Curry **Date:** January 7, 1993
Title: Inventory late successional and other special ecosystems
Working Group Coordinator: Sean Curry
Activity contact: Sean Curry
Activity team members:
Confirmed:
Potential: JNP, Switzer Park
Purpose: To determine the amount and distribution of special ecosystems in order to provide baselines for longterm management goals.
End Results: Goals and Objectives:
Location: Complete Foothills Forest area.
Methods: Determine the amount and distribution of forest cover types and ecosystem associations across the foothills forest area. This will be accomplished by the following:
1. Query the foothills forest database to determine the area contained in each forest cover type and in each "special ecosystem".
2. Determine the distribution and location of each.
3. Using the definition of old growth from activity 2 in the IRM working group, determine the extent and distribution of old growth across the foothills forest area.

Links to other activities: Will provide information for activity 2 in the IRM working group.
Time-frame: To be completed in 1994
Budget: (000's)

Item	92/93	93/94	94/95	95/96	96/97	97/98
NA						

Status: proposal

old growth projects; appears to be a task

A/D

Activity Number: 14

Filename (mfa-3-2.wp)

Prepared by: Brian Maier

Date: November 16, 1992

Title: ArcForest Data Loading

Working Group Coordinator: Sean Curry

no F.F. money

Activity Contact: Brian Maier

Activity Team Members:

Potential:
Confirmed: Bob Willing (WW), Harold Hunt (ESRI), GIS Analyst

Purpose

To create an ArcForest module that will allow loading of digital data for the Foothills Forest.

End Result

Directly addresses Goal 3, objective 1. Allows successful incorporation of the results of Goal 1, obj 1 to be incorporated into the Foothills Forest information system.

Final product will allow loading of such information as: AVI forest inventory, Phase 3 Forest Inventory, Biophysical survey data, WW photo-point samples, PGS plots, soils data, or others that the team decides are likely themes that would be updated.

Location N/A

Methods

Links

Timeframe

Budget

	92/93	93/94	94/95	95/96	96/97	Total

Resources/Contributions

Status

Watershed Contingency

McLeod #6

McLeod Buffer Management
Foothills Forest Activity Outline

Date: December 17, 1992

Activity Coordinator Pat Guidera

Activity Contact Christy Butt

Activity Team Members Confirmed: MF Biologist, U of A - Bill Tonn, F&W - Carl Hunt
Potential: Inland Waters, Trout Unlimited, IWA

Purpose

Watershed system trials to preserve softwood understory, including a study to evaluate the role of large organic debris in Foothills Forest streams.

End Results: Goals and Objectives
See Riparian Timber Harvesting

Research is to analyze the function of large organic debris and stream side vegetation to fish and fish habitat

Location McLeod River Demonstration project.

Methods
Study would look at:

1. Upper bank conditions: slope, erosion, vegetative cover and tree density
2. Lower bank conditions: rock and erosion
3. Stream cover: cover of debris, overhanging vegetation and canopy
4. Watercourse characteristics: water temp, chemistry, width, depth
5. Habitat use by different species of fish; potential tagging survey

Links to other activities
See Riparian Timber Harvesting

-this study will provide a basis for fish habitat use, habitat models and many of the riparian inventory programs

Time-frame

Activity could begin Summer 1993 with actual research summer of 1994 and 1995 by fall 1995.

Budget

Hiring of a graduate student or summer field technician will be needed in the summer of 1994 and 1995
Estimate: $10 000/yr for technician and equipment

Resources/Contributions

Trout Unlimited has offered to become involved in projects involving fish habitat improvements and reducing erosion. Information from the Tri-Creeks water project could be integrated into this study.

Status University of Alberta Zoology Department has shown an interest in the project

McLeod #6

Watershed Contingency Pol ?

Riparian Timber Harvesting
Foothills Forest Activity Outline

Prepared by: Christy Butt Date: December 17, 1992

Title Riparian Timber Harvesting

Working Group Coordinator Rick Bonar/Kirby Smith

Activity Contact Christy Butt

Activity Team Members

Confirmed: MF Biologist, Tom Mulvihill, Brian Kirstein
Potential: Fish and Wildlife, Inland Waters, Trout Unlimited, IWA

Purpose

Improve guidelines, standards and operational practices to minimize the effects of timber harvesting on water quality, fish and fish habitat, streamside vegetation and large organic debris in watercourse buffers.

End Results: Goals and Objectives

This activity supports;
- the development of the DSS to evolve a total concept operational planning system (Goal 3; Objective 4)
- the development of management strategies for aquatic ecosystems by improving strategies for stream crossings and riparian zones (Goal 5; Objective 3)
- the development of new techniques for timber harvesting to protect and enhance resource value by improving crossing structures and maintenance practices to reduce the impact of roads on aquatic ecosystems, improve processes for road planning, construction and maintenance, development of operator training programs in environmental ethics and evaluating harvest systems at various sites (Goal 10; Objective 2,4,6 and 8).
- the implementation of the McLeod River demonstration of low-impact harvesting, development of access management and designing watershed buffer research (Goal 17; Obj 1)

General Objectives;

Improve timber harvesting techniques to maintain the integrity and habitat values of riparian zones:

- Assess habitat values of creek/river banks and retain those values for fish and wildlife that use the riparian zones
- Reduce activities near intermittent and ephemeral streams to maintain water quality
- Assess harvesting trials on steep slopes and riparian zones to reduce erosion and maintain riparian zones

Location

McLeod River Demonstration project. Compartments planned for 1994 and 1995 adjacent to small streams.

Methods

Bank Habitat:
-Evaluate the role of large organic debris and stream side vegetation in streams
-Assess creek habitat conditions (upper bank, lower bank, stream cover, substrate)
-Pre-harvesting assessments of habitat values in riparian zones; vegetation inventory, snag and down woody debris, wildlife surveys (birds, tracking transects and pellet counts)

Ephemeral Streams:
-Develop operational guidelines to protect in block ephemeral draws and streams: creek classification, season, operator practices, block and layout design and adequate buffer zones.

Harvesting Trials within Riparian Zones:
-Assess use of harvesting systems used on steep slopes in terms of erosion control
-Assess use of partial cutting harvesting systems in buffer zones

Integrate guidelines into operational planning procedures for each of the above. Ensure information and rational is relayed to supervisors and operators.

Links to other activities

The activity links to;
1. Fisheries habitat inventory programs
2. Watercourse crossing projects (improving standards, buffer management, erosion control ...)
4. DSS operational planning and integrated resource management projects.
5. McLeod River demonstration project
6. Operator training programs
7. Road improvement projects

This project is based on accumulated research of other activities involving watercourse and buffer zone information. Guideline development should occur in conjunction with other management strategies involving riparian zones and stream-crossings. Rational for improved protocols are to be integrated into operator and contractor training programs.

Time-frame

Start up of this activity can be initiated by coordinating with the McLeod Demonstration and area coordinators in the spring 1993. Results from other activities can be integrated into developing guidelines to protect stream habitat, fish and water quality. Guideline framework should be completed by fall 1995.

Budget

This activity is based on the results from other projects. Improvement of operational practices will be done on an ongoing basis. Work will mostly be done by existing staff.

Resources/Contributions

Trout Unlimited has offered to become involved in projects involving fish habitat improvements and reducing erosion. Information from the Tri-Creeks water project could be integrated into this study.

Status See above

RH Swanson & Associates
Land-Use Hydrological Consultants

WRNSHYD, HSPF assessments and analyses -- special studies

Robert H. (Bob) Swanson, PhD, RPF
Principal Forest Hydrologist
Box 1431
Canmore, Alberta
CANADA T0L 0M0

Phone/FAX (403) 678-6096

7 January 1993

Page 1 of	10	Including this cover sheet
To:	Rick Bonar Activity coordinator Foothills Model Forest Hinton	
Message:	Rick: Attached is an activity outline for the aquatic DSS. I have consolidated the material that I received from my partners into this one document. I believe it represents a fair estimate of the time and resources that we will need in order to prepare a reasonable aquatic DSS for use on the model forest and for future use by Weldwood and possibly other FMA holders. Apart from the resources mentioned, the only source of funding for our work is the Foothills Model Forest. Bob	

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Foothills Forest Activity Outline

Title: **Development of Aquatic Systems Decision Support System (DSS)**

Working Group Coordinator: Sean Curry, Brian Maier

Activity Contact: Hugh Lougheed

Team members:

Coordination, GIS interface and hydrologic modelling
Robert H. Swanson
RH Swanson & Associates
P.O. Box 1431
Canmore, Alberta T0L 0M0
Phone/FAX (403) 678-6096

GIS data, GIS interfacing with alternative hydrologic model
Ivan Muzik
Department of Civil Engineering
The University of Calgary
2500 University Drive NW
Calgary, Alberta T2N 1N4
Phone: (403) 220-5821 FAX (403) 282-7026

Erosion and sediment transport studies/modelling
Richard L. Rothwell
Department of Forest Science
University of Alberta
Edmonton, Alberta T6G 2R3
Phone: (403) 492-2355 FAX: (403) 492-4323

Fish habitat and population dynamics studies/modelling
Thomas Hoag
D.A. Westworth & Associates, Ltd.
#240, 3015 - 12th Street, N.E.
Calgary, Alberta T2E 7J2
Phone: (403) 250-2093 FAX: (403) 250-2210

within time frame, too much cost, but for now some element may be back in later

Purpose:

The purpose of this work is to create a decision support system (DSS) linked to the Weldwood ARC/INFO GIS database that can be used by forest land managers to assess the consequences of their activities on water resources and the aquatic environment. The type of information needed to address such environmental concerns is time dependent, temporal and spatial variant. The type of system envisioned would access current as well as historical meteorological, hydrological and land-use data to model the state-of-affairs at any given time. The DSS will link with the existing Weldwood GIS to provide temporal and spatial information on water yield, water quality, stream regime, channel characteristics, sediment transport, habitat for and populations of specified fish species, etc. for any time interval, watershed, stream, river or segment, as requested by the GIS user.

Why is such information needed? The management of the Foothills Forest cannot be considered truly integrated unless the initial and cumulative effects of management decisions on all forest resources are considered. Public pressure is being exerted to insure that public resources are sustainable under the harvesting and silvicultural systems being used on all forest management agreement areas.

One example is the fisheries resource. Critical streamflow velocities, water volumes, water temperature, bedload movement, dissolved oxygen and sub critical biological oxygen demand and suspended sediment levels need to be present at the appropriate time in order to maintain stable fish habitat within these small streams. These are dynamic properties that are best 'inventoried' by near-continuous simulation throughout the year with periodic event and/or random field measurements to ensure the validity of the simulated results.

Earlier studies at the Tri-Creeks watershed on the Weldwood Canada Forest Management Agreement area have shown that the small first to third order streams, tributary to major rivers such as the McLeod, are important spawning areas. The flow and water quality conditions in these streams are important to the maintenance of stable and healthy fish populations. Streams of this size frequently drain catchments of such area that much of their timber cover may be removed within a given year or within one cutting cycle. Since a large proportion of the surface area of these first to third order catchments may be clearcut or regenerating for a considerable length of time, timber extraction and silvicultural activities in these catchments pose the threat of considerable environmental impact during harvest and until a new stand of the desired tree species is established.

End Result: Goals and Objectives. (Relevant Foothills Model Forest Goals and Objectives in parentheses.)

Objective I: To provide an environmental decision support system for the sustainable development of aquatic and waterbased resources, which will provide realistic and timely assessments of the initial and cumulative effects of past, current and proposed timber harvesting and silvicultural activities on stream channel stability and water quality parameters affecting downstream or instream water or channel users. (p. 13; Overall Foothills Model Forest Goal: p.14; Goal 3, objective 7: p.14; Goal 5, objectives 3 & 4: p. 15; Goal 11, objective 1: p.17; Goal 17, objectives 1, 3 & 5.)

Objective II: To provide a methodology for the continuous dynamic inventory of aquatic environmental variables (water quantity, streamflow regime, water chemical quality, sediment, DO, BOD, fish population and habitat data, etc.) for streams and rivers within forest management agreement areas where fish populations exist and where spawning and/or other life-cycle activities critical to maintenance of stable fish populations or to human users might be affected by forest harvesting and silvicultural activities. (All of the goals indicated under Objective I above plus p.13; Goal 1, objective 2 and Goal 2, objective 2.)

Location: Computer work in own offices at Canmore, Calgary, Edmonton and Hinton. Field studies in Tri Creeks and other catchments in the Foothills Model Forest area and Weldwood FMA,

Methods:

Historical data from the Tri Creeks watershed study will be used in all initial modelling and analysis work. The streamflow, sediment, channel characteristics, fishery, chemical water quality parameters relevant to fish and climatic data from one or more measurement locations within Tri Creeks will be used with various interpolation models to predict similar data at other sites and checked against data not used in the interpolation model. The procedures and models developed from the Tri Creeks data sets will be tested by extrapolation to catchments where minimal historical information exists using the 1973 and 1974 stream flow, forest harvest and climate data

available for the eighteen catchments studied by Swanson and Hillman (1977)[1]. These extrapolation tests will be used to define the minimum data requirements to operate the aquatic systems DSS on ungauged catchments within the Weldwood FMA. A limited amount of information on water yield and storm flows can be garnered from fairly simple models. The hydrology portion of the WRENSS[2] procedure (often referred to as the WRNSHYD model, although technically it is not a model) will be attached to the Weldwood ARC/INFO GIS database to provide an estimate of water yield changes accruing from timber harvest. The WRNSHYD procedure/model is limited in that it provides annual water yield only. A second model, the US Soil Conservation Service runoff curve number (SCSRCN) method which has been adapted to a specialized GIS, (Muzik and Pomeroy 1990, Chang and Muzik 1991)[3] which estimates flood hydrographs only will also be attached to the Weldwood ARC/INFO GIS database. The combination of these two procedures will serve to provide "first approximation" information on the effects of timber harvest on downstream water users. However, a much more comprehensive hydrologic model, such as HSPF[4], is required to provide the "instream" flow and hydraulic conditions required for site-specific

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[1] Swanson, R.H. and G.R. Hillman. 1977. Predicted increased water yield after clear-cutting verified in West-Central Alberta. Northern Forest Research Centre, Edmonton, Alberta, Information Report NOR-X-198. 40p.

[2] The US EPA commissioned the Water Resources Evaluation on Non-point Silvicultural Sources (WRENSS) as a graphical procedure to assist forest managers in their assessment of the impacts of timber harvest on water yield, water quality and sediment. The hydrology portion of WRENSS has been adapted by Forestry Canada to the personal computer environment (MS-DOS) and can be adapted to other operating systems as well.

[3] Muzik, I. and S.J. Pomeroy. 1990. A geographical information for prediction of design flood hydrographs. Canadian Journal of Civil Engineering 17:965-973.

Chang, C. and I. Muzik. 1991. Flood predictions at ungaged sites aided by a hydrologically oriented GIS. pp.604-610 *In* Proceedings, International Conference on Computer Applications in Water Resources, Volume 2, July 3-6, 1991, Tamkang University, Taiwan.

U.S. Soil Conservation Service. 1972. National Engineering Handbook, Section 4, Hydrology. United States Department of Agriculture, Government Printing Office, Washington, DC.

[4] The Hydrologic Simulation Program Fortran (HSPF) model was commissioned by the US Environmental Protection Agency for use as a tool for assessing the dynamic state of streamflow and water quality. It was published in 1980, has been placed in the public domain by the EPA. It has been configured to run on mainframe, mini (VAX, SUN or equivalent) or IBM-PC(386/486) computers. It is in routine use in the US by their Geological Survey, the counterpart of our Water Survey of Canada, as an extension to their stream flow monitoring program to provide a capability for dynamic simulation of the effects of probable events (such as peak flows, low flows, channel scouring, etc.). The excellent capability of the HSPF model for simulating stream flow is recognized and accepted by most engineering consulting firms and many government agencies in both the US and Canada. It has been successfully applied to watersheds ranging in size from small farm plots through the entire Amazon River basin. The capability of the HSPF model for simulation of water quality changes resulting from the application of fertilizers, herbicides and pesticides to agricultural lands has been documented in both countries as well. However, it has not been used for these same water quality objectives in non-agricultural situations.

One of the principle advantages of the HSPF model is that it does not treat a watershed as a "black box", but has built into it a comprehensive understanding of watershed physical and chemical processes. For instance, the concentration and movement of various water soluble materials can be simulated at a number of physically meaningful locations on a watershed, rather than solely at the beginning (points or areas where chemicals are applied) and end (point where the stream leaves the watershed). This feature allows one to better understand the role of measurable

fisheries habitat evaluation and local peak/low flow estimates. The HSPF model seem reasonably well suited to this task. The framework for the data needed to run the model and to utilize its output as part of a DSS will be provided. That framework will be coupled with existing and/or future GIS databases to provide a dynamic inventory of stream and water resources available throughout a harvest rotation that is commensurate with the inventory of the fibre resources.

The Hydrologic Simulation Program Fortran (HSPF) model was commissioned by the US Environmental Protection Agency for use as a tool for assessing the dynamic state of streamflow and water quality. It was published in 1980, has been placed in the public domain by the EPA. It has been configured to run on mainframe, mini (VAX, SUN or equivalent) or IBM-PC(386/486) computers. It is in routine use in the US by their Geological Survey, the counterpart of our Water Survey of Canada, as an extension to their stream flow monitoring program to provide a capability for dynamic simulation of the effects of probable events. The excellent capability of the HSPF model for simulating stream flow is recognized and accepted by most engineering consulting firms and many government agencies in both the US and Canada. It has been successfully applied to watersheds ranging in size from small farm plots through the entire Amazon River basin. The capability of the HSPF model for simulation of water quality changes resulting from the application of fertilizers, herbicides and pesticides to agricultural lands has been documented in both countries as well. However, it has not been used for these same water quality objectives in non-agricultural situations.

We will design a database, containing the necessary data (or links to data held in the archives of Environment Canada or Alberta Environment) to operate the SCSRCN, WRNSHYD and HSPF models, within the existing Weldwood ARC/INFO GIS. We will then use topographic data from the Tri Creeks watersheds to derive climate data for various sizes of hydrologic units of the three sub-basins (with digital terrain or other suitable models). The WRNSHYD and SCSRCN models will use climate, forest cover information and water yield data for various catchments to derive water yield and flood frequency hydrographs, respectively, for other ungauged catchments. The HSPF model will use the climate and forest cover data for the various hydrologic units to simulate water quantity, streamflow regime, inorganic chemical water quality, channel characteristics and other water-orientated variables as appropriate. These simulated data from all three models will be field checked against up to date measurements of water quality, flow velocity, water depth, etc. from automated sensors in the stream channels of the selected hydrologic units, and input into the GIS for analysis over various areal and temporal aggregations.

We will relate fish habitat associations/requirements spatially within the Weldwood FMA for individual life-history stages of resident species (young-of-the-year, juvenile, and adult) through field studies, a GIS database, and the HSPF dynamic simulation model simulations of stream habitat conditions (flow at critical times in various stream reaches, water quality conditions within those reaches, etc.) through time. We will use the results of the Tri Creeks studies on salmonids and incorporate findings of a recent review by D.A. Westworth and Associates (1992) to identify principle study criteria and data needed for modelling fish populations and habitat dynamics. We will survey fish populations and habitat within selected control streams. These data will be incorporated into the GIS database. One or more of the existing Habitat Evaluation Procedures

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watershed parameters (soil, vegetation and topographic properties) in modifying chemical actions and to calibrate the model on water quality data collected at various points in the soil and groundwater pathways rather than solely on data from the stream channel, as is the case with most models. Chemical reactions, adsorption and desorption are simulated as functions (f(time, temperature, concentration, flow velocity)) at the soil surface (volatilization also at the surface), in one or more soil layers (uptake by plants also from these layers), in the groundwater and in the stream channel. In the stream channel, volatilization and exchanges with sediments, both suspended and temporarily held on the sides or bottom of the channel, are also simulated. Model routines specific to phosphorous, nitrogen and some pesticides are included. Up to 10 user-specified chemicals can be simulated with suitable calibration. All model routines are thoroughly described and documented.

(HEP) will be used as an initial guide and refined specifically for the Foothills Forest streams as the study progresses.

Similar studies to those for fisheries are planned for erosion, sediment and sediment production/movement processes. Emphasis will be on the dynamic hydraulic processes operating within various stream reaches as they relate to bed load movement, changes in morphology and changes in the composition and structure of the stream bottom materials. As with all of the other components of this activity, initial testing and procedure development will be done primarily with Tri Creeks historical and current data.

Links to other activities:

The provision of the aquatic systems DSS is one of the principle components of the Foothills Model Forest program. In light of the current and future emphasis on sustainable development, we feel that the success of this DSS, and a demonstration of a commitment on the part of Weldwood and other FMA holders to the use of this DSS in evaluating the sustainability (and possibly modifying future operations to ensure their sustainability) of the water-based forest resources, is critical to future FMA developments in Alberta (and probably elsewhere in Canada).

Time-frame:

Year	Swanson GIS, WRNSHYD, HSPF	Muzik GIS, SCSRCN	Rothwell Erosion/Sediment	Hoag Fish Habitat/Population
93/94	- Purchase and become familiar with ARC/INFO GIS software for MSDOS - Attach existing Tri Creeks data to ARC/INFO GIS - Purchase HYDRO SCOUT water quality and water level sensor/loggers	- Purchase and become familiar with ARC/INFO GIS software for MSDOS - Attach existing Tri Creeks data to ARC/INFO GIS - Procure graduate student	- Procure graduate student - Purchase sediment sampler(s) - Review literature for models relating flow parameters to channel structure variables	- Identify habitat criteria and model(s) - Select and survey control sections of streams
94/95	- Attach WRNSHYD to MSDOS GIS - Install water quality - water level sensors in selected test sections - Calibrate HSPF on Tri Creeks data - Do trial extrapolation runs with WRNSHYD/GIS (MSDOS) on 1973-74 multiple catchment data - Simulate channel flows and other variables in control sections with HSPF	- Attach SCSRCN to MSDOS GIS - Calibrate SCSRCN for Foothills Model Forest area - Simulate flood hydrographs for test catchments	- Select model(s) for testing with control-section streamflow and channel characteristics data - Sample control sections to test model(s) validity of HSPF sediment routines	- Use model(s) to predict populations and habitat conditions within selected experimental stream sections - Test model(s) predictions against measured values
95/96	- Attach WRNSHYD to Weldwood GIS - Train and/or instruct Weldwood personnel in operation of WRNSHYD model on their GIS - Simulate sediment and channel characteristics within control and extrapolated test sections. - Modify HSPF routines as necessary to refine predicted hydrologic variables	- Attach SCSRCN to Weldwood GIS - Train and/or instruct Weldwood personnel in operation of SCSRCN model on their GIS	- Continue validation of HSPF sediment routines in control and unguaged (extrapolated) test sections - Improve HSPF routines to better reflect measured conditions in stream channel sections	- Continue validation of HSPF Sediment routines in control and unguaged (extrapolated) test sections - Improve HSPF routines to better reflect existing conditions

Time-frame:

Year	Swanson GIS, WRNSHYD, HSPF	Muzik GIS, SCSRCN	Rothwell Erosion/Sediment	Hoag Fish Habitat/Population
93/94	- Purchase and become familiar with ARC/INFO GIS software for MSDOS - Attach existing Tri Creeks data to ARC/INFO GIS - Purchase HYDRO SCOUT water quality and water level sensor/loggers	- Purchase and become familiar with ARC/INFO GIS software for MSDOS - Attach existing Tri Creeks data to ARC/INFO GIS - Procure graduate student	- Procure graduate student - Purchase sediment sampler(s) - Review literature for models relating flow parameters to channel structure variables	- Identify habitat criteria and model(s) - Select and survey control sections of streams
94/95	- Attach WRNSHYD to MSDOS GIS - Install water quality - water level sensors in selected test sections - Calibrate HSPF on Tri Creeks data - Do trial extrapolation runs with WRNSHYD/GIS (MSDOS) on 1973-74 multiple catchment data - Simulate channel flows and other variables in control sections with HSPF	- Attach SCSRCN to MSDOS GIS - Calibrate SCSRCN for Foothills Model Forest area - Simulate flood hydrographs for test catchments	- Select model(s) for testing with control-section streamflow and channel characteristics data - Sample control sections to test model(s) validity of HSPF sediment routines	- Use model(s) to predict populations and habitat conditions within selected experimental stream sections - Test model(s) predictions against measured values
95/96	- Attach WRNSHYD to Weldwood GIS - Train and/or instruct Weldwood personnel in operation of WRNSHYD model on their GIS - Simulate sediment and channel characteristics within control and extrapolated test sections. - Modify HSPF routines as necessary to refine predicted hydrologic variables	- Attach SCSRCN to Weldwood GIS - Train and/or instruct Weldwood personnel in operation of SCSRCN model on their GIS	- Continue validation of HSPF sediment routines in control and unguaged (extrapolated) test sections - Improve HSPF routines to better reflect measured conditions in stream channel sections	- Continue validation of HSPF channel property routines in control and unguaged (extrapolated) test sections - Improve HSPF routines to better reflect measured conditions in stream channel sections.

Year	Swanson GIS, WRNSHYD, HSPF	Muzik GIS, SCSRCN	Rothwell Erosion/Sediment	Hoag Fish Habitat/Population
96/97	- Attach HSPF to Weldwood GIS - Simulate sediment, channel conditions, fish habitat and populations in unguaged streams - Verify model simulations with field measurements - Prepare manual for operation of aquatic DSS system on Weldwood GIS - Train or instruct operators as required	- Assist in preparation of manual for operation of aquatic DSS system on Weldwood GIS - Train or instruct operators in use of SCSRCN model output as required	- Assist in verification of simulations in unguaged streams - Assist in preparation of manual for operation of aquatic DSS system on Weldwood GIS - Train or instruct operators in evaluation of erosion and sediment production and sediment transport as required	- Assist in verification of simulations in unguaged streams - Assist in preparation of manual for operation of aquatic DSS system on Weldwood GIS - Train or instruct operators in evaluation of fish populations and fish habitat. production/transport as required

Year
96/97

d Budget – Hydrology, erosion-sediment, and fish habitat inventory, modelling and database development

	Climate, hydrology, database, WRNSHYD and HSPF modelling	SCSRCN	Sediment and Erosion	Fish habitat	Total all Activities
sponsible	Swanson	Muzik	Rothwell	Hoag	
nal time	$30,000	$30,000	$10,000	$30,000	$100,000
quipment	$50,000	$20,000	$20,000		$90,000
l Help	$10,000			$30,000	$40,000
Students		$20,000	$20,000		$40,000
d Travelling	$10,000		$10,000	$25,000	$45,000
94	$100,000	$70,000	$60,000	85,000	$315,000
nal time	$40,000	$30,000	$10,000	$26,000	$106,000
	$20,000				$20,000
l Help	$10,000				$10,000
Students		$20,000	$20,000		$40,000
	$10,000	$10,000	$10,000		$30,000
95	$80,000	$60,000	$40,000	$26,000	$206,000
96	$84,000	$63,000	$42,000	$56,000	$245,000
97	$88,200	$66,150	$44,100	$24,000	$222,450
3-1997	$352,200	$259,150	$186,100	$191,000	$988,450

Estimated Budge
93/94
Person responsit
Professional time
Capital Equipmer
Technical Help
Graduate Studen
Living and Travel Expenses
Total 93/94
94/95
Professional time
Capital
Technical Help
Graduate Studen
Expenses
Total 94/95
Total 95/96
Total 96/97
Total 1993-1997

Resources/Contributions:

RH Swanson & Associates

- Currently have an IBM 486 computer with 660 MB hard drive and 20 Mb of RAM. Also an HP IIIP Laser printer. I have a most comprehensive hydrology reprint library in my office. Will need MSDOS GIS software (~$9000), digitizer (~$1000), digital tape backup (~$5000) to complete computing requirements. The Digitizer will be available to Dr. Muzik for his use in inputting map information into the GIS database too. Field equipment required - 4 water quality and water level samplers to measure flow and water quality within selected control sections of streams. Two of these should be purchased in 1993 and the other two in 1994 (~ $10,000 each, total $40,000). All administrative costs will be covered within the professional time budget.

Ivan Muzik

- Currently have an IBM 8088 PC that will need to be upgraded to a 486 (~$5000). Will need high speed modem to communicate with RH Swanson & Associates to share data and programs (~$1000) CD ROM drive for direct input of Water Survey of Canada data sets (~$1000) and laser printer (~$3000). Will also need a copy of MSDOS ARC/INFO software (~$9000). Will rely on graduate student help requested to input climate and streamflow data into GIS database.

R. L. Rothwell

- Currently have IBM 386 computer with sufficient peripheral space to carry out the necessary modelling. Will need to purchase four automatic sediment samplers to measure suspended sediments in selected control sections. Will rely on graduate student requested to assist in field studies of bed materials and transport.

D.A. Westworth & Associates, Ltd.

- Will provide all of the capital equipment needed to carry out the fisheries component of this activity. Have GIS capabilities, large in-house library and computer support.

Thomas Hoag suggests that he may be able to cut cost somewhat by using volunteer labour for fish censusing and habitat studies. However he is not optimistic with respect to the quality of such work. We have discussed the possibility of using the Weldwood GIS directly or via telephone lines with Brian Mair and it is impractical. There appears to be no way to achieve substantial cost reduction short of reducing the quality and tested reliability of the DSS that will be produced.

Activity 8

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Elk Study
Foothills Forest Activity Outline

Prepared by: Rick Bonar **Date:** November 4, 1992

Title Elk study.

Working Group Coordinator Rick Bonar/Kirby Smith.

normal business ? not new too expensive look for other money

Activity Contact Rick Bonar.

Activity Team Members

Confirmed: Rick Bonar, Kirby Smith.
Potential: Model Forest Biologist, Rocky Mountain Elk Foundation, Wildlife Habitat Canada, Canadian Wildlife Federation, Canadian Wildlife Service, University of Alberta, graduate students.

fund fy 93/94 - review annually

Purpose

Improve management of elk and elk habitat by getting better understandings of elk ecology in forested habitat in relation to various disturbances and impacts.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 3 - Objectives 3,5,7; Goal 4 - Objectives 5-8; Goal 19 - Objectives 2-3.

General objectives:

Movements
- Home range, annual and seasonal
- Migrations
- Movements between food and cover habitats
- Response to disturbance (logging operations, roads, ATV, hunting, other)
- Response to environmental factors (temperature, snow, etc) on both seasonal and daily basis

Habitat Use
- Test preliminary Habitat Suitability Index model
- Use/importance of various habitats during all seasons (eg winter, spring, summer) and life stages (eg calving, rut)

Response to habitat changes
- Winter range habitat improvement

Populations/Demographics
- Population changes
- Immigration/Emigration
- Mortality/Survival
- Age/sex structure

Integrated Habitat/Population model
- Develop conceptual model
- Test using habitat/population data

Location

Elk will be captured and fitted with transmitters in the Athabasca Mixedwood Demonstration Project area, which covers the south-facing slopes of the Athabasca Valley from approximately Hinton to the Obed Mine road.

Methods

Capture elk in pen-traps or by helicopter during winter and attach radio-transmitters. Re-locate study animals using ground triangulation. First-year capture and relocation will be done through a short-term hire of a biological technician. Longer-term work will be done through one or more graduate students. The temporary position and associated start-up costs are identified in the 1992/93 work plan. We hope to eventually have all aspects of the study transferred to two or more graduate students.

Links to other activities

The elk study links to:

1. The Athabasca Mixedwood Demonstration Project, which is designed partly to assess the impacts of timber harvesting on elk and elk habitat.
2. Evaluation of habitat models and testing of the habitat supply analysis module of the Foothills Forest DSS.
3. Several technology transfer and public information components: elk are a high-profile species and the study area is easily accessed from Hinton.

Evaluation of habitat models and impacts of timber harvesting are essential to the credibility of DSS initiatives and proposals for management alternatives. The end results will include a revised habitat model, revised guidelines form elk winter range habitat management, elk population management, and a better understanding of elk ecology in foothills/boreal forest habitats.

Time-frame

The study will start in the winter of 92-93 with capture of elk and preparation of a detailed research proposal. Elk will be monitored during the planning stages of the Athabasca Mixedwood Demonstration Project to obtain before-treatment ecological information. The short-term impacts of harvesting and silviculture activities on elk will be assessed in years 2-5. This will extend to the end of the Foothills Forest project, but the study will serve as the basis for a long-term monitoring program to continue assessing elk responses. The elk study must be started this winter because winter is the easiest time to capture elk, and we need at least a year of pre-treatment monitoring before the Demonstration Project starts. Evaluation of the elk habitat model is required by approximately year 3 to improve the reliability of its use in the DSS habitat supply analysis module.

Budget

ITEM	92/93	93/94	94/95	95/96	96/97	TOTAL
Transmitters	8,000	4,000	4,000	4,000		20,000
Receiver	1,500	1,500				3,000
Elk capture	12,000	2,500	2,500	2,500		19,500
Technician	12,000					12,000
Graduate Students		18,000	36,000	36,000	36,000	126,000
Vehicle/ATV	3,500	8,400	8,400	8,400	8,400	37,100
Miscellaneous	$1,000	2,000	2,000	2,000	2,000	9,000
TOTAL	38,000	36,400	52,900	52,900	46,400	226,600.00

The budget and study could be down-sized by reducing the number of graduate students from two to one or by paying them less than $1500/mo. We may also be able to make more use of volunteer labour and existing staff.

Resources/Contributions

We have one receiver that needs servicing and 5 used transmitters that may be re-furbished into elk transmitters at approximately half the cost of a new transmitter. The Fish and Wildlife Division has an elk pen trap that we can use. ATVs may be available at cost from Fish and Wildlife and Weldwood. Contributions of volunteer labour may be available from Forest Technology School students and other interested groups.

Potential sources of funding include the Rocky Mountain Elk Foundation (high), the Canadian Wildlife Service (medium), Wildlife Habitat Canada (medium), the Fish and Wildlife Habitat Trust Fund (medium), Buck For Wildlife (medium), and the Alberta Recreation, Parks, and Wildlife Foundation (medium). Graduate students may also be eligible for research grants and other funding mechanisms (medium). There are no confirmed contributions other than the $38,000 of Foothills Forest support for the 92/93 year.

Status

This activity has been submitted for Board of Director approval as part of the 92/93 work plan. As soon as approval is received, we will proceed with ordering transmitters, hiring the temporary technician, and developing a more detailed research plan. Elk capture will begin in early winter and continue until spring or until 20 animals are captured.

Activity 9

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Pileated Woodpecker Study
Foothills Forest Activity Outline

Prepared by: Rick Bonar **Date:** November 13, 1992

Title Pileated Woodpecker study.

Working Group Coordinator Rick Bonar/Kirby Smith.

Activity Contact Rick Bonar.

Activity Team Members

Confirmed: Rick Bonar
Potential: Dr. Jim Beck, Dr. Susan Hannon, Model Forest Biologist, Wildlife Habitat Canada, Canadian Wildlife Federation, Canadian Wildlife Service.

Purpose

Obtain ecological data on pileated woodpeckers to evaluate and revise the preliminary HSI model, assess pileated woodpecker use of fragmented forests, and develop a habitat management strategy.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 3 - Objective 5; Goal 4 - Objectives 1, 5-8; Goal 19 - Objectives 2-3.

General objectives:

Home Range Territory size, annual and seasonal

Habitat Use Test/revised preliminary Habitat Suitability Index model
Use/importance of various habitats during all seasons (eg winter, nesting season).
Nest/roost tree selection and use/availability
Foraging habitat macro-selection (stand level) and micro-selection (substrate type)

Response to habitat changes
Use of fragmented habitats compared to even-aged habitats
Response to harvesting operations

$10,000 for 93/94
max $50,000 over mf. term

Populations/Demographics
Reproduction success
Mortality/Survival

Location

Pileated woodpeckers will be captured and fitted with transmitters primarily in the Athabasca Mixedwood Demonstration Project area, which covers the south-facing slopes of the Athabasca Valley from approximately Hinton to the Obed Mine road. Birds and habitat measurements may also be monitored in the McLeod River Demonstration Project area and in several of the older operating compartments (eg McLeod 6,9, Athabasca 14-19).

Methods

Locate and capture birds at nest trees May-June, monitor birds by re-locating and following them during several intensive sampling periods throughout the year (nesting, winter, etc). Habitat measurements will continue during the sampling periods for areas of use and after for comparative purposes. Capture will start in spring 1993, and the study will last for 3 years. First-year capture and nest tree location and capture will be done through a short-term hire or contract. Longer-term work will be done through one or more graduate students.

Links to other activities

The pileated woodpecker study links to:

1. The Athabasca Mixedwood Demonstration Project.
2. Evaluation of habitat models and testing of the habitat supply analysis module of the Foothills Forest DSS.
3. Several technology transfer and public information components: pileated woodpeckers are a high profile species that represent old forest habitat and cavity-using wildlife species, the study area is easily accessed from Hinton.

Evaluation of habitat models and impacts of timber harvesting are essential to the credibility of DSS initiatives and proposals for management alternatives. The end results will include a revised habitat model, revised guidelines for habitat management, and a better understanding of elk ecology in foothills/boreal forest pileated woodpecker habitats.

Time-frame

The study will start in the winter of 92-93 with selection of study sites and surveys of woodpecker use. Nest tree location and transmitter attachment will start in March 1993. Monitoring of birds will continue for three years. Pre-treatment baseline information for the Athabasca Mixedwood Demonstration Project will be obtained in year 1. The short-term impacts of harvesting and silviculture activities on pileated woodpeckers will be assessed in years 2-3. The study must start in spring 1993 because we need at least a year of pre-treatment monitoring before the Demonstration Project starts. Evaluation of the pileated woodpecker habitat model is required by approximately year 3 to improve the reliability of its use in the DSS habitat supply analysis module.

Budget

ITEM	92/93	93/94	94/95	95/96	TOTAL
Transmitters	2,000	3,000	1,000	1,000	7,000
Receiver	1,500	1,500			3,000
GPS Equipment		14,500			14,500
Field expenses	1000	2,500	2,500	2,500	8,500
Technician/Contract		14,000	14,000	14,000	42,000
Graduate Students		18,000	18,000		36,000
In-kind	10,000	33,000	33,000	33,000	109,000
Vehicle/ATV	1000	5,000	5,000	5,000	16,000
Miscellaneous	1,000	2,000	2,000	2,000	7,000
TOTAL	16,500	93,500	75,500	57,500	243,000

The budget and study assumes that one graduate student will be Rick Bonar, and most of the in-kind costs will be covered through regular Weldwood salary. The study could be down-sized by reducing the number of graduate students from two to one, which would eliminate graduate student costs, or by paying the second graduate student less than $1500/mo. We may also be able to make more use of volunteer labour and existing staff.

Resources/Contributions

ATVs may be available at cost from Fish and Wildlife and Weldwood. Weldwood will supply one vehicle if Bonar is the principal researcher. Volunteer labour may be available from Forest Technology School students and other interested groups.

Confirmed funding includes $48,500 from the Canada-Alberta Partnership Agreement in Forestry program. Potential sources of funding include Weldwood, (in-kind, high), the Canadian Wildlife Service (medium), Wildlife Habitat Canada (medium), and the Alberta Recreation, Parks, and Wildlife Foundation (medium). Graduate students may also be eligible for research grants and other funding mechanisms (medium). There are no confirmed contributions other than the $48,500 PAIF funding. It is possible that the study could be fully funded by other sources, and not require contributions from the $5 million Foothills Forest fund.

Status

Partial funding for this activity has been secured, including total funding for the 92/93 work period. Bonar is developing a detailed research plan and a proposal to conduct part of the research as a PhD program at the University of Alberta, which should be resolved by January 1993.

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Lichen Survival/Regeneration Study
Foothills Forest Activity Outline

Prepared by: Rick Bonar

Date: December 21, 13, 1992

Title Lichen study.

Working Group Coordinator Rick Bonar/Kirby Smith.

Activity Contact Rick Bonar.

Activity Team Members

Confirmed: Rick Bonar
Potential: Richard Quinlan, Jan Edmonds, Melissa Todd, Jim Beck, Don Thomas (Canadian Wildlife Service), Jim McCammon (Alberta Newsprint), Wildlife Habitat Canada, Canadian Wildlife Federation, FERIC.

Purpose

Measure survival and regeneration of terrestrial lichen species used by caribou in response to a variety of harvesting and silviculture prescriptions.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 4 - Objective 3; Goal 10 - Objective 8; Goal 11 - Objective 4; Goal 18 - Objectives 2-5.

Terrestrial lichens are the major food source for caribou, which are a threatened species. Lichens are most abundant in the UBC9 Ecosystem Association (Corns and Annas 1986). A retrospective study of lichen regeneration by Woodard and Snyder (1992) showed that lichens regenerate after harvest, depending on time since harvest and other factors. This study will examine both pre-treatment and post-treatment lichen densities and species composition to assess lichen survival and regeneration in a controlled experiment.

Location

The study area is in Compartments Berland 1 and 13 near Highway 40 and the Berland River crossing in the northwest corner of the Weldwood FMA. Two trial areas in age 80-110 pine stands will assess lichen response to several commercial thinning treatments. Response to clearcut trails will be assessed in several cutblocks being developed as part of the Berland 1 harvest plan.

Methods

The study is a stratified random block design, with at least two treatment blocks for each treatment. The treatments are:

Clearcut	Winter/Summer Stumpside/Roadside processing No Scarification/Scarification/Direct Plant/Chipper Residue/Prescribed Burn
Commercial Thinning	Several levels of winter thinning, compared to no-harvest control and clearcut.

All treatment blocks will be surveyed for lichens prior to harvest. Survival will be assessed after harvest and before silviculture activities, and after all operational activities are completed. Permanent plots will be used to evaluate long-term lichen regeneration responses to the various treatments.

Links to other activities

The lichen study is a core feature of the Berland Demonstration Project. In addition to the lichen study, caribou response to harvesting and use of regenerated stands will be measured. Related harvest, silviculture, and growth and yield aspects of the treatment blocks will also be measured. For example, growth response of pine to commercial thinning on poor sites will be assessed in the commercial thinning trials, and high elevation silviculture strategies will be assessed in the clearcut trails. Responses of other wildlife species will also be assessed

Time-frame

The study will start in the spring of 1993 with pre-treatment measurements. Harvest trials will start in the winter of 93/94 and continue through summer 1994. Long-term plots will be established in 1994.

Budget

ITEM	92/93	93/94	94/95	95/96	TOTAL
Study design	3,000				3,000
Establish and measure pre-treatment plots		25,000			25,000
Harvest and silviculture activities		10,000	10,000		20,000
Re-establish and measure post-treatment plots			25,000	10,000	35,000
Total	3,000	35,000	35,000	10,000	83,000

Resources/Contributions

mf 10,000

The budget includes confirmed Weldwood contributions of $3,000 in 1992/93 and $25,000 in 93/94. Harvesting/silviculture costs represent the incremental costs associated with the trials, which will be paid for by Weldwood. Part of the study could be undertaken by a graduate student looking at short-term survival of lichen.

Potential sources of funding include the Canada-Alberta Partnership Agreement in Forestry, Canadian Wildlife Service (in-kind, medium), Wildlife Habitat Canada (medium), other forest industry companies (Alberta Newsprint, Canfor, Weyerhauser - medium), and the Alberta Recreation, Parks, and Wildlife Foundation (medium). A graduate student may also be eligible for research grants and other funding mechanisms (medium). There are no confirmed contributions other than the $28,000 from Weldwood.

Status

This activity was originally developed in conjunction with the Berland 1 harvest plan to learn more about the impacts of timber management on lichens, which are critical food resources for caribou. A field workshop to view the study area and scope out study design was held in September 1992, and some preliminary sample plots were established. The pre-treatment plots will be established and measured in spring 1993. Harvesting may start in the summer of 1993, but more likely in the late fall or early winter.

RESPONSES OF LICHENS TO TIMBER HARVESTING
FOOTHILLS FOREST ACTIVITY OUTLINE

Prepared by: Bob Ellis *Date:* December 31, 1992

Title: Responses of Lichens to Timber Harvesting.

Working Group Coordinator(s): Rick Bonar, Kirby Smith

Activity Contact: Rick Bonar

Activity Team Members:

Confirmed: Bob Ellis (D.A. Westworth & Associates Ltd.), Rick Bonar

Potential: Jan Edmonds (Alberta Fish and Wildlife Division), Don Thomas (Canadian Wildlife Service), Department of Botany, University of Alberta

Purpose:

To determine species composition, relative abundance and productivity of lichens in differently-aged cutovers and mature, undisturbed forests and relate to various timber harvesting activities.

End Results: Goals and Objectives

This activity relates to the following goals and objectives from the Foothills Forest Proposal:

- Goal 4 - Objectives 3,7, and 9;
- Goal 9 - Objective 2;
- Goal 18 - Objectives 1,2, and 4.

General Objectives:

- Select 3 age-classes of post-harvest sites (i.e. 15 y, 20-40 y, and 60-80 y) and one undisturbed site (80 y) within 2 forest site types common throughout the study area.
- Compare lichen development and productivity on harvested and unharvested sites.
- Document lichen species cover and abundance in winter forage areas of woodland caribou.
- Relate results to timber harvesting activities and develop a management strategy for lichens.
- Provide productivity estimates of lichens for use developing a habitat suitability model for woodland caribou.

Location:

Berland River region north of Hinton. Exact locations of the sample sites to be finalized with the Working Group Coordinators.

Methods:

Species composition, relative abundance and productivity of lichens varies with forest age. Therefore, a primary objective of the proposed study is to compare the development and productivity of lichens in 3 age-classes of post-harvest forest to mature, unharvested sites. In an effort to maintain sample site homogeneity, all age-classes should be selected from a single forest site type that is common to the study region and that contains differently-aged cutovers. Site conditions such as moisture regime, aspect and nutrient regime vary widely, even among similar forest types. Within each age-class, two sample sites will be randomly selected for replication, resulting in a total of eight sample sites.

Within each sample site, terricolous lichen cover will be assessed semi-quantitatively using quadrats placed along pre-determined transects. In each quadrat, total lichen cover (%) and individual species cover (%) will be estimated. In addition, selected areas within each sample site will be harvested to obtain an estimate of above-ground lichen biomass (kg/ha) for major lichen groups (i.e. *Peltigera* spp., *Cladonia/Cladina* spp.). Lichen cover and biomass data collected will be analyzed to assess the degree of similarity between harvested and unharvested sites. Epiphytic lichens will be assessed qualitatively at each sample site. Selection of sample areas will be undertaken in conjunction with Weldwood GIS staff. Once the sample areas have been selected, field sampling will be initiated. It is anticipated that two forest types will be selected for the study, although, depending on the availability of funding, additional forest types may be included.

A secondary objective of the proposed study is to provide detailed species composition and abundance of lichens associated with woodland caribou winter feeding areas. Results from this component can be used to help construct a model of habitat preferences by woodland caribou within the foothills model forest area. If lichen species cover and abundance are documented for caribou winter forage sites, comparisons can be made between these data and lichen characteristics of harvested sites. Concurrent observations on other site characteristics, such as forest type, shrub cover and aspect, that are deemed important to caribou, can be compared to harvested sites. These comparisons, of winter forage sites to harvested/unharvested sites, will form the basis on which to model the responses of lichens and caribou to various integrated timber management scenarios.

Links to Other Activities:

The responses of lichens to timber harvesting links to:

1. Old growth forests - lichens are an important feature of old growth forests. Information on the abundance and productivity of lichens in different forest types may assist in the development of an old growth definition for the Foothills Model Forest as well as in other areas of the province.

2. Regional ecologically-based inventory and landscape management strategy. Responses of lichens to different timber harvesting activities will assist in developing an overall forest-wildlife management strategy.

3. Succession model for lodgepole pine ecosystems. Stand characteristics favoured by woodland caribou, including lichen development, are probably closely tied to successional development of lodgepole pine forests.

4. Regional management strategy for woodland caribou.

Determination of lichen responses to different forest harvesting practices will be essential to the development of a long-term management program that combines on-going forest harvesting and maintenance of the Berland woodland caribou herd.

Time Frame:

The study would commence during the winter of 1992/93 following the preparation of a detailed research proposal. The initial phase of the proposed study would consist of a review of maps, airphotos and other relevant data, and contacts with Weldwood GIS specialists and forests to select sample areas. Final selection of sample sites and vegetation sampling can begin in late spring or early summer, access permitting. Preliminary data will be analyzed in fall 1993 and a progress report submitted in early 1994. Data collection and analysis for the first forest type would occur in 1993 while the second forest type would be sampled in 1994. The final report would be completed in spring, 1995. This study, when completed in 1995, will form the basis for ongoing work on the relationship of winter foraging by caribou and forest harvesting activities.

Budget:

Study Component	Year					Total
	1992/93	1993/94	1994/95	1995/96	1996/97	
Preliminary investigations	$ 0.00	$ 8,000.00	$ 6,000.00	$ 0.00	$ 0.00	$ 14,000.00
GIS search	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00
Field inventory	$ 0.00	$ 17,500.00	$ 17,500.00	$ 0.00	$ 0.00	$ 35,000.00
Data entry/analysis	$ 0.00	$ 8,500.00	$ 8,500.00	$ 1,000.00	$ 0.00	$ 18,000.00
Preliminary report	$ 0.00	$ 2,000.00	$ 2,000.00	$ 0.00	$ 0.00	$ 4,000.00
Final Report/Mgmt. Strat.	$ 0.00	$ 0.00	$ 0.00	$ 7,500.00	$ 0.00	$ 7,500.00
Miscellaneous	$ 0.00	$ 600.00	$ 600.00	$ 600.00	$ 0.00	$ 1,800.00
Total	$ 0.00	$ 36,600.00	$ 34,600.00	$ 9,100.00	$ 0.00	$ 80,380.00

The budget indicated above assumes that potential partners such as Weldwood and the Alberta Fish and Wildlife Division or volunteers will be able to provide technical assistance during the field inventories. At the present time, only 1 technican will be required. In

addition, lodging at the Forest Technology School may also be available. This budget does not include any Goods and Services Tax that would be charged for professional services.

Resources/Contributions:

The resources of D.A. Westworth & Associates Ltd., which includes fully-equipped field camps complete with camping gear, four-wheel drive trucks, ATV's and sampling equipment will be made available for the duration of the study. Attempts will also be made to utilize volunteers from Forest Technology School students and other interested groups.

At the present time, there are no confirmed contributions of funds. However, potential sources of funding and/or logistical support include:

- Alberta Fish and Wildlife - technical support
- Forest Technology School - lodging
- Weldwood - GIS and forest data base support, logistical assistance, maps, airphoto mosaics

Status:

The proposed activity plan has been submitted for approval of the 1993 program. Forest inventory information is available in Weldwood's GIS system and will be accessed during the sample site selection process. Once approval has been received, a detailed research plan will be developed and preliminary investigations will be initiated.

Foothills Forest Activity Outline

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Activity number: 13

Prepared by: Sean Curry Date: December 14, 1992

Title: Snag Dynamics for the Subalpine and Boreal Forests of the East Slopes of Alberta

Working group coordinator: Rick Bonar, Kirby Smith

leave in

Activity contact: Sean Curry

Activity team members:

Potential: Hugh Wollis FLW, Ellen McDonald UoA

Confirmed:

Purpose: This project will describe the underlying patterns and population dynamics of snags in common fire-origin forest cover types in the Eastern Slopes of Alberta. In addition it will describe how those attributes and characteristics of snags necessary for birds, change over time. The intent of establishing the underlying relationships is to provide a baseline against which habitat values can be measured, and from which habitat goals can be set.

End result: Information gaps will be filled in and some of the HSI models will be validated. While a snag model is not a formal component of the MSc programme, it is a product that will stem from the MSc. It will be developed and written in such a manner as to fit with the DSS initiatives being developed. Meets Goal 4, objective 1 and 8, Goal 19 objective 1

Specifically the end results would be to:

-Quantify the height, diameter and density relationships in the snag population over time for subalpine and boreal forests.

-Through a literature review, determine which attributes and characteristics of snags are important and describe the bird species that use snags and the role and importance that snags and snag attributes and characteristics play for these species.

Methods: Weldwood of Canada Ltd., Hinton Division has a permanent sample data base spanning 35 years of tree and stand growth that can provide the majority of information required. The database records when mortality occurs and the probable cause. The analysis would be based on a combination of the permanent sample growth data and a chronosequence using similar plots at different ages. Field work would be required in older plots to determine loss from the population. Field work is also required to determine the other attributes and characteristics of snags that are important.

The sampling design has not been identified for the other attributes and characteristics of snags because the literature review has not been completed. This will occur under the advisement of my supervisor and committee. The analysis methods are not identified at this time either and this will occur under the advisement of my supervisor and committee as well.

Links: Data is needed for activity 1 in the Wildlife and Terrestrial Ecosystem Working Group and activity 2 in the Athabasca Mixedwood Demonstration Project

Budget:

why FF pays tuition??

1992: Fall tuition $566.09
Total $566.09

1993: Spring tuition $566.09, Fall tuition $566.09
Total $1,132.18

1994: Spring tuition $566.09, Summer field work $10,000, Fall tuition $566.09
Total $11,132.18

1995: Spring tuition $566.09, Summer to December programming work $10,000
Total $10,566.09 **Grand total** $23,396.54

Timeframe:

September to December 1992: one day per week at UoA

January to April 1993: one day per week at UoA

Summer 1993: supplemental data collection within FMA and model forest area. Objective is to verify presence of snags in older PSP plots.

September to December 1993: one day per week or less at UoA
January to April 1994: 2 days per week at UoA
Summer 1994: supplemental data collection within FMA and model forest area. Objective is to verify presence of snags in older PSP plots, if not complete and to sample for the other attributes and characteristics of interest.
September to December 1994: no formal time commitments, thesis work
January to April 1995: no formal time commitments, thesis work
April 1995: Thesis completion and publication
September 1994 to April 1995: Development of snag model software
Resource/Contributions: An application was submitted to Wildlife Habitat Canada. Their decision will be made in November 1992.
Status: Active. Enrolled at UoA for 1992/1993 year
Additional: The model development would comprise the MSc thesis while programming would be accomplished by contractor upon completion of the data analysis.

Weldwood summer 1 day/week

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EFFECTS OF MANAGEMENT ON GENETIC DIVERSITY OF WHITE SPRUCE AND LODGEPOLE PINE

FOOTHILLS FOREST RESEARCH PROPOSAL

Prepared by: S. Ellen Macdonald, Dept. Forest Science; Ross Hodgetts, Dept. Genetics
University of Alberta
Edmonton, AB
(403) 492-3070 (403) 492-5379

Title: Effects of management on genetic diversity of white spruce and lodgepole pine.

Working Group Coordinator: Ellen Macdonald

Activity team members:

Confirmed: Ellen Macdonald, Ross Hodgetts
To be recruited: 1 MSc student, 1 PhD student, 1 Postdoctoral fellow

Purpose:

To determine the impact of forest harvesting and reforestation activities on genetic variation in populations of white spruce and lodgepole pine.

End Results: Goals and Objectives

This project directly relates to the following goals/objectives from the Foothills Forest proposal: Overall Objective 7, Goal 9, Goal 11.

General objectives

To compare the extent of genetic variation among the following gene pools:

1) natural populations of lodgepole pine and white spruce from different seed zones on Weldwood's FMA;

2) random seed collections from these natural populations;

3) seed collected (from these same areas) for production of seedlings for reforestation - after extraction and cleaning at Pine Ridge Forest Nursery;

4) seedlings produced from these seed collections by Pine Ridge Forest Nursery - at the 'ready to ship' stage;

5) stands in the same areas which were regenerated by planting up to 30 years ago;

6) "Genetically improved" stock

6) stands in the same areas which were re-established by 'natural' regeneration after logging;

7) populations of trees from these same areas which have been selected for breeding programs.

Location

Collections will be from all seed zones within Weldwood's FMA. All laboratory work will be done in the Dept. of Genetics at the University of Alberta.

Methods

The study will utilize populations of lodgepole pine and white spruce from different seed zones within Weldwood's (Canada - Hinton) Forest Management Area. This areas provides an excellent opportunity for this type of study because there is easy access to: remnant 'natural' stands; 'naturally regenerated' (drag scarification) stands; planted stands up to 30 years old; for both species. Weldwood (Bob Udell) has promised full co-operation and support 'in kind' for access to these sites during collections.

Laboratory analysis of genetic variation will involve the application of DNA based molecular techniques to assess the extent of genetic variation in individuals trees or seedlings from the populations selected for analysis. These techniques fall within the general area of DNA fingerprinting. Initially, the polymerase chain reaction (PCR) will be used to amplify segments of DNA for subsequent analysis of Randomly Amplified Polymorphic DNA (RAPD) markers. This will provide a crude analysis of genetic variation. More locus-specific information on genetic variation will then be obtained by constructing primers and utilizing techniques involving gene cloning and sequencing. The primers will be available in the second half of the grant period, which will allow their use in the testing of hypotheses developed from the data set generated with the RAPD markers.

If these methods suggest a loss of genetic diversity resulting from current management practices, alternative methods could be suggested and then tested.

Time frame

1993/94 - establish laboratory protocols, definition of seed collection zones, field sampling of uncut and planted stands, initial DNA extractions

1994/95 - initial RAPD assessment of variation in uncut and planted stands, determination of optimum sample size, consideration of appropriateness of seed collection zones, collection of seed and seedlings from Pine Ridge Forest Nursery, start preparation of genomic library.

1995/96 - postdoctoral fellow joints project, analysis of RAPD markers in nursery samples, preliminary results on effects of management practices on genetic diversity, development of modified regimes for testing (if required), DNA sequencing and development of primers.

1996/97 DNA sequencing, ascertwnment of variable loci, complete DNA sequencing, detailed results of genetic variability using microsatellite probes

1997/98 Detailed results of genetic variability under modified regime (if required), completion of project and submission of recommendations

Budget

ITEM	1993/94	1994/95	1995/96	1996/97	1997/98
Students	$30,000	$30,000	$15,000	$15,000	
PDF			$27,500	$27,500	$27,500
Eqpt.	$10,700				
Lab	$10,000	$10,000	$10,000	$10,000	$ 5,000
Travel	$ 4,000	$ 4,000	$ 2,000	$ 2,000	
Public.		$ 200	$ 400	$ 400	$ 400
TOTAL	$54,700	$44,200	$54,900	$54,900	$32,900
U of A	$10,700				
NSERC/FC	$29,000	$29,200	$30,000	$30,000	$20,000
Other			$ 9,900	$ 9,900	$ 2,900
FMF	$15,000	$15,000	$15,000	$15,000	$10,000

REQUESTED CONTRIBUTION FROM FOOTHILLS FOREST: $70,000 OVER 5 YEARS

Costs:
MSc student yr 1-2, PhD student yr 1-4,
Postdoctoral Fellow yr 3-5
Equipment - PCR machine and spectrofluorometer
Lab supplies for genetic analysis
Travel for field collections
Publication costs

Contributions
U of A Central Research Fund for Eqpt.
NSERC/Forestry Canada Partnership Grant
Other - U of A, Macdonald or Hodgett's Personal NSERC Research Grants, AFDRT etc.
FMF - Foothills Model Forest Contribution

Other contributions

Dr. S. Ellen Macdonald is a forest ecologist with considerable experience in population genetics, seed collection, nursery practice, and reforestation. Dr. Ross Hodgetts is a renown molecular geneticist. He has extensive experience in all of the molecular techniques which will be utilized. In addition, he has a fully equipped molecular genetics laboratory at the University of Alberta which will be made available to this project. He has available expert technical assistance provided by the Department of Genetics which will also contribute to this project. The time of the two principle investigators will come at no cost.

Status

The project proposal is ready for submission to the NSERC/Forestry Canada Partnership Program. We require a commitment from the company soon after December 1 in order to meet NSERC deadlines. A student has already been identified to fill the MSc position. The investigators are set to begin as soon as funding is received.

Approved 93/94
No Foothills Forest
Money

Integrated Resource Mgmt / WFAE

3

#14

678

4

Roads and Soil Erosion
Foothills Forest Activity Outline

Prepared by: Christy Butt Date: December 17, 1992

Title Minimizing the Effects of Roads * No Budget - cost to IRF = 0.

Working Group Coordinator Rick Bonar/Kirby Smith

Activity Contact Christy Butt

Activity Team Members

Confirmed: Biologist, Carmen Densmore, Mike O'Rourke
Potential: Fish and Wildlife, Inland Waters, Trout Unlimited

Purpose

Improve guidelines, standards and operational practices, especially erosion control, to minimize the effects of roads and stream crossings on fish and fish habitat.(1993).

End Results: Goals and Objectives

This activity supports;
- the development of the DSS to evolve a total concept operational planning system (Goal 3; Objective 4)
- the development of management strategies for aquatic ecosystems by improving strategies for stream crossings and riparian zones (Goal 5; Objective 3)
- the development of new techniques for timber harvesting to protect and enhance resource value by improving crossing structures and maintenance practices to reduce the impact of roads on aquatic ecosystems, improve processes for road planning, construction and maintenance, development of operator training programs in environmental ethics and evaluating harvest systems at various sites (Goal 10; Objective 2,4,6 and 8).
- the implementation of the McLeod River demonstration of low-impact harvesting, development of access management and designing watershed buffer research (Goal 17; Obj 1)

General Objectives;

Develop standards for watercourse crossing structures, crossing location, reduce disturbance at installation and evaluate creek improvement trials.

Improve access management policies by evaluating road design and location relative to sensitive areas.

Evaluate road construction to improve road stabilization and ditch construction to reduce soil erosion.

Location

Roads on the Foothills Forest region registered under Weldwood's License of Occupation. McLeod River demonstration project.

Methods

Watercourse Crossings:
Evaluate present watercourse crossing; analyzing crossing structure, site disturbance and improvement trials on existing structures. Review literature available on stream crossings.
Activities: Watercourse Inventory, Aquatic System Module

Access Management:
Evaluate road design to identify areas where roads may be reduced in number and alternative construction near sensitive areas. Study available research on road design.
Activities: CTI Technology and Harvest Systems

Road Construction:
Improve roads stabilization and ditch construction on an ongoing basis. Identify problem areas during construction and monitor corrections/improvements. Literature is available in addition to courses on soils types and seed mixes and ditch construction.
Activities: CTI Technology and Harvest Systems, Aquatic System Module

Integrate guidelines into operational planning procedures for each of the above. Ensure information and rational is relayed to supervisors and operators.

Links to other activities

The watercourse inventory links to;
1. Fisheries habitat inventory programs
2. Watercourse crossing projects (improving standards, buffer management, erosion control ...)
4. DSS operational planning and integrated resource management projects.
5. McLeod River demonstration project
6. Operator training programs
7. Road improvement projects

This project is based on accumulated research of other activities involving watercourse and buffer zone information. Guideline development should occur in conjunction with other management strategies involving riparian zones and stream-crossings. Rational for improved protocols are to be integrated into operator and contractor training programs.

Time-frame

Start up of this activity can be initiated by coordinating with road maintenance. Improved standards from other projects can be integrated into developing guidelines to protect stream habitat, fish and water quality. Guideline framework should be completed by fall 1995.

Budget

This activity is based on the results from other projects. Improvement of operational practices will be done on an ongoing basis. Work will mostly be done by existing staff. COST TO TROUT O.

Resources/Contributions

Trout Unlimited has offered to become involved in projects involving fish habitat improvements and reducing erosion. Information from the Tri-Creeks water project could be integrated into this study.

Status See above

#20

(3)

River Corridor Management
Foothills Forest Activity Outline

task 1 — #15 RIP — no money needed

Prepared by: Rick Bonar

Date: November 16, 1992

Title River Corridor Management

Working Group Coordinator Rick Bonar/Kirby Smith.

Activity Contact Rick Bonar.

Activity Team Members

Confirmed: Rick Bonar, Jim McCammon (Alberta Newsprint)
Potential: Hinton Strokers, AFS Land Use, Fish and Wildlife Division, Recreation groups and users, Hinton Good Companions, etc.

Purpose

Inventory and develop management strategies for major river corridors within the Foothills Forest, including recreation, watershed management, riparian zone management, and management of adjacent upland areas.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 1 - Objective 2; Goal 3 - Objective 3, 7; Goal 4 - Objectives 4-5; Goal 5 - Objectives 2-3; Goal 6 - Objectives 1-4; Goal 9 - Objectives 2-3; Goal 17 - Objective 4.

General objectives:

1. Collect and collate existing information on river corridors, including access, natural features, water based recreation use, etc.
2. Develop a protocol and plan to collect additional resource information to complete an information data base for the river corridors.
3. Collect information.
4. Use information and DSS modules to develop management alternatives within the overall Foothills Forest DSS. Examples would include opportunities for water-based recreation, viewshed assessments from the river, management alternatives within riparian zones, adjacent upland zones, etc.
5. Develop a multi-stakeholder process to review alternatives and recommend management objectives and strategies for each river corridor.
6. Incorporate corridor objectives and strategies into the Foothills Forest IRM Strategy.

Location

Major river corridors include the Berland, Wildhay, Athabasca, McLeod, Embarras, Pembina, Cardinal, and Brazeau, within or along the boundaries of the Foothills Forest.

Methods

Develop a list of resource inventory to be used in developing management alternatives, and a sampling protocol for collection of additional information. Gather existing information and obtain new information using volunteers where possible. The process to generate alternatives will be GIS based,

using modules such as Digital Elevation Mapping to predict areas visible from the river, aggregate and project inventory, etc.

Links to other activities

The river corridor program links to:

1. Inventory of natural features and recreation use.
2. The landscape management planning module of the Foothills Forest DSS.
3. The aquatic systems planning module of the Foothills Forest DSS.
4. The review of buffer management standards, including protection, management strategies, and watershed protection.
5. Trails, tour packages, and other recreation and interpretive programs.
6. Recreation facility development.
7. The McLeod River Demonstration Project.

Time-frame

This activity will start in the spring of 1993 with formation of an activity team, collection and collation of existing information, and development of a protocol and action plan to collect additional information. This will be collected from 1993-1995, concurrent with public involvement programs and development of GIS tools to assess forecasted management alternatives. These alternatives will be integrated into the final overall Foothills Forest IRM strategy.

Budget

ITEM	92/93	93/94	94/95	95/96	96/97	TOTAL
Data/sampling protocol		2,000				2,000
Existing data transcription		10,000	5,000			15,000
Data collection			5,000	5,000		10,000
Develop management alternatives			5,000	5,000		10,000
TOTAL		12,000	15,000	10,000		37,000

The budget and study assumes most expenses are related to contributions in kind of existing staff or Foothills Forest staff, estimated at a daily charge of $200. This activity could also be done by contract or temporary hire. However, I hope most of the data collection can be done by volunteers. Foothills staff time would only be needed to enter data to the GIS and develop forecasting applications. Depending on the work plan and availability/condition of existing data, costs could be considerably less than estimated.

Resources/Contributions

Existing information includes the 1991 Weldwood/Alberta Newsprint survey of the Berland River Corridor, and various surveys of other corridors by Alberta Forestry, Lands, and Wildlife and recreation users and groups. Commercial tour operators also have information. Once the information protocol is developed, information gaps can be filled by volunteers or other means. Most of the GIS forecasting tools are being developed separately for other components of the Foothills Forest DSS. There is no confirmed funding.

Status

This activity is an essential component of the Foothills Forest DSS and final IRM strategy. Because of their multiple resource values, river corridors are a key point of potential conflicts within Integrated Resource Management systems. However, they are also good opportunities to demonstrate that IRM conflicts can be resolved through consensus, which is a key Foothills Forest objective. This outline represents a fairly minimal program. It can be expanded through partner interest at little or no additional cost.

Activity 20

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2

~~Habitat Yield Curves~~
Foothills Forest Activity Outline

Prepared by: Christy Butt **Date:** November 17, 1992

Title Trail Enhancement

Working Group Coordinator Rick Bonar/Kirby Smith

Activity Contact Christy Butt

mly

ND

Activity Team Members

Confirmed: Christy Butt, Jack Wright; Hinton Good Companions, Perry Hayworth; Black Cat Ranch
Potential: Nordic Ski Centre, Evergreen Tourist Association, Outfitters Association, William Switzer Park, Town of Hinton Parks, Alberta Yellowhead West Tourism Consortium and Alberta Forest Service(Land Use)

Purpose

Expand existing hiking/equestrian trails to preserve historic and /or provide access to significant features.

End Results: Goals and Objectives

-Develop cooperative management strategies for recreation by completing a recreation corridor inventory and planning for recreational use, by expanding existing hiking and equestrian trails and by developing a multi-stakeholder recreation plan. (Goal 6; Objective 1,2 and 4)

-Establish a community forest by developing local land-use strategies and recreation use structure(Goal 8; Objective 2)

-Designing an integrated resource management in Rob Highlands and McLeod River demonstration projects by developing recreation, access management and public information.(Goal 17, 20; Objective 4 and 2 respectively)

General Objectives:

Identify features of interest and areas already indicated by public as a location of recreational use.

Establish or upgrade trails to enhance use and enjoyment by public

Location

Concentrate on areas already used by the public; Existing reserve areas, Switzer, Nordic Ski Centre, Pine management trail, Emerson and Sundance.

Methods

1. Inventory list of natural features and historical sites located around the FMA.
2. Assess access to these features and areas for trial improvement or construction.

3. Collect and map existing equestrian trails. These may be updated from Weldwood maps, and local operators (ie Black Cat Ranch has maps of their equestrian trails - could contact Outfitters also).
4. Construction of new trails or connecting trails to features
5. Upgrade and maintain existing hiking and ski trials
6. Implement a long term maintenance plan for trail system through volunteers
7. Post signs at existing areas on trails, indicating permitted users and other information.

Potential: -Establish ski/hiking trails between William Switzer, the Black Cat Ranch and the Nordic Ski Centre.
-Construct interpretive trails in Demonstration Project Sites

Construction and maintenance may be accomplished through volunteers, JFR crews(AFS), minimum security crews and tourist operators. A supervisor will be necessary to coordinate volunteers and work crews during the summer.

Links to other activities

The trail maintenance program links :
1. Recreation corridor inventories along the major river systems
2. Development of tours, guides and interpretive programs
3. Angling management
4. Land status zoning
5. Public information program
6. Demonstration projects

Time-frame

This activity will start this winter : inventory of features and established trails in the Foothills Forest region. This project would be ongoing for the next 5 years and more if we could involve local interest from the community.

Budget

ITEM	1993	1994	1995	1996	1997	TOTAL
Equipment	5,000	1,000	1,000	1,000	1,000	9,000
Mapping	1,000	200	200	200	200	1,800
Signs	3,000	5,000	5,000	3,000	3,000	19,000
Miscellaneous	1,000	1,000	1,000	1,000	1,000	5,000
Supervisor/ Coordinator		8,000	8,000	8,000		24,000
TOTAL	10,000	15,200	15,200	13,200	5,200	58,800

This budget is highly flexible depending upon the extent of the work needed to be accomplished in that year. If the construction of new trails is a high priority, hiring of a part time or full time summer crew supervisor is necessary. If the trail work is limited to maintenance a couple times a month, existing staff could coordinate volunteer crews ($100/day x 4days/month x 4 months = $1,600/yr)

Resources/Contributions

Some used equipment and directional signs be obtained from Weldwood. Trail maps could be collected from Weldwood, W. Switzer, the Ski Centre, Outfitters and Tourist operators. Work crews could include minimum security through the AFS, Junior Forest Ranger program(AFS) and volunteers through recreation programs and tourist volunteers. Hinton Good Companions have volunteered to inventory historic sites and features in the area and to maintain the Spruce Management trail.

Status

Junior Forest Warden have been involved in trail maintenance at Sundance, Emerson, Bighorn trail and W. Switzer park in the last couple of years. Jack Wright has done alot of volunteer maintenance of many trails around the region.

2223

24

1992 Forestry Canada Non-Timber Valuation Project

016

no mail

1. Principal Investigators:

Peter Boxall - Non-Timber Valuation Economist, Forestry Canada

Dr. Vic Adamowicz - Associate Professor, Department of Rural Economy, University of Alberta

Michael Williams - President, Intelligent Marketing Systems Inc., Edmonton

Dr. Jordan Louviere - Professor, Department of Marketing, University of Utah

2. Project Statement:

Non-timber values are frequently talked about, but rarely measured and incorporated into planning and operational resource management decisions. In many cases non-timber values are referred to in a wildlife habitat context such that the values are associated with wildlife productivity rather than the social and/or economic contexts in which wildlife species are important. However, a major problem associated with these socioeconomic values is that many of the important non-timber goods and services are not traded in markets. Thus it is problematic to compare fiber products from the forests which are traded in markets with those non-fiber products. In order to address a number of conceptual and theoretical problems surrounding the measurement of non-timber values Boxall and Adamowicz initiated a research effort into valuation methodologies appropriate for examining these values. The challenge is to assess how these values change with forest management practices rather than the static measurement of them. This information should prove useful to forest woodland managers who must assess the impacts harvesting and other operations have on non-fiber uses of the forest.

At present, there are two methods currently used by economists to measure non-marketed non-timber values. These are the travel cost method and the contingent valuation method. The first uses actual behavioral data from forest recreationists to assess demand and ultimately measure values. A key variable in these models is the distance individuals travel between their homes and forest recreation sites. The contingent valuation method utilizes surveys in which a hypothetical market is established for the good or service and individuals are asked how much they would be willing to pay for a given level of the product. Both of these methods have associated problems. However, they are used in the United States in court cases to assess the impacts of proposed public work projects, measure forest recreation values on federal lands, and estimate the economic losses in lawsuits associated with pollution of air and water resources.

In order to utilize these models, assessment of their accuracy, portability to the Canadian forestry context, and investigations into alternative methods are required. The Foothills Model Forest lands provide a unique opportunity to investigate these models because the current and past research into wildlife habitats and impacts of forest management regimes offer us the chance to link forest modifications with changes in economic values.

3. Project Description:

Our current study occurring in the Model Forest and surrounding areas involves a detailed examination of the non-market values of moose hunting. We are attempting to measure how these values change with forest management activities that affect access, congestion, moose populations, quality of roads, and direct evidence of tree harvesting. The study involves three individual methods: the travel cost model, a 'state of the art' contingent valuation exercise, and a new technique called choice experiments. This latter method comes from the marketing research literature and initial investigations by Adamowicz, Louviere and Williams show considerable promise in assessing changes in economic values associated with recreational fishing due to irrigation projects. This moose hunting project will be a better designed and more thorough examination of this method.

The study design consists of a series of meetings with moose hunters who were licensed in the 1992 fall hunting season. These meetings will each involve approximately 30-40 individuals in the towns of Edson, Hinton, Whitecourt and Drayton Valley, as well as in the city of Edmonton. The hunters will be contacted by letter, with a follow up phone call from the University of Alberta Population Research Laboratory to confirm attendance. A number of incentives will be offered to ensure an appropriate level of response to the invitation. At these meetings hunters will be asked to complete a questionnaire in which data required for the three methods will be collected.

The travel cost analysis will involve the following Wildlife Management Units (WMUs) which will be considered sites: 337, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 437, 438, 439, and 507. The contingent valuation exercise involves valuing an increase in moose populations in WMU 344 in terms of increasing distances travelled to access moose. Other information collected involves: socioeconomic variables (sex, age income etc.), perceptions of some quality measures associated with hunting in the 15 WMUs, and a series of 16 choice scenarios in which quality measures are varied.

These data will enable us to compare economic values for moose hunting from three different methods. We will also be able to value hypothetical changes in the forest due to harvesting or other management activities. An important outcome of the choice experiment will be a decision support system in which a resource manager can vary the hunting quality measures and inspect associated valuation changes. Although the sample of hunters used in this study will not be drawn to represent the actual hunting population that utilizes the 15 WMU's, the results will hopefully suggest a method which

can be used to collect data relevant to the operational needs of forest managers and or policy analysis by government resource managers.

4. Other Relevant Information:

The meetings in Edson, Hinton, Whitecourt and Drayton Valley are scheduled for 7 PM on the following dates:

Edson	December 8 and 10	Provincial Building, 111-54 Street
Hinton	December 9	Greentree Lodge, Hwy 16 West
Whitecourt	December 7	Renford Inn, 3555 Caxton St.
Drayton Valley	December 14	Black Gold Inn, 4302 50 St.

We have obtained approximately 850 names of hunters who held General Moose Hunting Licenses for 1992; we have contacted 255 outside of Edmonton so far, and these people will be phoned during the week of December 1.

The meetings in Edmonton will be held after Christmas.

Any interested staff who wish to attend the meetings are welcome, especially if they hunted moose in 1992.

Funding for this project is provided by the Forestry Canada Science and Technology Opportunities Fund and the Canada-Alberta Partnership Agreement in Forestry.

Integrated Resource Mgmt 2.6. / Initiated for aquatic #16

648 / H

Foothills Forest Activity Outline

Prepared by: C. Hunt * no Budget. Nov. 92

Title: Convert Prov. fisheries inventory to digital format with GIS potential.

Working Group Co-ordinator: Kirby Smith IRM / INFAT

no money task

Activity Contact: C. Hunt

Activity Team Members: F & W., Potential T.U., Northern River Basin Studies, Department of Fisheries and Oceans.

Purpose: To provide a reference system for the fisheries resource that will readily identify fish species composition, fish distribution and eventually show critical habitats such as spawning areas, migration routes and winter habitat. Highlighting fish habitat and critical areas will assist in designing road alignments, stream crossings and cutblock layouts that minimize the impact on the fisheries resource.

End Results: Goals and Objectives.

Goal 5 (Objective 1)

Applies to principle 1 - 6 in Sec. 3.1 Vision and Issues and to the overall goal of an integrated resource management strategy (obj. 4, 5). Applies directly to Goal one but is not listed as one of the objectives. Provides essential background information for Goal 5 (Objectives 2, 3 & 4) and Goal 3, Objective 7.

Industrial planners will have direct access to fisheries resource information or can readily recognize where information is not available during the early stages of industrial development.

General Objectives:

1. Provide species occurrence and distribution information in each drainage to identify fish related or water quality concerns.

2. Records relative abundance of each species within representative reaches of streams and rivers. Eventually to determine population estimates for featured species in various drainages.

3. Identify known limiting factors and critical habitats.

   Limiting factors include

   Low productivity - short growing season, high gradient streams with fast water velocities, low water temperatures, poor nutrient levels, lack of cover.

Industrial impacts - sedimentation, movement barriers & increased flood events.

Recreational demands - cause harvests or mortalities that exceed the maximum sustained yield.

Critical habitats include:

(a) spawning areas (usually small diameter clean gravel substrates). Spring spawners require sites that are protected from flood events that cause bedload movements. Fall spawners require an abundant supply of ground water throughout the winter months.

(b) winter habitat usually deep pools free of anchor or frazzle ice fed by an abundant source of ground water.

Location:

Wherever computer facilities and capable staff to organize the data entry. Background information is primarily stored in Edson.

Methods:

Review existing data base of fisheries resource information and organize the material so it can be readily retrieved and eventually displayed on GIS maps.

Link to other activities:

This project provides the historical data base and a receptacle for information developed for the operation of a model forest.

Time Frame:

A project under the Northern River Basin Study has designed a fish & habitat data base and initiated some data input. Federal Fisheries and Oceans has reportedly agreed to develop the data base for Alberta. This project has not been confirmed so I can not predict a time frame but with adequate manpower such a project could be completed in several months.

Budget:

Will depend on activities of partners. - may be minimal if both covered by northern rivers.

use existing staff & Weldwood to digitize info into GIS.
eg incorporate interference inventory.

Resource Contribution:

F & W will provide a hierarchial list of rivers & streams, that includes current survey levels. More detailed information is available from Fish & Wildlife files and a report library. One computer may be available for data input. NRB have provided a data base program. Federal Fisheries and Oceans may provide a completed data base.

Status: See above.

#4

571
771

Foothills Forest Activity Outline

Prepared by: John Renaud

Date: December 17, 1992

Title: Geophysical Timber Avoidance

Working Group Coordinator: Sherry Maine

Activity Contact: John Renaud

$12,000 for 93/94

Activity Team Members:

Confirmed: None
Potential: Canadian Association of Petroleum Producers(CAPP)
Chevron, PanCanadian, AEC, Gulf,
AFS officers, FTS students,

Purpose:

Reduce timber drain from FMA by Geophysical operations by evaluating present timber avoidance programs, interpolating results to make recommendations for future timber avoidance programs.

End Results: Goals and Objectives.

This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 10 - Objectives 8, 9; Goal 12 - Objectives 4; Goal 15 - Objectives 1.

General Objectives:

1. Decrease average line width from seismic activities, thereby saving resources.

2. Acurate resource saving statistics to be applied to timber damage assessments, resultant incentives will encourage increased usage of timber avoidance technique.

3. A better feel for the other values; erosion potential, vegetation establishment, sight line, wildlife habitat.

Location:

The FMA Working Circles Marlboro, McLeod and Athabasca presently contain timber avoidance programs for initial evaluation.

Methods:

Identify programs to evaluate. Begin process of gathering field data during non-snow covered months utilizing existing staff, supplemented by temporary student positions. The partners may be able to provide some field man-power. Formulate field data into a report on viability of timber avoidance with recommendations.

Links:

The timber avoidance evaluation links to the main Foothills Forest vision of integrated management of forest resources through conservation and cooperation. Effective Timber Avoidance will decrease the impact to the forest resources by the oil and gas sector. By establishing recommendations within our Model Forest, there will be opportunity to transfer this knowledge to a much wider audience, possibly provincial.

Time-Frame:

The evaluation could begin spring of 93, continuing through spring-summer 94 gathering field data depending on manpower resource. Interpolation and report to be generated over the winter of 94-95. There should be no reason to not finish within the Foothills Forest program. The first milestone would be completing field work by October, 1994.

Budget:	92/93	93/94	94/95	96/97	Total
Technician	5,000	10,000	5,000	0	20,000
Vehicle/ATV	3,500	7,000	3,500	0	14,000
Helicopter	3,000	6,000	0	0	9,000
Misc.	500	500	500	0	1,500
Total	12,000	23,500	9,000	0	44,500

This total could be reduced if other potential partners contributed to the man-power, reducing the three months of temporary help I have shown.

Resources/Contributions:

In house there is the possibility of vehicle's, ATV's, and Land Use staff field time. The seismic final plans indicating timber avoidance are also in house.

High Pot. Contributions; Cost sharing of temporary technician by oil and gas sector, and/or contribution of an ATV.

Med. Pot. Contributions; utilize FTS students for field work, data collection.

Low Pot. Contributions; CAAP grant, PITS grant.

Status:

I have been collecting randomly since 1989 line widths from various programs to deal in the short term with the timber damage assessments. Some photographs for documentation. But have not been able to qualify these timber avoidance efforts for determining standards.

(3)

Outside normal Business?

HORSE GRAZING - IMPACTS AND STRATEGIES
Foothills Forest Activity Outline

Prepared by: Sherry Maine Date: January 7, 1993

Title: Horse Grazing - Impacts and Strategies

Activity Contact: Sherry Maine

Activity Team Members:

Confirmed: Sherry Maine, Howard Anderson, Ken Groat, Bryan Allen
Potential: Rocky Mountain Elk Foundation, Range Management Branch, Graduate Student, Hinton Grazing Association.

Purpose: Determine the damage to regeneration by Horse Grazing and the impact Horses are having on Wildlife habitat and to establish some Horse Management strategies.

End Results: This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 1-Objective 2, Goal 4-Objectives 5,6, Goal 7-Objective 6-7, Goal 17-Objective 2,4.

Analyze the Impact of horse grazing on reforestation and the magnitude of competition between horses and Wildlife; and to develop a grazing management strategy to ensure the availability of grazing opportunities. for wildlife and horses

Location: The study of Horse grazing and its impacts will take place in the Cache Percotte Forest and the Athabasca Mixedwood Demonstration Forest.

Methods: Areas within regenerated cutblocks will be fenced off, as a sample area, to determine the effect of damage to the seedlings outside the fenced off area. Various age classes of conifers will be chosen to determine the correlation of damage to each age class. A technician will be hired to set up the fenced off areas and a graduate student to evaluate the regeneration and vegetation cover of each site. The study will be carried out by inhouse staff and then a student/technician hired to amalgamate the information and report on the findings and remove the fenced enclosures.

Links to other Activities:

The Grazing study links to:
1. Integrated Resource Management, Wildlife and Terrestrial Ecosystems.

2. McLeod River and Athabasca Mixedwood Demonstration Projects.

There are presently 500+ horses running at large within the Foothills Forest Boundaries. The final results will assist in determining the loss of habitat to other Wildlife due to horses and will assist in a Horse Management Strategy. The study will establish some criteria for Horse grazing.

Time Frame:

The Study will start in the Spring of 1993 with the establishment of fenced enclosures and the sampling of regeneration and vegetation within and adjacent to the enclosures. The study will be ongoing throughout the 5 years of the Model forest with the end result being a technical report on the findings and strategies.

Budget:

ITEM	92/93	93/94	94/95	95/96	96/97
Fencing Mat.		$5,000			
Technician		$3,000			$3,000
Grad. Student		$7,500			$7,500
Vehicle		$7,000			$7,000
Miscellaneous		$1,000	$1,000	$1,000	$2,000
TOTAL		$23,500	$1,000	$1,000	$19,500

The total budget may be reduced by donation of materials for fencing or by volunteer work to put up and remove the enclosures.

Resources/Contributions:

Resources available include inhouse expertise and assistance from the Alberta Forest Service, Weldwood and Forest Technology School.

Potential sources of funding include Weldwood (Medium), Rocky Mountain Elk Foundation (Medium), Range Management (Low), Agriculture Canada (Medium).

Status: Proposed

#3

(3)

FOOTHILLS FOREST ACTIVITY OUTLINE

Prepared By: Mike Eder/Derek Petersen **Date:** January 05, 1992

Title: Complimentary Protected Area Permanent Sample Plots

Working Group Coordinator: Derek Petersen

Activity Contact: Derek Petersen

Team Members: JNP, Switzer Park, Ab. FL&W

Purpose: To establish a system of permanent sample plots in protected areas within and adjacent to the Foothills Forest.

End Results:

This activity relates to the following goals/ objectives of the Foothills Forest proposal: Goal 1- Objective 2; Goal 2- Objective 2; Goal 3 - Objective 1; Goal 4 - Objective 1,2; Goal 9 - Objective 1,2,3,4 and Goal 11 - Objective 1.

General Objectives:

1. To expand the existing permanent sample plot data base maintained by Weldwood by identifying a series of complimentary and supplementary plots within the protected lands adjacent to Weldwood's FMA (Willmore, Jasper) and within the FMA area (Switzer).

2. To identify the data parameters to be collected and appropriate sampling methodology.

3. Ensure that the design of the data collection techniques provides compatibility with the Decision Support System and the GIS programs of the Foothills Forest.

4. Complete the inventory of protected area sample plots.

5. Design an on-going monitoring program for the new sample plots.

Location:

The new protected area sample plots will be established in protected area ecosites inside the Model Forest Area such as Switzer Provincial Park and in adjacent protected lands in Jasper National Park and the Willmore Wilderness Area.

Method:

A contract will be tendered to identify suitable sites, ground check the sites and then establish the plots. Data requirements will reflect not only new research needs but will also provide sufficient duplication with existing information that comparisons and analysis of managed versus non-managed lands may be completed. A suitable collection format will be developed by the contractor in order to be compatible with the DSS and GIS programs.

Establishment and data collection coordination will be provided by the contractor. Protected area staff will be utilized for field level data acquisition. The contractor will ensure that the data collection methods are scientifically acceptable within the constraints of economic realities. Future data collection will become the responsibility of the appropriate land management agency.

The program will run in conjunction with the ecosystem classification of the existing Weldwood plots so that comparable and complementary ecosites can be selected in the protected areas.

Links to other Activities:

This activity provides baseline information for many planned and future research projects. The information collected will be integrated into the GIS and DSS systems and from there it will assist in all aspects of integrated resource management. This project depends on the identification of the ecosystems that the existing sample plots are in. Similar ecosites can then be identified as well as ecosites with insufficient representation or special status.

The data obtained from the complementary PSP's will be integrated with the Weldwood data and will be essential components to the Carbon Budget/Energy Conservation Plan project.

Time Frame:

Contractual arrangements will ensure that the design and designation of protected area sample plots will be completed by June 1/93. This will allow the initiation of data collection to occur in the 93/94 field season. These activities will occur in conjunction with the project directed at the ecosystem classification of existing plots. Additional protected area sample plots will be established as the special ecosystems and old growth stands are defined and identified. Data collection will continue during the 94/95 field season.

Budget:

ITEM		93/94	94/95	95/96
PSP identification	- JNP	10.0		
	- MF	5.0		
Data Collection	- JNP	25.0	25.0	
	- MF	10.0		
Data Management	- JNP	5.0	5.0	
Totals:	JNP	40.0	25.0	
	MF	15.0		

Resources/Contributions:

Jasper National Park will be contributing resources both in dollar and in kind support. Park staff will be employed extensively in the data acquisition phase of the project and represent an in-kind contribution of 25.0 K for each year of the project.

Comments:

The present Weldwood permanent sample plot program consists of about 3,200 plots. They are measured approximately every 10 years with both plot and tree level data collected. Each plot costs approximately $600 to measure. The $60,000 identified for data collection will allow an additional 100 plots to be measured. Additional funding is identified for the selection of the PSP plots and the management of the acquired data.

T.H. #13 - 519

FOOTHILLS FOREST ACTIVITY OUTLINE

Prepared by: Brian Kirstein

Title: Assess harvesting options in Mature mixedwoods/spruce understorey regarding clear-cutting alternatives to promote mixedwood management including wildlife habitat, bio-diversity and boral ecosystem sustainability.

Working Group Coordinators: Terry Nilson/Brian Kirstein

Activity Contact: Brian Kirstein

Activity Team Members:

Confirmed: CFS - Lorne Brace, Stan. Navratil, FERIC - Tony Sauder, Brian Kirstein, Ken Groat, Rick Bonar

Potential: AFS, Harvest Contractor or Company Crew personnel, Wayne Mayan, Ken Clark

Purpose

1) Assess harvesting and tending options in mixedwood stands - characterized by deciduous overstories and white spruce understories.

2) Develop stand selection criteria based on tree and stand stability and site factors which reflect blowdown risk for spruce understorey.

3) Develop an initial grow and yield framework for mixedwood stands following harvest to protect understorey spruce.

4) Monitor and evaluate for wildlife habitat management.

End Results: Goals and Objectives

Location

Undetermined at this time, however, moist sites will be priority candidates, probably in Marlboro and/or Athabasca Working Circles.

Methods

A number of harvesting treatments will be utilized and performed, each on a 15 ha. cutblock. Sites will be comparable. Blocks will be harvested in winter. Growth and yield monitoring plots will be established prior or following trial.

expand on previous FERIC study

Links to other activities

1) Different types of harvesting equipment could be compared as well as cost comparisons.

2) Follow-up wildlife study could be initiated.

Time-frame

1) Begin pre-harvest fieldwork - Summer 1993.

2) Begin operations - late Winter 1993.

Budget

The budget would cover: $1.50/m^3 \rightarrow \$30,000$

1) Moving of all equipment

2) All harvesting costs (falling, skidding, limbing, slashing & hauling)

3) All fieldwork and supervision costs (including planning)

Resources/Contributions

Has not been addressed.

Status

Preliminary background information has already been submitted to Weldwood by Forestry Canada.

Logging to start 1993

494
L

IMPACTS OF CHIPPER RESIDUE DISPOSAL

PREPARED BY: D. Renaud DATE:January 6, 1992

Group Coordinator:

Contact: Diane Renaud

Team Members: D. Renaud, I. Corns

Targets: Goals and Objectives
Assess the impacts of chipper residue disposal on:
1) Short-term tree establishment and growth
2) Long-term site productivity

Potential Contributions:
- UBC Kimmins
- ForCan Corns

Activity Purpose:
To assess the effects of chipper residue on regeneration of cut blocks with meeting Stand and Forest Level Objectives.

Location:
Chipper blocks across sites on the FMA

Methods:
1) Analyze organic and inorganic Properties of residue
2) Quantify disturbances (aerial extent, distribution, load, soil chemistry pre-post treatment,soil temperature)
3) Measure and quantify effect on seeded and planted tree growth and vigour (root egress, Root Collar, height, nutrient levels, survival).
4) Investigate soil amendments (formulations of fertilizer grass/legume seeding)
5) Track the temporal nature of changes (1 through 4)

Links to Other Activities:
Using hog fuel, sludge, Yard reclaimer fines and boiler ash to ameliorate soils; Responses of lichens and caribou to harvesting activities (Berland); and Green Plan Forestry Practices Science & Technology Initiative: "Assessing the effect of wood chip spreading on various aspects of site productivity"; and the Operatinonal harvesting proposal: "Comparison of stump-side delimbing versus road-side delimbing harvest systems".

Time-Frame:
Implementation 1993-1994
Monitoring 1994 to 1997

Budget:

ACTIVITY	92-93	93-94	94-95	95-96	96-97	TOTAL
Chemical analysis soil		$4,500	$ 4,500	$ 4,500	$ 4,500	$18,000
Chemical analysis residue		$5,000	$5,000	$ 5,000	$ 5,000	$20,000
Spread residue and amendments		$10,000				$10,000
Regenerate & foliar analysis			$10,000 $5,000	$ 5,000	$ 5,000	$10,000 $15,000
Fertilize		$10,000				$10,000
Monitor growth			$ 2,500	$ 2,500	$ 2,500	$7,500
Total		$29,500	$27,000	$17,000	$17,000	$90,500

Resources/Contributions:
Forestry Canada probably will do the foliar and chemical analysis in their Edmonton Lab.
Spreading of the residue can probably be done as part of Weldwood operations.
Model Forest requirments probably a Total of $17,500: 93-94 $10,000; 94-95 $2,500; 95-96 $2,500; 96-97 $2,500.

Status: Pending review

ASPEN REGROWTH AFTER MECHANICAL RELEASE OF CONIFERS

Prepared by: Stan Navratil
Forestry Canada

Jan 8/93

Group Coordinator: S. Navratil

Contact: Roger Hayward, Foothills Forest

Team Members: S.Navratil / B.Rugg / D. Renaud / Jim Kitz

Targets: Goals and Objectives
- Determine the best timing and technique for reducing aspen competition from regrowth following conifer tendings.
- Improve understanding of biological processes controlling vegetative regrowth of aspen suckers and shoots.
- Investigate responce of other competitive species, such as calamagrostis, to tending disturbance.

Potential Contributions:
- For Can - research scientist for methodology & analysis
- Weldwood - implementation of treatments.
- Can/Alta agreement

Activity Purpose:
- Formulate a comprehensive knowledge base and develop appropriate tending prescriptions for spruce and pine.

Location:
- Canyon Crk / Prest Crk / Centre Crk / Marlboro / other

Methods:
- Evaluate data and results from existing local trials.
- Establish replicated, trials in 5, 9, & 15 yr. old stands with sequential treatments @ critical phenologic stages.
- Quantify aspen responce and relate to controlling factors.

Links to Other Activities:
- Head to head screening trials
- Mixedwood Demo Site - spruce
- Cache Percotte Demo Site - spruce tending along hwy 16

Time-Frame:
- Suitable treatments already initiated across the FMA.
- Controlled treatments to begin in 93.

Budget:
93 - $15.0 94 - $15.0 95 - $15.0 96 - $15.0

Resources/Contributions:
- as described above

Status: some tending, completed in 92, can be useful for analysis.

#1-1

Submission to Weldwood Canada - Model Forest

Silviculture Research Component

S. Navratil, Forestry Canada, NoFC, Edmonton

Cooperators: Silviculture section of Weldwood Canada, Hinton Div.

FOR CAN

ASPEN REGROWTH AND COMPETITION AFTER RELEASE OF CONIFERS

Background: Release of conifers from aspen competition is increasingly used in management of mixed juvenile stands and in implementation of free-to-grow concepts. Aspen regrowth after release by suckering from roots and root collar and by reshooting from the remaining stems often necessitates repeated treatments and may negate the investments in tending. Preliminary observations suggest that the proper release technique could greatly improved the efficacy of release treatments.

Problem: Very little is known how the time of cutting and type and height of cut affects the density and growth rate of aspen regrowth and how these processes are in turn related and controlled by aspen age and size.

Dynamics of aspen competition, aspen growth and development of juvenile mixed stands after release are virtually unknown.

Objective:

1. Determine the best timing and cutting technique for reducing aspen regrowth expressed in density, growth and competition.
2. Develop the knowledge and understanding of the processes controlling vegetative reproduction by suckering and reshooting of juvenile aspen after cutting or wounding stems.

1-2

Methods:

a) evaluate data and results from the existing release trails (Forestry Canada, Weldwood Canada).

b) establish controlled, replicated trails in 5, 9, and 15 years old aspen (or mixed) stands with release at sequential monthly intervals and critical phenological stages.

c) quantify aspen regeneration processes and relate to the controlling factors.

d) relate the density and growth of regenerated aspen to intensity and dynamics of competition and growth curves of aspen and conifer species

e) formulate comprehensive knowledge base and develop appropriate prescriptions

Plan:

1992:
- review of existing knowledge and trials
- remeasure existing trials
- select target stands
- initiate one trial

1993
- continue establishment of trials
- first year monitoring

1994
- continue monitoring
- establish competition plots

1995
- continue remeasurements
- report on Aspen regeneration processes after manual and motor-manual release

1996
- continue remeasurements
- compile results on aspen density growth and competition
- interpret and formulate guidelines and prescriptions

#2-1

SUBMISSION TO WELDWOOD CANADA - MODEL FOREST

Silviculture Research Component

SHELTERWOOD SILVICULTURE SYSTEM FOR ENHANCEMENT OF WHITE SPRUCE NATURAL REGENERATION

Background:

Renewal of softwoods on mixedwood sites will increasingly need to take advantage of innovative silviculture and harvesting systems that enhance natural regeneration and complement successional and biodiversity patterns.

Even-aged shleterwood system may offer the advantages of promoting white spruce natural regeneration while maximizing benefits and reducing the cost of bringing white spruce regeneration to growth performance standards.

Objective:

To evaluate even-age shelterwood system with the variants of canopy removal, site preparation and site for white spruce establishment in mixed stands.

Partners:

Forestry Canada, Mixedwood silviculture, S.Navratil
V.Lieffers, Dept. of Forest Science, Univ. of Alberta
Silviculture Section, Weldwood Canada, Hinton

Methods:

In a mature mixed stand (aspen/white spruce)
A shleterwood sequence involving two cuts - seed cut and removal cut 10? years later
Seed cut reducing canopy/basal area:
A. light reduction
B. heavy reduction (over 40%)

Removal cut when regeneration reaches approx. 1 m

Site preparation: A. no treatment
B. scarification/site prep.with small equipment

Site: 1 - LBC 5 mesic
2 - LBC 10 subhygric

Alternative: One year prior to seed cut apply single-tree chemical tretament to reduce aspen suckering after seed cut

Measurements and application of results:

Monitor white spruce regeneration, aspen suckering and brush,vegetation and competition ingress.

Develop knowledge base for formulating prescriptions

Develop juvenile growth curves of white spruce under two canopy levels and after removal cut and apply to G a Y model/predictions

Option: Measure diameter growth of the residual stand to assess growth increase after seed cut

Plan: 1992 Site 1 - LBC 5 White spruce/Viburnum/Aralia
Select prospective stands, plan cutblock layout select,mark white spruce dominant trees to be left in the residual canopy

1993 winter logging,
seed cut
summer site preparation
layout of monitoring plots

1994 repeat the sequence on site 2 - subhygric LBC 10 White spruce/Equisetum/Hylocomium

1995-1997 monitor the response variables as listed above

1997 conclusions and recommendations pertinent to initial establishment of white spruce and aspen

Budget:

$5.0/yr for 5 yrs => $25.0

STAN'S — Dec 21st.

566

#

MODEL FOREST PROPOSAL

VALIDATION OF BASAL DIAMETER RATIO COMPETITION INDEX FOR PINE-ASPEN

Date: December 7, 1992

File: BDRPROP1.WP

1. Proponents:
S. Navratil and D. MacIsaac

2. Objective: application
To test ~~efficacy of using~~ the basal diameter ratio competition index developed by Forestry Canada in tending decisions ~~to increase conifer growth.~~ at several forest levels

3. Methodology:
~~The overall method is to~~ Remove competing aspen ~~within 1.8 m of lodgepole pine trees, using the basal diameter ratio~~ competition index ~~as a guide~~, and then monitor growth response of lodgepole pine over a 3 to 5 year period.

3.1 Site Selection:

Young cutblocks (around 10 years old) with planted or naturally regenerating lodgepole pine and aspen as the main competitor ~~would be selected~~. High aspen competition sites would be favoured. These would be within the Weldwood FMA, preferably in one of the designated model forest sites. Alternatively, this research could be done in conjunction with AFS. This latter approach would allow for a wider selection area.

3.2 Experimental Design

A randomized complete block design with three cutblocks and four plots per cutblock would be used. Within each plot, 35 subject lodgepole pine trees should be selected, spaced at least 5 m apart (the plots would be 50 m x 50 m to ensure adequate numbers of lodgepole pine trees).

Within a cutblock, the four treatments would be randomly assigned to the four plots. Within each plot, there would be uniform aspen competition manipulation (using brush saws) as described below:

a) no vegetation removal (control plot)
b) removal of certain aspen within 1.8 m of the selected lodgepole pine trees such that BD ratio between subject pine and tallest aspen is less than 0.75.
c) removal of certain aspen within 1.8 m of the selected lodgepole pine trees such that BD ratio between subject pine and tallest aspen is less than 1.0.
d) removal of all aspen within 1.8 m of the selected lodgepole pine tree.

not feasible

(These competition levels would be maintained for the duration of the study.)

3.3 Field Measurements

Baseline competition data (e.g. aspen density, distances, RCD) will be collected prior to aspen removal. Every year, growth response of the lodgepole pine (e.g., RCD, height increments will be recorded).

4. Schedule

Site selection	May-June 1993
Plot establishment	summer/fall 1993
Establishment Report	fall 1993
Annual Measurements	late summer 1994 to 1996
Third Year report	fall 1996

5. Resources

Site selection and analysis would be done be Forestry Canada personnel. Plot establishment and annual measurements would be done on a contract basis.

6. Budget

3 blocks x 4 plots/block x 35 trees/plot = 420 trees
rate for a 2 person crew is $450.00/day.

1993	Site Selection	$ 1,000.00
	Plot Establishment	$ 2,000.00
	Baseline data collection & aspen control (12 trees/crew/day)	$15,750.00
1994-1996	Annual measurements & plot maintenance (40 trees/crew/day)	$15,000.00
	1994 - $ 5,000	750
	1995 5,000	
	1996 5,000	
	TOTAL	$33,937.00

= 34 k

for one trial

Approved 93/94
No Foothills Forest
Money

Commercial Cl...
#11

Foothills Forest Activity Outline

Prepared by: Christy Butt **Date:** November 22, 1992

Title Furbearer Collection

Working Group Coordinator ~~Rick Bonar/Kirby Smith~~ Sherry Maine

Activity Contact Christy Butt

Activity Team Members

Confirmed: Christy Butt
Potential: Alberta Trappers Association, Alberta Fish and Wildlife, Forest Technology School
Local trappers, Wade Berry

Purpose

Design and implement a cooperative furbearer data collection program (1993-1996)

End Results: Goals and Objectives

-Develop improved resource information to complete existing inventory programs and start new for non-timber resources (Goal 1; Objective 2)

-Develop cooperative management strategies for wildlife by conducting wildlife supply analysis to ensure biodiversity and analyzing wildlife habitat supply and population vulnerability(Goal 4; Objective 5 and 6)

-Integrate timber management activities with other commercial uses by developing an action plan to increase communication, data collection among all commercial users(Goal 7;5)

General Objectives:

Add to existing database to include furbearing species

Integrate collected information into integrated resource management plan

Location

Data can be collected with the cooperation of local trappers from the Foothill Forest region.

Methods

Continue updating furbearer trapper catches for each year.

Implement a program through trapper contact to retrieve carcasses. Potentially through cooperation with Fish and Wildlife and FTS. Collection to include the following species; black bear and grizzly, fisher, marten, mink, weasel, wolverine

Collect data such as species sex, age, stomach contents, catch/effort and parasite data on furbearers

Integrate furbearer information into integrated resource management plan

Include road kills and illegal kills from fish and wildlife offices

Links to other activities

1. Expansion of small mammal and fur-bearer inventory programs
2. Completion of timber/wildlife habitat/population modelling process
3. Assessment of wildlife use in operational trials in harvested areas
4. Operational programs to ensure wildlife conservation and biodiversity
5. Improving trapper communication

Time-frame

Project start up by Fall 1993. Depending upon trapper cooperation this could continue for 2 winters

Budget

Technical data collection will be conducted by existing staff (spelled BUTT not TECH).
Possible to gain assistance through teaching programs at the FTS or High School

Resources/Contributions

Cooperation of ATA and local trappers are essential to this program. Cooperation from the teaching institutions and F&W would be helpful.

Status

Initial data collection on marten has been performed near the Cache Percotte Forest area with the cooperation of the Registered Trapper.

Alberta
TOURISM

Product Development Division
5th Floor, CityCentre, 10155 - 102 Street
Edmonton, Alberta, Canada T5J 4L8
403/427-2601 Fax 403/422-1180

DOCUMENT TRANSMITTED TO

DATE: January 7, 1993

ORGANIZATION:
Weldwood Canada Limited

PHONE/FAX NUMBER:
865 - 8164

IN: (City)
Hinton.

ATTENTION:
Rick Bonar -

NO. OF PAGES FOLLOWING: (not including this cover sheet)
2.

SPECIAL INSTRUCTIONS:
Rick: Here is the activity outline which we wish to have considered by the Board. It should have no impact on current budget year and we will include a detailed budget section at a future date. Should you have any questions do not hesitate to contact me.
Kevin.

DOCUMENT TRANSMITTED FROM

ORGANIZATION: ALBERTA TOURISM, PARKS AND RECREATION

FAX NUMBER: (403) 422-1180

FROM: Kevin Crockett, 427-4340

Backcountry Lodge Integration Assessment
Foothills Forest Activity Outline

Prepared by: Kevin Crockett - Alberta Economic Development and Tourism

Title: Backcountry lodge integration assessment

Working Group Coordinator:

Activity Contact: Kevin Crockett

Activity Team Members:

confirmed: Alberta Economic Development and Tourism;
potential: Weldwood, Alberta Forest Service, Alberta Fish and Wildlife, Improvement District #14, Evergreen Country Tourism Council (Zone 7), Hinton and District Chamber of Commerce and Alberta Yellowhead West Tourism Consortium.

Purpose:

To determine whether a specific tourism activity, a backcountry lodge opportunity, can operated within a commercial forest and to investigate those mechanisms which can be used to effectively integrate this opportunity within an area of timber commitment. A backcountry lodge is an example of a tourism opportunity which is dependent upon the natural resource base. While the actual development area is relatively small the opportunity may be impacted by surrounding land uses. Like forestry development, tourism is a key component of Alberta's economic diversification strategy, operates on a sustained use basis and can make significant contributions to the Hinton-Edson regional economy. This project is designed to develop the mechanisms by which these two legitimate uses of public land can be integrated successfully.

End Results: Goals and Objectives:

This activity directly relates to the overall vision for the model forest: "Sustainable development and integrated management of the forest resource through conservation and cooperation" and associated objectives 3 and 4. It relates specifically to Goal 6, to: "develop cooperative management strategies and improve opportunities for recreation, public use and commercial tourism", and 7, to "integrate timber management activities with other commercial uses on the Foothills Forest."

General objectives:

1. Establish appropriate site selection criteria incorporating the essential requirements of a backcountry lodge tourism operation

(site access, linkages to recreational trails, access to quality recreation and tourism resources, etc.).

2. Establish appropriate site selection criteria incorporating the essential requirements of the forestry operations (access to the timber resource, public safety, fire prevention, etc.).

3. Utilizing the above criteria, identify one or more locations within the model forest which would be suitable for backcountry lodge development.

4. Develop appropriate planning and operational guidelines to meet the needs of both the timber operator and any potential lodge operation.

5. Develop mechanisms which can be used to ensure ongoing consultation and coordination of activities between the timber operator and any potential lodge operation.

6. Develop this information as a case study which would be shared with other forest operators in Alberta and with other areas of the country through the Model Forest Network and other appropriate mechanisms.

Budget:

The specific budget which will be required for the project has yet to be determined.

Resources/Contributions:

There is no resource commitment necessary out of the 1992/93 model forest budget. Alberta Economic Development and Tourism will investigate additional sources to fund this initiative during the development of the detailed budget projection. While we feel that the proposal merits model forest funding due to its focus on integration of non-timber activities within a commercial forest, we anticipate that partial funding can be acquired from other sources.

Status:

This activity is being submitted for Board of Director approval in principle. As soon as approval is received we will proceed with determination of activity team members and sources for funding source commitment. Following this we will prepare a detailed budget description for consideration by the Board of Directors. We anticipate that the project can be initiated in the 1993/94 budget year and that the project will occupy at least two budget years.

Forestry Canada / Forêts Canada

Northwest Region / Région du Nord-Ouest

Northern Forestry Centre
5320 - 122 Street
Edmonton, Alberta
T6H 3S5
(403) 435-7210
FAX (403) 435-7359

Centre de foresterie du Nord
5320 - 122e rue
Edmonton (Alberta)
T6H 3S5
(403) 435-7210
FAX (403) 435-7359

Your file / Votre référence

Our file / Notre référence

7 January 1993

Foothills Forest
Project Steering Committee
P.O. Box 6330
Hinton, Alberta
T7V 1X6
ATTN: Rick Bonar

Dear Rick:

Enclosed please find a copy of our research proposal for the Foothills Model Forest. The sites for our study were established last fall in cooperation with Bill Rugg. We are not requesting any direct funding for the study but are looking for in kind support for the harvesting, and if available, summer student assistance during the harvesting and plot treatment phase of the study.

Thank you for your consideration of this proposal and we look forward to hearing from your committee.

Sincerely,

Ian Corns Doug Maynard

cc. Bob Newstead, ForCan
Bill Rugg, Weldwood

Canada

ENVIRONMENTAL IMPACTS OF FORESTRY PRACTICES ON BOREAL MIXEDWOOD ECOSYSTEMS

Prepared for:

Foothills Forest Activity Outline

Project Staff:

Dr. I. Corns, Dr. D. Maynard, Dr. S. Sidhu, Dr. I. Edwards
Northwest Region - Northern Forestry Centre

Working Group Coordinators: I. Corns, D. Maynard

Northern Forestry Centre Support Staff: D. Allan, L. Lywak, F. Radford, Y. Kalra

Purpose:

Determine the impact of selected forestry practices (organic matter removal and soil compaction) on short- and long-term site productivity, and composition and structure of plant communities, including biodiversity.

End Results: Goals and Objectives:

This research activity relates to the objectives of the Foothills Model Forest Proposal in the following areas:

i) developing integrated resource management,
ii) understanding of ecological processes and impacts of forest management practices through research, and
iii) conserve forest biodiversity.

General Objectives:

1. Conduct research to provide baseline information and gain a better understanding on structure and ecological processes of Boreal Mixedwood ecosystems against which short and longterm impacts of management practices can be evaluated to assist in the development of sustainable forestry.

2. Refine concepts and determine information needs to support ecologically sound forestry practices which will maintain long-term sustainable productivity in the boreal mixedwoods.

Location:

The study plots were established on two cutblocks (cutblocks P447 and P526) within the Marlboro working circle in September and October 1992. The preliminary classification of the sites are white spruce/Viburnum/Aralia, aspen facies (LBC 5c) within the Lower Boreal Cordilleran (LBC) ecoregion (Corns and Annas 1986). The soils are predominantly Orthic Grey Luvisols with some Brunisolic Grey Luvisols.

Methods:

1992-93 - Progress to Date

A study was set up to determine the impact of soil compaction and different forest harvesting techniques (with respect to organic matter removal) on site productivity. The original plan was to follow the experimental design proposed by the United States Forest Service to evaluate timber management impacts on long-term soil productivity. We decided to alter the organic matter removal treatments to meet the current practices being used within Alberta including application of wood chips from unusable debris. Soil compaction remains an important concern and we will attempt to follow the treatments proposed by the U.S. Forest Service in their cooperative study.

Harvesting of the plots is scheduled for August 1993. The experimental design is a randomized complete block design with two factors, organic matter removal and soil compaction. The treatments are:

I. Organic matter removal

1. Boles only. Slash to be left on the plots
2. Whole tree harvest. Trees to be taken to a landing and the slash removed.
3. Whole tree harvest, slash is chipped and spread back on to the plot.

The third treatment is a relatively new practice. Forestry operations are trying to reduce disposal of woody debris that can not be used; however, very little is known of the long-term impact of chip spreading on recently harvested land. The first two treatments will simulate currently used practices in forest operations of Alberta.

II. Soil compaction

1. No compaction
2. Moderate compaction
3. Heavy compaction

The compaction rates applied will be based on the results from earlier work on similar soils done by I. Corns.

Three replicates will be used resulting in a total of 27 plots (3x3 factorial). The treatments will be randomly applied among 27 of the plots. The additional three plots may be used to assess a harvesting technique related to organic matter removal. An adjacent leave block will be used for sampling undisturbed vegetation and soils.

Thirty plots, 15 X 100 m were established between the two locations. Aerial 35mm photographs and a VHS video were taken of the plots in October. A digital map on GIS has been made of the plots and will provide a link for future work related to the Green Plan DSS program. The data base for the plots will also provide the basis for assessing the spatial aspects of biodiversity with Weldwood's inventory.

Within each plot 10-5 X 10 m subplots were established. Tree heights and diameters (dbh) were taken for all trees within the subplots. One soil pit was dug for each plot. The pits were randomly selected. The soil was classified according to the Canadian System of Soil Classification. Samples were collected by horizon up to and including the BC or C horizon for detailed chemical analysis. The analysis is on-going and should be completed by the end of March 1993. Measurements to be done include:

pH
Cation exchange capacity
Exchangeable cations plus S, Al, Fe, and Mn
Organic matter
Total N (surface organic horizons only)
Total elemental concentrations (P, S, Ca, Mg, Na, K, Mn, Al, and Fe)
2.0 N KCl extractable NH_4^+-N and NO_3^--N
Extractable P and S
Particle size analysis

Vegetation will be sampled prior to all treatments for vegetation composition, structure and diversity. Sampling will be repeated for two years (1994 and 1995) following harvesting and treatment. Depending on resources, foliar analysis (5 samples for each of the 3 to 5 dominant species in each treatment) will be collected. Samples of late summer standing crop (herbaceous stratum) and total litter fall (shrub and tree stratum) will be collected for pre- and post-harvest nutrient input estimates if resources are available.

Resources:

We require no budget with regard to O&M, staffing or capital. We have applied for funding from various other sources (listed below) to cover these costs. Our funding requirements from the Foothills Forest committee would be in the form of in-kind support for harvesting and if available some summer student support during the harvesting and plot treatment stages of the study. This would all occur in August of 1993. The plot locations are scheduled for harvest in August 1993; however, additional costs will be incurred to ensure the plots are protected when harvested.

Other Sources:

Enhanced Science & Technology, Forestry Practices Green Plan Resources Requested:

Year	92-93	93-94	94-95	95-96	96-97	Total
O&M	48.5K	56 K	64 K	72 K	72 K	312.5 K

A-Base Resources:

Year	92-93	93-94	94-95	95-96	96-97	Total
PY's (prof)						
Environ.	0.3	1.0	1.0	1.0	1.0	4.3
Resources	0.2	0.8	0.8	0.8	0.8	3.4
(Supp)						
Environ.	0.7	1.0	1.0	1.0	1.0	4.7
Resources	0.3	0.5	0.5	0.5	0.5	2.3
Total	1.5	3.3	3.3	3.3	3.3	14.7

Alberta PAIF:

Alberta PAIF: Three years funding was initially approved at $ 20 K for 1992-93 and $50 K per year for the remaining two years. The main objective was to hire a post doctoral fellow to carry out research at the Model Forest location. Resource reductions in 1992-93 reduced the budget to $ 15.0 K.

Background for #4

Alberta
FORESTRY, LANDS AND WILDLIFE

File No.

Alberta Forest Service, Edson Forest, #203 - 111 - 54 Street, Edson, Alberta, Canada T7E 1T2 403/723-8269

December 8, 1992

Weldwood of Canada Limited
Hinton Division
760 Switzer Drive
Hinton, Alberta
T7V 1V7

ATTENTION: Sean Curry

Dear Sean:

RE: **Foothills Forest Activities**

Please find attached Ian Corns' proposal. It should be added to the activity list and considered along with all the others for inclusion into the work plan.

Yours truly,

A. J. Sikora, Forester i/c
Timber Management
FOR: W. F. H. Fairless
Forest Superintendent

Forestry Canada
Forêts Canada

Northwest Region
Région du Nord-Ouest

Northern Forestry Centre
5320 - 122 Street
Edmonton, Alberta
T6H 3S5
(403) 435-7210
FAX (403) 435-7359

Centre de foresterie du Nord
5320 - 122e rue
Edmonton (Alberta)
T6H 3S5
(403) 435-7210
FAX (403) 435-7359

Your file *Votre référence*

Our file *Notre référence*

NOR 02-01
NOFC

November 4, 1992.

Mr. Tony Sikora
Forester in Charge
Alberta Forest Service
#203, 111-54 St.,
Edson, AB
T7E lT2

Dear Tony,

In accordance with your request on behalf of the Foothills Forest Steering Committee, in your letter of Oct. 5, 1992 to provide additional information on our Foothills Forest Study, I am enclosing our proposal and a description of similar work conducted by R.F. Powers of the Pacific Southwest Forest Experiment Station. The final experimental design of our study, funded primarily from the Green Plan Forestry Practices initiative is yet to be finalized. In addition to the treatments described by Powers et al we may consider a wood chip application treatment, to simulate recent woody debris disposal practices, and their impact on productivity. We look forward to discussions of our project and working with the Foothills Forest Committee. Please feel free to contact Doug Maynard or myself if you require more details.

Sincerely yours,

Ian Corns

Ian G.W. Corns
Research Scientist

cc: Dr. D. Maynard
Mr. B. Kirstein, Weldwood Hinton

Canada

ENVIRONMENTAL IMPACTS OF FORESTRY PRACTICES ON BOREAL MIXEDWOOD ECOSYSTEMS

Project Leaders:

Dr. I. Corns, Dr. D. Maynard, Dr. S. Sidhu

Green Plan Initiative:

Forestry Practices

Support Staff: S. Navaratil, Y.Kalra, F. Radford. S. Lux, L. Lywak

Major Cooperators(Potential): Universities Univ. of Alberta - E. McDonald/V. Lieffers (Forestry Department))

Alberta Environment Centre Dr. David McNabb)

Canadian Parks Service ~~Parks Canada~~ (Riding Mountain, Manitoba)

Canadian Wildlife Service (T. Diamond)

Provincial Forest Services in Alberta, Saskatchewan, and Manitoba.

Forest Industry - Weldwood (R.Bonar) and Alpac (D. Brown)

Resources:

Green Plan Resources Requested:

Year	92-93	93-94	94-95	95-96	96-97	Total
O&M	60K	70 K	80 K	90 K	90 K	390K

Other Sources:[1]

Year	92-93	93-94	94-95	95-96	96-97	Total
PY's (prof)						
Environ.	0.9	1.3	1.6	1.6	1.6	7.7
Resources	1.6	1.5	1.3	1.3	1.3	7.6
(Supp)						
Environ.	0.7	1.3	1.3	1.3	1.3	6.0
Resources	1.5	1.4	1.3	1.3	1.3	7.0
Total	4.7	5.5	5.5	5.5	5.5	28.3

Saskatchewan PAIF: Funding of about $ 30 K has been proposed to set up a similar baseline location in Meadow Lake Provincial Park.

Location of Work: Boreal Mixedwood Region of Alberta, Saskatchewan, and Manitoba, with emphasis on Alberta.

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[1]The PY and O&M resources are NoFC A-Base. Additonal funds in kind may be provided from forest companies and provincial forest services through field plot establishments.

Summary of Proposed Research:

Statement of problem:

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

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

1) decreases in ecosystem productivity through soil compaction and loss of soil organic matter and nutrients,

2) the destruction of ecosystem integrity through ecological dysfunction and fragmentation, loss of biodiversity and wildlife habitat, and

3) a loss of landscape diversity through the harvesting of old growth forests.

We still have limited knowledge on the impacts of forestry practices and other disturbances upon the structure and processes of the major Boreal Mixedwood ecosystems in the Northwest Region. Studies must be conducted in order to provide a basic understanding of how such systems function and change over time and space. Without this information, it will be difficult to assess the effects of forestry practices on sustained productivity of these ecosystems. These studies will also provide valuable information for the development and validation of a variety of current initiatives in the areas of DSS, climate change, land classification, biomonitoring and integrated resource management.

A number of Boreal Mixedwood R&D projects were established within the region 30 to 40 years ago. They examined a variety of harvesting and stand tending alternatives. These sites provide a opportunity for a retrospective assessment of environmental and silvicultural impacts of forestry practices for current base comparisons to similar undisturbed sites. This

opportunity is unique to the Northwest Region.

Objectives:

1. Provide baseline information on Boreal Mixedwood ecosystem structures and processes against which short and longterm changes related to forestry practices and other disturbances can be compared.

2. Refine concepts and determine information needs to support ecologically sound forestry practices which will maintain longterm sustainable productivity in the boreal mixedwoods.

3. Conduct retrospective (30 to 40 year old) studies and determine needs for supplementary research in disturbed and undisturbed Boreal Mixedwood ecosystems.

Methods:

1992-93.

Complete retrospective studies of 30 to 40 year old R&D projects started by Forestry Canada (formerly CFS) and other regional agencies in Alberta, Saskatchewan, and Manitoba. The retrospective methods will include measurement of environmental parameters and remeasurement of the original study factors. Environmental parameters include measures of soil quality, vegetation composition, and biodiversity.

Select a maximum of 2 candidate sites for current and longterm baseline ecological studies (If a Model forest is located within the NWR a site will be located there).

Complete a literature review of forest ecosystems and long-term ecological studies. Intiate a publication on a review of the impacts of forestry practices in Boreal Mixedwoods.

Initiate vegetation vegetation and soil descriptions of sites for short- and long-term baseline ecological studies.

1993-94.

Begin experiments on factors controlling ecosystem structure and processes.

1994-95 and 1995-96.

Continue experiments on factors controlling ecosystem structure and processes.

1996-97.

Complete short-term experiments and continue long-term experiments on factors controlling ecosystem structure and processes.

Milestones:

1992-93

a) Prepare a registry indentifying ecosystems represented in former R&D sites and select candidate sites for continued R&D.

b) Prepare a list of candidate sites for soil disturbance/ degradation studies (tentative depending on consultation with USDA site disturbance specialists) and site productivity studies in priority ecosystems.

c) Initiate fieldwork on Boreal Mixedwood ecosystems including long-term ecological plots.

d) Prepare a report on current conditions in former R&D sites.

1993-94:

a) Prepare a report describing methods for studying ecosystem structure and function at long-term ecological research sites.

b) Prepare an interim report on long-term studies.

1994-95:

a) Identify future information needs and research directions for DSS in relation to sustainable forestry practices.

9. Potential Long-term Benefits:

a. Scientific Achievements:

1) Acquistion of baseline data describing the structure and processes operative in ecosystems of the Boreal Mixedwood Section.

2) Development of a conceptual model of factors controlling the structure and processes operative in ecosystems of the Boreal Mixedwood Section.

b. New technological Developments:

c. Technology transfer:

1) Identification of environmental impacts associated with forestry practices in Boreal Mixedwood ecosystems.

d. Training of new scientists:

1) There will be support to hire 2 or 3 Summer students for the duration of the project.

2) If external funding (NSERC grant), is secured, a post doctoral fellow will involved in the project for 3 years (associated with the University of Alberta - E. McDonald).

10. Links with Model Forest initiative:

The intent of Model Forests is to provide a focal point for developing and displaying Canada's knowledge, skills and leadership in sustainable forest management. Forestry Canada is committed to providing scientific support to its partners in the Model Forests program. The **Environmental Impacts of Forestry Practices on Boreal Mixedwood Ecosystems** study will provide the basic information essential to demonstrate that the many uses and benfits of our Boreal Mixedwood forests can be managed in a sustainable fashion.

11. Links to other Forestry Canada Green Plan Initatives:

This research will provide basic information on the structure and function of Boreal Mixedwood ecosystems essential for the evaluation of existing and improved forestry practices.

The long-term baseline studies will be conducted in natural ecosystems. They will, therefore, determine what factors maintian the natural function of similar ecosystems located in Ecological Reserves

All ecosystems present in former R&D study sites and newly established long-term research sites will be cross-referenced to the Land Classification initiative, so that research findings may be extrapolated to similar sites within the Boreal Mixedwood Section.

The research will provide a long-term record of forest structure and function which will enable the detection of ecosystem responses to Climate Change.

Information gathered on the environmental conditions in the R&D study sites will provide a knowledge base essential for the development of a Boreal Mixedwood Decision Support System.

12. Links to Regional Strategic Plans and PAIFs:

The enhance S&T baseline research under the green plan provides direct links to the current NWR research initiatives on the assessment of old forestry practices studies, baseline for impact assessments, DSS for aspen and mixedwood management and climate change.

Support for a baseline study in Meadow Lake Provincial Park has been tentatively approved and will provide additional information on Boreal Mixedwood ecosystems within the NWR.

AN ORGANIZED APPROACH TO EVALUATING MANAGEMENT IMPACTS ON LONG-TERM PRODUCTIVITY

Robert F. Powers, David H. Alban, Gregory A. Ruark, Allan E. Tiarks

Pacific Southwest, North Central, Southeastern, and Southern

Forest Experment Stations, USDA Forest Service

A. ABSTRACT

Sustaining the inherent capacity of forest land to grow vegetation is central to modern forest management. In the United States, it is mandated by law on lands managed by the U.S. Forest Service. Soil management is central to sustained productivity, and the Forest Service is setting soil quality monitoring standards to detect significant changes in productivity potential. In many cases, such standards are based on professional judgement, rather than hard evidence. However, research suggests that losses in soil productivity are linked with changes in site organic matter and soil porosity. A coordinated national research effort involving designed experiments has begun on benchmark U.S. sites. Results should lead to a better understanding of the role of organic matter and soil porosity in the site processes controlling inherent productivity. This will generate sound guidelines for evaluating the probable impacts of forest management on potential productivity.

B. INTRODUCTION

Sustaining the long-term productivity of forests can be justified for several reasons. High among them are land ethics and a progressive view of economics (Powers et al., in press). But a particularly persuasive reason that overrides these justifications is law. In the United States, landmark land law directs the U.S. Forest Service--the largest forest management agency--to address the impacts of management practices on long-term, inherent productivity, and to prevent resource degradation. Compelling a public agency of an advanced nation to practice good land stewardship may seem superfluous. However, laws do exist as guiding principles to ensure that natural resource values are protected. Once enacted, laws can lead to problems not envisioned by their "founding fathers." Recognizing the ramifications of such land laws helps clarify important issues, This clarification carries a special significance for productivity research in the U.S. Forest Service.

C. BACKGROUND

1. THE LAW

The Multiple Use-Sustained Yield Act of 1960 binds the Forest Service to achieve and maintain outputs of various renewable resources in perpetuity without permanently impairing the productivity of the land. Following this, the National Forest Management Act of 1976 (NFMA) charged the Secretary of Agriculture with ensuring research and continuous monitoring of each management system to safeguard the land's productivity. This led to a Code of Federal Regulations for Forest Planning requiring the Forest Service to measure effects

of prescriptions on "significant changes in land productivity." In response, the Chief of the Forest Service has charged each of the nine Forest Service administrative regions with developing monitoring standards that can detect losses in productive potential of the land over a planning horizon (i.e. a rotation). Clearly, such laws and regulations are laudable in principle. The problem lies in their practice.

2. THE RESPONSE

a. Definitions. A initial step was to develop a working meaning of "land productivity." While the concept of "land productivity" is interpreted broadly to include wildlife, watershed, fisheries, aesthetic, and timber values, Forest Service attorneys intrepret this in its strictest sense to mean the inherent capacity of a site to produce vegetation. This capacity is assumed to be a function of climatic, topographic, edaphic, and biotic factors interacting over time--in short, the product of a complex function that exists in concept, only. The working definition is the capacity of the soil to support plant growth as indicated by some index of biomass accumulation (USDA Forest Service, 1987).

b. Rationale. Many of the natural resource values covered by NFMA are nebulous or difficult to quantify. However, plant biomass is a measurable property that integrates the factors of productivity and reflects the overall "health" of an ecosystem. In short, it is a fundamentally useful index of the land's potential for producing other resources. Soil was selected as a barometer of the land's productive potential for two reasons. First, along with climate and topography, soil is a basic, fundamentally important resource that

controls both quality and quantity of such renewable resources as timber, wildlife habitat, and water yield. Second, soil is a non-renewable resource that is affected directly by forest management practices--particularly those surrounding timber harvest and site preparation. Thus, monitoring the condition of the soil following forest management operations can provide an index of the potential productivity of the site.

c. Result. Each Forest Service Region is developing soil quality monitoring standards that can detect losses in productive capacity of 15 percent or greater over a planning horizon (USDA Forest Service, 1987). The 15-percent standard was set not because a 15-percent decline is tolerable, but because this is believed to be the lowest magnitude of change that is detectable, given current monitoring intensity. Such standards are based on the best information available, but often are anchored in professional judgement. This soil monitoring strategy is grounded on the following assumptions:

1. The proper soil variables are being measured.

2. The relationship between those variables and potential productivity is known.

Both assumptions are open to question. Variables commonly monitored following forest mangement activities are soil loss, soil displacement, soil bulk density, the amount of exposed mineral soil, and the proportion of ground cover in coarse woody debris. Is there evidence that these variables are important? If so, have changes in these variables been corellated with changes

in potential inherent productivity? Finally, how secure are we in our assessment of inherent productivity?

D. RESEARCH EXPERIENCE

What data are there for setting soil monitoring standards? For that matter, is there convincing evidence that forest management practices have led to productivity declines? Can we develop some principles?

1. FINDINGS

a. **Forest Floor Removal.** In temperate and boreal forests, the forest floor is a particularly important nutrient reserve. In fact, its N content may be from one- to three-times that in the standing forest (McColl and Powers, 1984). Wiedemann (1935), summarizing effects of litter raking on growth of Pinus sylvestris on mesic sites in eastern Germany, showed that productivity was lowered nearly two site classes where litter had been removed regularly. Soil density also increased. This was confirmed recently in New Zealand's pumice region. Removing needle litter annually for 17 years reduced volume growth of Pinus radiata by 12 percent, and produced nutrient deficiencies in the foliage of trees (Ballard and Will 1981). In South Australia, Keeves (1966) found that growth rates in second-rotation stands of Pinus radiata were about 40-percent lower than in the first rotation following clearcutting and slash burning. Squire et al. (1985) traced this decline to increases in moisture and nutrient stress when the forest floor was removed during slash burning. Retaining logging slash reversed this effect and increased productivity in second

rotations above that in first rotations. Whether done mechanically or by fire, losses of forest floor residues can spell losses in productivity.

b. Surface Soil Displacement. Soil organic matter and labile nutrients usually concentrate near the soil surface and decline rapidly with depth (Pritchett, 1979). Tew et al. (1986) estimate that displacing surface material into windrows removes two- to three-times more N and P than does whole-tree harvesting. In New Zealand, stripping logging residues and an estimated 2.5 cm of pumice topsoil into windrows in a first-rotation clearcut produced a plantation with only 84 percent of the volume found on unwindrowed sites at 7 years (Ballard, 1978). By age 17, standing volume had dropped to 70 percent of the adjacent, unwindrowed site (Dyck and Beets, 1987). Similar windrowing in North Carolina led to a 23-percent growth reduction by 25 years (Fox et al., in press). Elsewhere, direct effects of surface soil displacement on growth often are confounded by growth-promoting factors. In Alabama, 3-year-old Pinus taeda had 55-percent volume where 8 cm of surface soil had been removed than where it was left intact--apparently, because weed competition was reduced as well.

c. Soil Deformation. Moving logs or equipment over a soil disturbs the forest floor, gouges and ruts the mineral soil, and can cause compaction or puddling. Soil aeration, water infiltration, and saturated hydraulic conductivity are decreased and soil strength rises (Greacen and Sands, 1980)--all of which affect root penetration, respiration, and uptake. In fine-textured soils, compaction recovery may take decades (Hatchell et al., 1970). In coarse sands, effects may be irreversible (Sands, 1983).

In the U.S., direct evidence of productivity decline from compaction has been short-term or retrospective. Froehlich et al. (1986) and Helms et al. (1986) found that pines growing on compacted skid trails and landings were about one-fifth smaller than those growing on less-compacted soils nearby. However, initial soil conditions were unknown, and results were partially confounded by differences in stocking and weed competition. In South Carolina and Virginia, naturally regenerated pine growing on compacted skid trails were less than half as tall as those away from skid trails (Hatchell et al., 1970). Work summarized by Froehlich and McNabb (1984), largely retrospective, suggests that growth reduction in young trees is directly proportional to relative increases in soil bulk density. However, the relative impact of a unit increase in bulk density is bound to vary from soil to soil.

As with soil displacement, negative effects of compaction can be masked by other confounding factors. Miller et al. (in press) cite instances where growth of 25- to 40-year-old Pseudotsuga menziesii was better on skid trails (where stocking was adequate and weed competition was low) than on less-damaged soils nearby (where stocking was poor and weed competition was high).

d. Biomass Harvesting. Rotation length and utilization standards affect rates of biomass and nutrient removal, and nutritional aspects have drawn most of the attention in the U.S. and elsewhere. As a rule-of-thumb, a 1-percent increase in biomass removal spells about a 3-percent increase in nutrient removal (Switzer et al., 1981). On the average, about one-tenth of the total ecosystem N is in the standing biomass (Alban et al., 1978; Wells and Jorgensen, 1979). Presumably, a series of short rotations would remove more nutrients than a longer rotation over the same period. Foliage biomass stabilizes shortly after crown closure, and the shorter the rotation, the

greater the cumulative removal of foliar biomass. Most such assessments are based on modeling projections, and documented field studies are rare. Sterba (1988), in a thinning study in Austria, reported that residual trees had 12-percent greater basal area increment if felled trees were left on the ground than if they had been removed. Presumably, the machinery needed to extract whole trees would affect soil physical properties, but these were not measured. Glatzel et al. (1985, cited by Sterba, 1988) show that whole-tree harvesting may lead to appreciable soil acidification.

e. Inherent Productivity. True measures of a site's inherent potential for growing plant biomass are rare in forestry because of the difficulty posed by seasonal and seral changes in plant communities. Instead, most records consist of tree growth--usually height, diameter, basal area, or volume measures of stem production, but sometimes changes in leaf area or biomass of various plant components. While tree growth certainly reflects inherent soil productivity, the effect can be confounded by effects of stocking, weed competition, and predation from forest pests. Pine shoot borer, for example, can reduce volume growth in young trees an average of 25 percent (Stoszek, 1973). The biomass production of entire plant communities are better reflections of inherent soil productivity, but even their productivity depends partially on seral stage. For example, net primary productivity may peak after canopy closure, and then decline as forest succession begins to modify the soil environment (Van Cleve and Viereck, 1981). With very few exceptions, baseline data on inherent soil productivity are nearly nonexistant.

2. CONCLUSIONS

Our technological abilty to disturb soil is advancing much faster than our assessment of its impact on fundamental resources. The oldest designed experiments in the U.S. rarely included the degree of soil disturbance possible using today's equipment. Much of our understanding rests on short-term experiments or on long-term circumstantial evidence. Often, findings are weakened because the experimental design failed to account for such extraneous, confounding factors as weed competition. Most U.S. research (and much of that reported in the IEA/BE workshop proceedings) has focused on nutritional impacts, and ignored soil physical impacts--which may be at least as serious in the long run (Wells and Jorgensen, 1979; Switzer et al., 1981). Although findings tend to be anecdotal case studies anchored on imperfect measures of productivity, the denominators common to many incidents of productivity decline are site organic matter and total soil porosity. The importance of these factors, and their interactions, will vary from site to site. To date, no universal standards exist for calibrating changes in these properties to changes in inherent soil productivity.

Work is needed at both the fundamental and applied level to quantify the effects of soil disturbance on productivity--not only in a timber management sense, but in a more fundamental sense as well. We know little about the inherent carrying capacity of forest sites for producing vegetation. Yet, the capacity of a site for producing vegetation is a good index of its ability to produce other resources useful to society. An effective soil monitoring program requires a sound understanding of how changes in site organic matter and soil porosity affect vegetative growth potential on a site-specific basis. Attacking both fundamental and applied aspects of long-term productivity is beyond the

scope of private and university forest research organizations, but is clearly within the mission of Forest Service research.

E. A COORDINATED RESEARCH PROGRAM

In our judgement, traditional lines of study offer modest hope for major advances. A new approach is needed if we are to understand how management practices affect soil processes and potential productivity across a broad spectrum of sites. Beginning in 1989, a cooperative study between Forest Service Research and National Forest Administrative arms will address this subject in western, north central, and southern regions of the U.S. Choosing benchmark sites, we will deliberately alter site organic matter and total soil porosity over a range of intensities encompassing those possible under management. This creates a network of comparable experiments producing nil to severe soil disturbance and physiological stress in vegetation over a broad range of sites and climates. Establishing and monitoring this network directly addresses the needs of National Forest Systems, and creates a research opportunity of unusual scope and significance. The work fosters close cooperation between Research and National Forest Systems, and opens doors for important collaboration with university researchers.

1. OBJECTIVES

The cooperative study creates a broad range of opportunities for basic and applied research. These can be stated as objectives under "research" and "development."

a. Research. How does soil disturbance affect:

- o Carbon allocation
- o Water use
- o Nutrient use
- o Other processes
- o Pest resistance
- o Fundamental productivity

b. Development. Facilitate soil monitoring efforts by:

- o Calibrate soil property changes against (i) stand productivity, (ii) total productivity
- o Evaluate/develop practicable field monitoring methods
- o Develop means for extending results over broad areas

2. METHODS

a. Site selection. Timber types and Regions chosen for study will reflect national priorities as determined by the Washington Office of the U.S. Forest Service. Soils must be common to the timber types of that Region. Emphasis will be placed on stands near rotation age with stocking and forest floor characteristics expected of stands under management. Study sites will be chosen from a list of candidates with the aim of covering the breadth of site conditions found within a timber type. The general approach will be to group candidate sites along a gradient in a physical soil property believed to be linked directly with potential site productivity (for example, effective rooting

depth, water holding capacity, drainage class, texture, etc.). Three study sites with similar soils would be drawn randomly from each of the "low," "medium," and "high" regions of the soil property gradient, producing nine study sites replicated three times on common soil types within three broad soil groupings. Study sites may be added at gradient positions intermediate between the "low," "medium," and "high" positions. This concept is shown graphically in Figure 1.

b. **Installation Procedures.** Each site requires a clearcut of about 15 acres (6 ha). Before harvesting, a preliminary soil survey will be made to locate portions of the study area with relatively uniform soil. Using a bucket auger or spade, soil will be examined at a 60-foot (18 m) grid interval and mapped for effective rooting depth (such as depth to mottling or lithic contact), horizon texture and color, and thickness of the A and B horizons. Following this, boundaries will be established for 11 1-acre (0.4 ha) treatment plots, 209 feet (64 m) on a side, in areas shown to be relatively uniform by the preliminary survey, and typical of the soil series of interest. Study site characteristics (see "Measurements") will be described within each plot before harvest. At harvest, all trees will be felled directionally so that boles or whole trees can be removed with minimal soil disturbance, but all felled materials will be left on the ground pending experimental treatments.

c. **Treatments** Nine treatment combinations of the following levels of organic matter removal and soil compaction will be assigned randomly to 9 of the 11 plots.

Organic Matter Removal

OM_0 Boles removed, only

OM_1 Boles and crowns removed

OM_2 Boles, crowns, and forest floor removed

Soil Compaction

C_0 No compaction

C_1 Intermediate compaction

C_2 Compaction to 80% of growth-limiting bulk density (Daddow and Warrington 1983) at 6 inches (15 cm)

Biomass will be removed soon after felling in the OM treatments in a way that minimizes soil disturbance. Crossing compaction treatments C_1 and C_2 with organic matter removal treatments OM_0 and OM_1 requires removing and storing surface organic matter before compaction, and replacing it afterward. The Principal Investigator will choose the most effective procedure for each site.

The two remaining plots are meant to test the efficacy of ameliorative treatments. One will receive a boles-only (OM_0) and no compaction (C_0) treatment. The other will have boles and crowns removed (OM_1) and moderate compaction (C_1). Each plot will be treated with a fertilizer mixture of all essential elements at a rate shown by research to promote tree growth. Soils also will be tilled on these two plots in the hope of improving physical properties. The purpose of the first ameliorative treatment (OM_0C_0+) is to examine the productivity potential after modifying existing soil constraints. The purpose of the second ameliorative treatment (OM_1C_1+) is to examine the

potential for restoring soil productivity if it is degraded by the central (and perhaps most operationally common) experimental treatment.

A possible treatment arrangement is shown in Figure 2. This cluster of 11 treatment plots will be separated from adjacent stands by an outer buffer strip at least 60-feet (18 m) wide. Other treatments may be installed, provided that they do not confound or alter the core treatment design. Plots will be monumented at each corner with permanent posts and described according to Curtis (1983). A standard weather station will be installed at each site to monitor air temperature, relative humidity, and precipitation. Wetfall and dryfall collectors are desirable as well to supplement national atmospheric deposition studies.

d. **Planting.** All treatment plots will be planted at a regular spacing with seedlings of the appropriate timber type and a mixture of the best available genetic stock. The aim is to meld superior growth with genetic diversity. Each treatment plot will be split in half, creating two subplots of 338 trees in 13 rows of 26 trees. A 198-tree measurement plot will be established from the third row of trees inward in each subplot, as shown in Fig. 3A, and trees will numbered consecutively with metal tags. Using herbicides, one subplot will be kept weed free. In the other subplot, regional vegetation will be allowed to grow with the trees--the aim being to establish complete vegetative cover as rapidly as site conditions permit. This creates a means for side-by-side comparisons of (1) stand productivity vs. total vegetative productivity; (2) the effect of competing vegetation on tree growth.

3. MEASUREMENTS

A core set of measurements must be taken at each installation, both pre- and post-harvest, in order to ensure comparability among sites. These are not meant to preclude other measurements. Breast-height diameters will be recorded for all trees in measurement subplots, and other measurements (height, volume, mass) will be recorded for a representative sample. Understory vegetation will be measured by line transect. Forest floor and soil sampling will occur at four positions around each grid point established at 20-foot (6 m) intervals within each measurement subplot, producing 21 grid points per subplot (Fig. 3B). These four "satellite" samples will be composited to produce a single sample per grid point. Measurements consist (but are not limited) to the following core items. Principal Investigators are encouraged to examine other variables and techniques as well. New leads should be shared rapidly with other researchers nationally.

a. Pre-Harvest. Overstory trees will measured before harvesting for breast-height diameter and total height. Understory vegetation will be measured for percent cover and subsampled for biomass and nutrient content. Woody residue masses and volumes will be measured by line transect. Mass and nutrient content of the forest floor will be estimated from composited subsamples at each 20-ft grid point interval. Soil profiles will be described from satellite samples at each grid point using standard taxonomic procedures (Soil Survey Staff 1975). Composited samples from each grid point will be analyzed for color, coarse fragment content, bulk density, pH, organic matter, exchangable cations, extractable P, and total N and S using standard procedures (Soil Survey Staff 1984, Page et al. 1982, Klute 1986).

b. Post-Harvest. Biomass and nutrient composition of crown and bole materials will be determined from a subsample of felled trees, and a stand history will be established through stem analysis. The following core measurements will be taken on composited samples at grid points in each subplot. These should be seen as minimum standards.

o Soil Data:

Soil bulk densities and soil strength will be measured at depths of 0 to 4 inches, 4 to 8 inches, and 8 to 12 inches (0-10, 10-20, and 20-30 cm) shortly after treatment and at 5-year intervals thereafter.

Soil color and chemical properties (discussed under "Pre-Harvest") will be measured by horizon in at 5-year intervals. Sampling intensity will be adjusted to achieve and maintain a precision of +/- 10 percent with 95-percent confidence.

Soil temperatures and matric potentials will be measured at 6-, 18-. and 30-inch (15, 46, and 76 cm) depths at 5 positions near dominant trees in each subplot. This will be done at the midpoint and near the end of the main growing season at 5-year intervals.

o Vegetation Data

Survival, height, diameter, and crown length of planted trees will be measured according to Curtis (1983) at the 1st, 3rd, and 5th year after planting, and at 5-year intervals thereafter. Height and

percent cover of other regional vegetation will be measured at the same intervals.

Cumulative standing biomass and leaf surface areas will be estimated at 5-year intervals for all vegetation through periodic biomass harvesting on small plots (perhaps in buffer strips), and regression.

Plant damage will be recorded at each measurement interval using PDMS tree classification codes (Curtis 1983).

Dry weight and nutrient content of current- and year-old, upper-crown foliage of trees and perennial understory vegetation. Collections will be made near the peak of the growing season at 5-year intervals.

Predawn and midday xylem moisture tension will be made at the midpoint and near the end of the main growing season for five dominant trees in each subplot at 5-year intervals. Timing and subplot position will match that for soil temperature and moisture measurements.

4. STATISTICAL ANALYSIS

A block of 11 core treatments repeated at 3 locations within each of 3 soil strata leads to a mixed-effects ANOVA model for a given forest type (Table 1). Orthogonal comparisons planned a priori appear in Table 2.

Nine combinations of organic matter removal and compaction treatments produces the following general regression model, given a minimum of three locations within three soil property strata:

$$Y_{ijk} = u + S_i + SL_{j(i)} + T_k + SxT_{ik} + SLxT_{j(i)k} + e$$

where Y = a response variable for a given forest type

S = a fixed soil stratification variable (such as texture), i = 1-3.

L = a random location effect (nested in S), j = 1-3.

T = a fixed treatment effect (org. matter x compaction), k = 1-9.

SxT = a fixed soil x treatment interaction

SLxT = a random soil x location x treatment interaction.

e = experimental error.

This serves as a general model for predicting the effects of changes in site organic matter and soil porosity on site productivity. Response variables include the soil and vegetation variables identified previously. Variables denoting "productivity" will be tree biomass or volume, or total vegetation biomass from "Trees-Only" or "Total Vegetation" subplots. Soil variables correlating well with productivity measures will be identified for use in operational monitoring.

5. IMPLEMENTATION

Once funding is approved, approximately 14 months would be needed to locate and install a series of study sites within a timber type. The first strong indication of long-term treatment effects would be expected by crown closure, or about 10 years after planting on average sites. A probable timeline is shown in Figure 4.

F. SUMMARY

The inherent capacity of forest land for sustaining vegetative growth is poorly researched. Yet, sustaining or enhancing this capacity is central to concepts of good land stewardship and sustained yield. Scattered findings do suggest that this inherent capacity can be degraded--chiefly through losses in site organic matter and soil porosity and their joint effects on key soil and site processes. The U.S. Forest Service has a legal and ethical responsiblity to sustain productivity on National Forest lands, and is setting soil quality standards for detecting and avoiding productivity losses. These standards often are based on professional judgement, rather than solid research. An opportunity and responsibility thus exists for the Forest Service to attack basic soil productivity questions and develop effective soil monitoring standards.

A major research and development program has begun in western, southern, and north-central regions of the U.S. to address this subject. A coordinated, cooperative long-term effort between research and administrative arms of the Forest Service is underway to examine the consequences of organic matter and soil porosity changes on soil processes and plant growth. Results from a common experimental design applied to a wide variety of sites across climatic boundaries will yield a common data base for broad-scale analyses. This effort is suggested as a model for similar investigations elsewhere.

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Table 1.--ANOVA showing expected mean squares for 11 treatments applied at 9 field locations (3 similar sites within low, medium, and high classes of soil properties).

Source of variation	Df	3 F i	3 R j	11 F k	Expected mean square	F test
Soil prop. i	2	0	3	11	$33v_S + 11v_{SL} + v_{err}$	S/SL
S x Location j(i)	6	1	1	11	$11v_{SL} + v_{err}$	cannot test
Treatment k	10	3	3	0	$9v_T + v_{SLxT} + v_{err}$	T/SLxT
S x T ik	18	0	3	0	$3v_{SxT} + v_{SLxT} + v_{err}$	SxT/SLxT
S x T j(i)k	60	1	1	0	$v_{SLxT} + v_{err}$	cannot test
Error 1(ijk)	0	1	1	1	v_{err}	
Total	96					

Table 2.--Orthogonal contrasts for testing the effects of organic matter removal, soil compaction, and ameliorative treatments on response variables of interest. Treatment codes are identified in Fig. 2.

Main effects test	H_o	Orthogonal coefficients for treatments--										
		1	1+	2	3	4	5	5+	6	7	8	9
Has level of organic matter any effect?	(1+4+7)/3 =	1/3	0	-1/3	0	1/3	-1/3	0	0	1/3	-1/3	0
	(2+5+8)/3 =	1/3	0	0	-1/3	1/3	0	0	-1/3	1/3	0	-1/3
	(3+5+9)/3	0	0	1/3	-1/3	0	1/3	0	-1/3	0	1/3	-1/3
Has level of compaction any effect?	(1+2+3)/3 =	1/3	0	1/3	1/3	-1/3	-1/3	0	-1/3	0	0	0
	(4+5+6)/3 =	1/3	0	1/3	1/3	0	0	0	0	-1/3	-1/3	-1/3
	(7+8+9)/3	0	0	0	0	1/3	1/3	0	1/3	-1/3	-1/3	-1/3
Is there an ameliorative effect?												
(A) Beyond inherent productivity	(1) = (1+)	1	-1	0	0	0	0	0	0	0	0	
(B) Where the soil has been altered	(5) = (5+)	0	0	0	0	0	1	-1	0	0	0	0

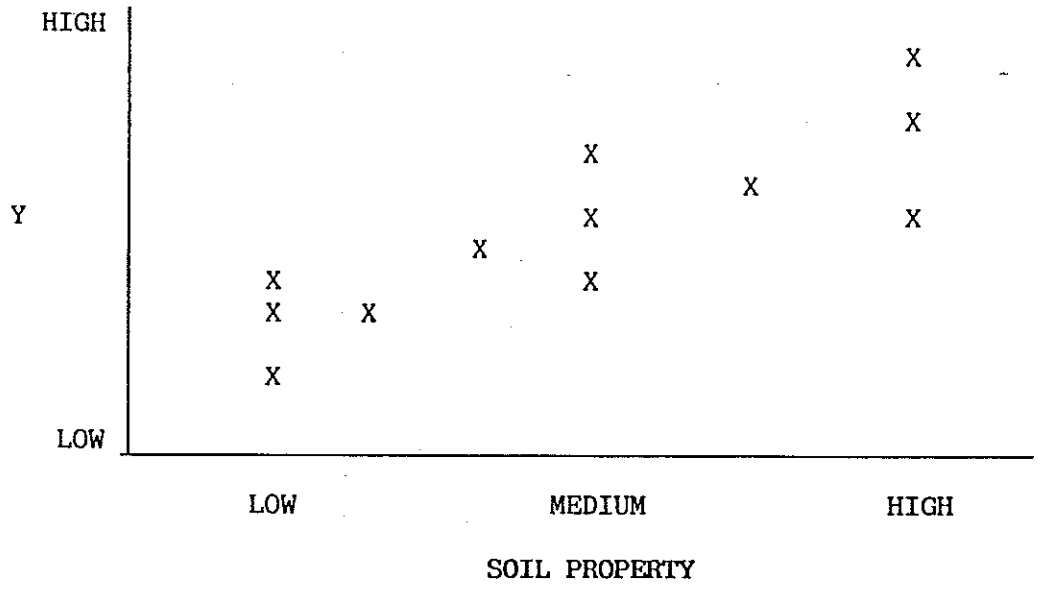


Figure 1.--Schematic positioning of 12 possible field installations (marked with "X") along a gradient in a physical soil property. The "Y" variable is a measure of productivity. Treatments are replicated three times at "Low," "Medium," and "High" positions along the soil property gradient.

ORGANIC MATTER REMOVAL

COMPACTION	OMO	OM1	OM_2
C_0	(1) OM_0C_0	(2) OM_1C_0	(3) OM_2C_0
C_1	(4) OM_0C_1	(5) OM_1C_1	(6) OM_2C_1
C_2	(7) OM_0C_2	(8) OM_1C_2	(9) OM_2C_2

AMELIORATION

(1+) OM_0C_0 +	(5+) OM_1C_1 +

Figure 2.--Generalized field layout of a 3 x 3 factorial arrangement of organic matter removal and compaction treatments, and two additional ameliorative treatments involving fertilization and tilling. Plots are 1-acre each.

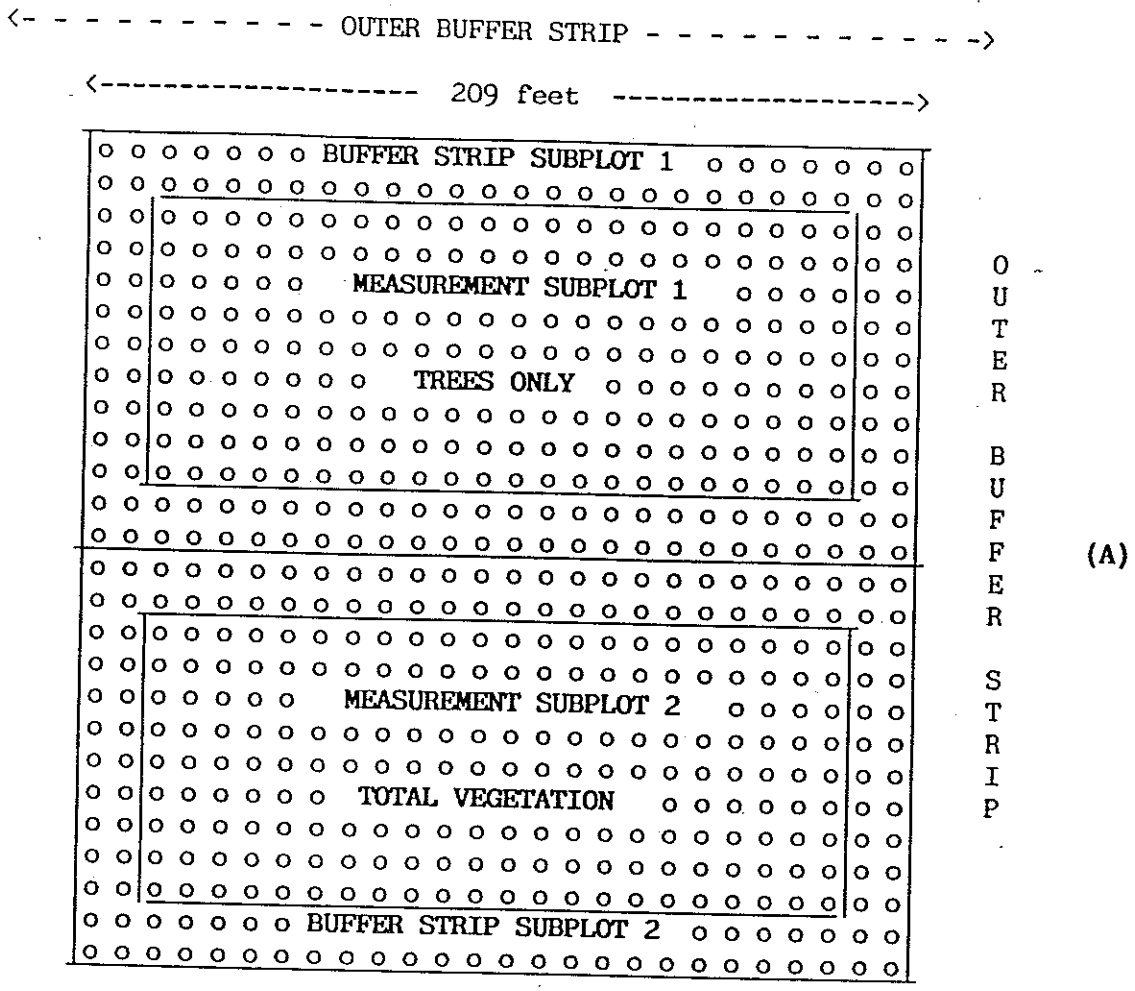
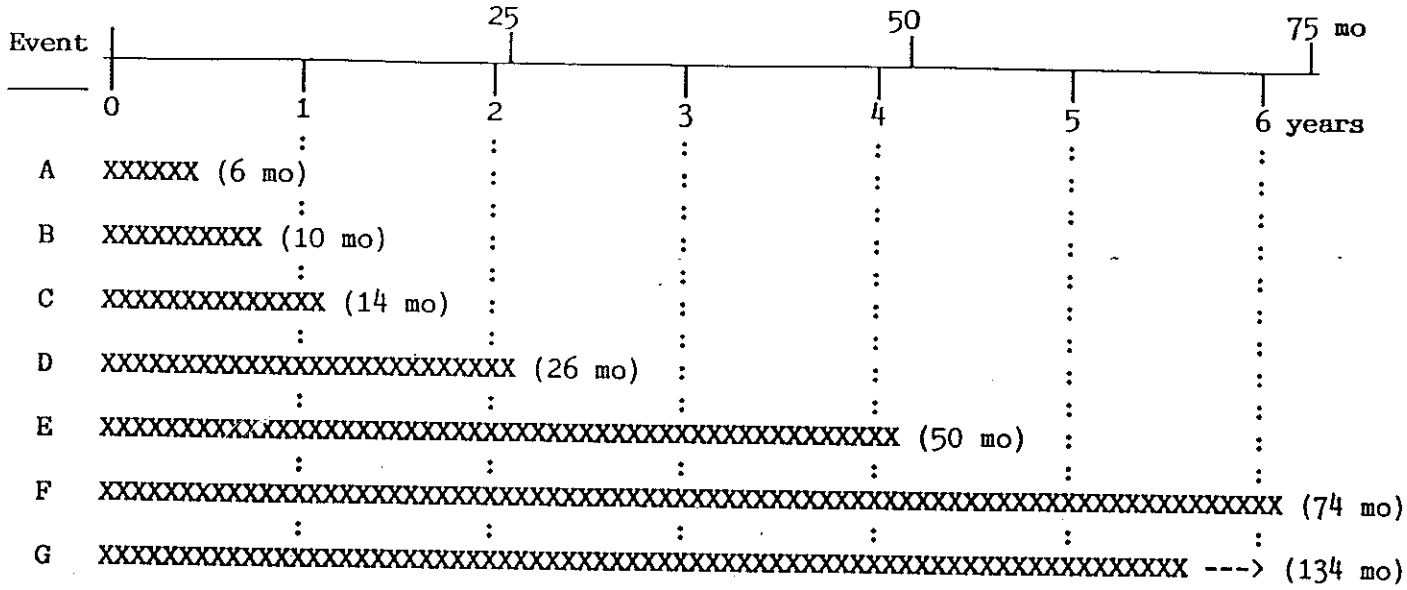


Figure 3.--(A) One-acre treatment plot and measurement subplot layout. Tree locations marked by "o." Each measurement subplot is bordered by two rows of buffer trees. (B) Measurement subplot showing location of grid sampling points ("X") spaced at 20-ft intervals, and satellite points for soil sampling ("*").



Event Codes:

A: Identify candidate study sites.

B: Select study sites, preliminary sampling, develop contracts and special provisions.

C: Harvest, install treatments, plant, collect initial measurements.

D: First main post-treatment measurements.

E: Second main post-treatment measurements.

F: Third main post-treatment measurements. First biomass measurements.

G: Fourth main post-treatment measurements. Second biomass measurements. (Probably the first valid indication of long-term productivity trends).

Figure 4.--Sequence and timeline for locating, installing, and measuring study plots. Plots would be thinned according to best management practices. Sampling would continue until rotation.

T. 2. #5

not started
- task
- no budget
- go ahead

FOOTHILLS FOREST ACTIVITY OUTLINE

Prepared by: Neil Holder

Title: Improve Operational Planning Standards

Working Group Coordinators: Terry Nilson

Activity Contact: Neil Holder

Activity Team Members:

Confirmed: Neil Holder, Dan Rooks
Potential: AFS, Weldwood Stump-to-Dump Contractor

Purpose

Improve operational planning standards guidelines and training programs as part of the total concept planning system.

End Results: **Goals and Objectives**

Planners and all Forest Resource Department staff understand planning process and expectations.

Planning process runs smoothly and efficiently with an improved turnaround time on approval process.

Government and public to understand and support planning process.

The objectives of the planning section are as follows:

- to promote good forest management
- integrated forest use
- maintenance and enhancement of fish and wildlife habitat.
- sequenced harvesting
- balanced cost
- progressive reforestation and reclamation of land disturbance.
- and to meet the Company's goal of a long-term economic wood supply.

Location

Methods

Continuation of Operational Planning Manual. Manual is a guideline and a defined timeline to be tried in this activity. Emphasize also it is not a substitute for experience or site specific judgement.

Visit other FMA holders within and outside province, to get different views and perspectives on Planning processes.

Links to other activities

Total planning concept should ensure we can plan cutblocks to preferred harvest systems.

Time-frame

Budget

Time spent on project will be contributed by existing staff.

Resources/Contributions

Cooperation of AFS and Company is essential.

Status

Activity 2

must be done

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell **Date:** November 22, 1992

Title: Newsletter

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members

Confirmed: Bob Udell, Rick Bonar
Potential: Alberta Forest Products Association
Forestry Canada
Alberta Forestry, Lands & Wildlife

Purpose

Produce a bi-monthly newsletter to inform partners, natural resource agencies, the Model Forest Network and the general public on activities and progress of Foothills Forest.

End Results: Goals and Objectives

This activity relates to Goal 22, objective 1 from the Foothills Forest proposal.

General Objectives:

a. Regular Reporting of Foothills Forest News (InForM)

- Projects and Activities
- People
- Partners
- Other Model Forests
- Staff

2 dpco

quarterly is most $16,000

8 pages too much

b. Public Information

As an educational/ informational medium to inform the public of the purpose and progress of Foothills Forest.

Methods

The newsletter will be produced every second month throughout the project, and receive wide distribution to partners, the Model Forest Network, local and Provincial media and interested members of the public.

Activity 5

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell **Date:** November 22, 1992

Title: Major Signs and Brochures

Working Group Coordinator: Ross Risvold

#5,000

Activity Content: Bob Udell

Activity Team Members:

Confirmed: Bob Udell, Ross Risvold

Potential:
Alberta Forest Products Association
Switzer Provincial Park
Cardinal River Coal
Gregg River Resources
Luscar Sterco Coal

Purpose:

Place major signs along numbered highways entering Foothills Forest, supported by interpretive signs, pullouts and brochures.

End Results: Goals and Objectives

This activity relates to Goal 22, objective 1 from the Foothills Forest proposal.

General Objectives:

a. Public Awareness of Foothills Forest:
   - Natural Features
   - History
   - Resource Industries
   - Geology
   - Forest Resources
   - Reforestation
   - Recreation
   - Model Forest Activities

b. Develop Tourism Potential of Foothills Forest
   - Maps and interpretive features
   - Watchable Wildlife
   - Camping
   - Self-guided Tours

Location:

Signs to be placed on Highways 16, 40 and 47. Interpretive pullouts where appropriate.

Links to Other Activities:

This activity has links to the programs and activities of many agencies and cooperators contained within Foothills Forest.

Time Frame:

Signs will be placed in 1993. Pullouts and tour packages 1993-97.

Activity 7

(3)

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell Date: November 22, 1992

Title: Develop Interactive Computer Models

Working Group Coordinator: Ross Risvold

Activity Content: Ross Risvold

Activity Team Members:

Confirmed: Ross Risvold

Potential:
Alberta Forest Products Association
Travel Alberta
Evergreen Tourist Association
Yellowhead Highway Association
Switzer Provincial Park
Cardinal River Coal
Gregg River Resources
Luscar Sterco Coal
Parks Canada

Purpose:

Develop interactive computer models to provide information on integrated resource management principles and activities, tour opportunities and features for public information and tourism purposes.

End Results: Goals and Objectives

This activity relates to Goal 22, objective 1 from the Foothills Forest proposal.

General Objectives:

Technology Development
- Develop the computer models for such programs
- Use existing computer technology, modified for this project

Public Information
- What natural resource industries are in the area?
- What do they contribute to local/ regional/ provincial/ national economies?

Public Education
- History of the area
- Integrated resource management principles
- Principle of Sustainable Development as expressed in Foothills Forest activities
- Forestry practices and Forest Care principles

Tourism

What features are of interest in tours?
How do you find them?

Location:

Major tourist sites, e.g. Tourist Information Bureaus, major hotels
Available for tourist shows
Forest Technology School

Methods:

The computer models will respond to queries or present quizzes to the user. Similar approaches are used at the National Science Centre, Ontario Science Centre. The potential of this tool as a means of attracting and informing tourism is recognized, but not well developed.

Links to Other Activities:

This Activity has strong links to the development of tour packages for Foothills Forest, also to most of the other projects and activities.

Time Frame:

Undefined, funding dependant.

Activity 9

(3)

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell Date: November 22, 1992

Title: Annual Report

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members:

$5,000

Confirmed: Board of Foothills Forest
Project Steering Committee
Partners Advisory Committee

Purpose:

Produce and distribute an annual report of Foothills Forest activities and progress.

End Results: Goals and Objectives

This activity relates to Goal 23, objective 1 from the Foothills Forest proposal.

General Objectives:

Public Information
Provide information to the public on Foothills Forest activities

Forestry Canada
An annual report is a condition of the Agreement with Forestry Canada

Partners
The annual report will provide a capsule summary of activities and accomplishments the previous year.

Methods:
Reports on activities will be prepared by the Project Steering Committee project coordinators, based on discussion and documentation of activity leaders. The financial accountability will be reported by the Administrator/Coordinator and Treasurer of Foothills Forest. The President and Chairman of the Board will report on overall progress and issues.

Links to Other Activities:
All activities will feed information to the annual report.

Activity 10

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell Date: November 22, 1992

Title: Develop and Implement an Environmental Audit Process

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

$10,000

Activity Team Members

Confirmed: Bob Udell, Ross Risvold

Potential: Alberta Forest Products Association
Ernst and Young
Lake Abitibi Model Forest

Purpose:

Develop and implement a prototype environmental audit on Foothills Forest.

End Results: Goals and Objectives

This activity relates to Goal 23, objective 2 from the Foothills Forest proposal.

General Objectives:

Improve Forest Practices
Develop an annual audit which examines activities, issues addressed, and recommendations for adjustments to forest practices.

Public Information
Provide information to the public on resource stewardship in Foothills Forest activities.

Time Frame
Start 1993, first audit 1994

Activity 11

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell **Date:** November 22, 1992

Title: Open Houses

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members:

Confirmed: Bob Udell, Ross Risvold

Potential: Project Steering Committee
Partners Advisory Committee
Forestry Canada
Model Forest Network

Purpose:

Hold open houses annually in local communities to inform the public of activities and results of Foothills Forest, including the Annual Report.

End Results: Goals and Objectives

This activity relates to Goal 23, objective 3 from the Foothills Forest proposal.

General Objectives:

Public Information
Provide information to the public on Foothills Forest activities

Location:
Community centres or shopping malls in Hinton, Edson, Grande Cache and Jasper

Links to Other Activities:
Has links to all Foothills Forest Activities and projects, as well as the National Program.

Time Frame:
Annually

Approved 93/94
No Foothills Forest
Money

#15,16,17

Foothills Forest Activity Outline

Prepared by: Ross Risvold **Date:** November 17, 1992

Title: (Generic) International Technology Transfer
- Revegetation and Reforestation
- Sustainable Forest Practises
- Integrated Forest Management Practises

Working Group Coordinator: Ross Risvold

Activity Contact: Ross Risvold

Activity Team Members: Technology Transfer Specialist

Confirmed: - Ross Risvold

Potential:
- CIDA
- World Bank
- Other agencies as required

Purpose:

To provide expertise and training to other countries of the world.

End Results:

Related to goal 16, pg. 16 of the Foothills Forest Proposal.

Methods:

This will be accomplished through partnership with individuals, agencies and companies who have the expertise required to complete the projects agreed to by the Foothills Forest and recipient nations.

Links to other Activities:

Technology transfer projects will utilize new techniques and innovations that have relevance to the resource management field in the recipient countries.

Time Frame:

It is expected that proposals for international technology transfer projects will commence in January of 1993.

Budget:

Not available at this time. The Foothills Forest has partners who will provide funding for the generic projects listed.

Resources/Contributions

Planning for the projects will be provided by various Foothill Forest partners. Funding for implementation of the projects will be provided by appropriate agencies involved in international development. The potential of contributions is high.

Status:

Specific starter study proposals will begin in January of 1993.

Activity 3

must be done

just a task

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell

Title: Tour Development

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members:

Confirmed: Bob Udell, Ross Risvold

Potential:
Alberta Forest Products Association
Travel Alberta
Evergreen Tourist Association
Yellowhead Highway Association
Switzer Provincial Park
Cardinal River Coal
Gregg River Resources
Luscar Sterco Coal
Harry Collinge High School

to be no budget for 92/93

Purpose:

Develop a tour package which is of interest to the general public, and students. The tours will highlight many of the forest landbase values which are considered in the management of the landscape contained within Foothills Forest.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest Proposal: Goal 22 - Objective 1

General Objectives:

a. Public Awareness of Foothills Forest:
   - Natural Features
   - History
   - Resource Industries
   - Geology
   - Forest Resources
   - Reforestation
   - Recreation
   - Model Forest Activities

b. Develop Tourism Potential of Foothills Forest
   - Self-Guided Driving tours
   - Watchable Wildlife
   - Camping
   - Guided Industrial Tours

Location:

Tour packages will generally focus on the main travel corridors west and south of Hinton, as far south as Mountain Park and north to Robb, back to Hinton along the Robb Road.

Methods:

Catalogue features of interest; develop text and photos; enlist cooperators; design tours; develop brochures; advertise and promote. School tours and accommodations offered through the Forest Technology School.

Links to Other Activities:

Tours will include the demonstration projects as part of the interpretive program.

Time Frame:

Start winter of 1992-93 with the gathering and cataloguing of information. Continue throughout the five year term with the production of various brochures and packages.

Activity 4

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell **Date:** November 22, 1992

Title: Speakers' Bureau

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members:

Confirmed: Bob Udell, Ross Risvold

Potential: Individuals from all partner organizations

Purpose:

Provide support for a speakers' bureau comprising foresters, biologists, scientists and others involved in Foothills Forest projects for presentations to public groups, schools, etc.

End Results: Goals and Objectives

This activity relates to Goal 22, objective 1 from the Foothills Forest proposal.

Time Frame:

Ongoing

- no budget
- funding areas

Foothills Forest Activity Outline

Prepared by: Date:

Title:

Working Group Coordinator:

Activity Contact:

Activity Team Members:

Confirmed:

Potential:

Purpose:

End Results: Goals and Objectives:

Location:

Methods:

Links to Other Activities:

Time Frame:

Budget:

Resources/Contributions:

Status:

Foothills Forest Activity Outline
Table of Contents

Prepared by: **Date:**

Title. Brief (one-line maximum) title to be used in activity tracking system.

Working Group Coordinator. PSC member responsible for coordinating this activity.

Activity Contact. Name of interim contact - individual responsible for preparation of Activity Outline.

Activity Team Members. This is an open list - members can be added or dropped at any time. Provide a list of confirmed, temporary, and potential members, at least to organization level. Names would be better.

Purpose. Why are we doing this activity? In order to...

End Results: Goals and Objectives. How does the activity relate to the overall vision of the Foothills Forest? Link this activity to the goals and objectives (Pages 13-18) in the Foothills Forest Proposal, by referring to the specific goal and objective by number. Goals are general statements that describe a desired state or condition. Objectives are clear, specific, statements of expected quantifiable results, related to goals, to be achieved within a specific time period. Propose additions and changes to those statements if appropriate. List goal and objective statements, including short-term objectives/results.

Location. Where will the activity take place?

Methods. Briefly describe how the activity will be undertaken. Include a description of manpower: existing partner staff, model forest staff, temporary hire, volunteer, grad student, contract, etc.

Links to other activities. Is the activity critical to the success of other activities? Describe how, where, and when it links to other activities. What evaluation criteria could be used to judge the success of the activity?

Time-frame. Estimate time required by year, including start and end dates, critical path, and milestones. What is the probability of accomplishment within the Foothills Forest program? Does initiation/completion of this activity depend on other activities?

Budget. Activity budget broken down by year and source. Indicate opportunities to down-size budget and still accomplish goals and objectives. What is the minimum budget required (below this the activity would be dropped)?

Resources/Contributions. List currently available resources/information and needed resources/information required to undertake activity. This should include manpower, equipment, data, etc. Identify confirmed and potential contributions from partners, including category (in-kind, money, leverage potential) and amount. The likelihood of potential contributions should be rated as low, medium, or high.

Status. Describe current status of the activity. Be as specific as possible.

Elk Study
Foothills Forest Activity Outline

Prepared by: Rick Bonar **Date:** November 4, 1992

Title Elk study.

Working Group Coordinator Rick Bonar/Kirby Smith.

Activity Contact Rick Bonar.

Activity Team Members

Confirmed: Rick Bonar, Kirby Smith.
Potential: Model Forest Biologist, Rocky Mountain Elk Foundation, Wildlife Habitat Canada, Canadian Wildlife Federation, Canadian Wildlife Service, University of Alberta, graduate students.

Purpose

Improve management of elk and elk habitat by getting better understandings of elk ecology in forested habitat in relation to various disturbances and impacts.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest proposal: Goal 3 - Objectives 3,5,7; Goal 4 - Objectives 5-8; Goal 19 - Objectives 2-3.

General objectives:

Movements
- Home range, annual and seasonal
- Migrations
- Movements between food and cover habitats
- Response to disturbance (logging operations, roads, ATV, hunting, other)
- Response to environmental factors (temperature, snow, etc) on both seasonal and daily basis

Habitat Use
- Test preliminary Habitat Suitability Index model
- Use/importance of various habitats during all seasons (eg winter, spring, summer) and life stages (eg calving, rut)

Response to habitat changes
- Winter range habitat improvement

Populations/Demographics
- Population changes
- Immigration/Emigration
- Mortality/Survival
- Age/sex structure

Integrated Habitat/Population model
- Develop conceptual model
- Test using habitat/population data

Location

Elk will be captured and fitted with transmitters in the Athabasca Mixedwood Demonstration Project area, which covers the south-facing slopes of the Athabasca Valley from approximately Hinton to the Obed Mine road.

Methods

Capture elk in pen-traps or by helicopter during winter and attach radio-transmitters. Re-locate study animals using ground triangulation. First-year capture and relocation will be done through a short-term hire of a biological technician. Longer-term work will be done through one or more graduate students. The temporary position and associated start-up costs are identified in the 1992/93 work plan. We hope to eventually have all aspects of the study transferred to two or more graduate students.

Links to other activities

The elk study links to:

1. The Athabasca Mixedwood Demonstration Project, which is designed partly to assess the impacts of timber harvesting on elk and elk habitat.
2. Evaluation of habitat models and testing of the habitat supply analysis module of the Foothills Forest DSS.
3. Several technology transfer and public information components: elk are a high-profile species and the study area is easily accessed from Hinton.

Evaluation of habitat models and impacts of timber harvesting are essential to the credibility of DSS initiatives and proposals for management alternatives. The end results will include a revised habitat model, revised guidelines form elk winter range habitat management, elk population management, and a better understanding of elk ecology in foothills/boreal forest habitats.

Time-frame

The study will start in the winter of 92-93 with capture of elk and preparation of a detailed research proposal. Elk will be monitored during the planning stages of the Athabasca Mixedwood Demonstration Project to obtain before-treatment ecological information. The short-term impacts of harvesting and silviculture activities on elk will be assessed in years 2-5. This will extend to the end of the Foothills Forest project, but the study will serve as the basis for a long-term monitoring program to continue assessing elk responses. The elk study must be started this winter because winter is the easiest time to capture elk, and we need at least a year of pre-treatment monitoring before the Demonstration Project starts. Evaluation of the elk habitat model is required by approximately year 3 to improve the reliability of its use in the DSS habitat supply analysis module.

Budget

ITEM	92/93	93/94	94/95	95/96	96/97	TOTAL
Transmitters	8,000	4,000	4,000	4,000		20,000
Receiver	1,500	1,500				3,000
Elk capture	12,000	2,500	2,500	2,500		19,500
Technician	12,000					12,000
Graduate Students		18,000	36,000	36,000	36,000	126,000
Vehicle/ATV	3,500	8,400	8,400	8,400	8,400	37,100
Miscellaneous	$1,000	2,000	2,000	2,000	2,000	9,000
TOTAL	38,000	36,400	52,900	52,900	46,400	226,600.00

The budget and study could be down-sized by reducing the number of graduate students from two to one or by paying them less than $1500/mo. We may also be able to make more use of volunteer labour and existing staff.

Resources/Contributions

We have one receiver that needs servicing and 5 used transmitters that may be re-furbished into elk transmitters at approximately half the cost of a new transmitter. The Fish and Wildlife Division has an elk pen trap that we can use. ATVs may be available at cost from Fish and Wildlife and Weldwood. Contributions of volunteer labour may be available from Forest Technology School students and other interested groups.

Potential sources of funding include the Rocky Mountain Elk Foundation (high), the Canadian Wildlife Service (medium), Wildlife Habitat Canada (medium), the Fish and Wildlife Habitat Trust Fund (medium), Buck For Wildlife (medium), and the Alberta Recreation, Parks, and Wildlife Foundation (medium). Graduate students may also be eligible for research grants and other funding mechanisms (medium). There are no confirmed contributions other than the $38,000 of Foothills Forest support for the 92/93 year.

Status

This activity has been submitted for Board of Director approval as part of the 92/93 work plan. As soon as approval is received, we will proceed with ordering transmitters, hiring the temporary technician, and developing a more detailed research plan. Elk capture will begin in early winter and continue until spring or until 20 animals are captured.

Suggested process for evaluating graduate student projects to be done under the model forest programme.

Candidate submits the following:

1 Project statement outlining project and expected results

2 Project description containing:

a) How project is relevant to existing activities by filling information gaps, providing useful tools (eg computer models) or addressing related questions.

b) How project addresses new activities that were not included in original proposal, but should be because of their value. Ideally they should address some facet of an activity not considered.

3 Letter of confirmation from University showing that the candidate is registered at a University and is not under suspension in any way.

4 A letter outlining support for the candidate, the likelihood of timely project or thesis completion and any previous related experience from either:

a) the candidate's thesis committee or supervisors
b) previous employers

5 Work plan for the duration of the project clearly outlining objectives, sampling methods and proposed analysis and project timelines and milestones

6. List identifying other sources of money and possibility of leverage.

Once all the information is received the project steering committee reviews work plan, merit of project relative to overall model forest objective and specific project goals and activity objectives, letters of reference and status with university. Attention is directed to the sampling methods to ensure that they are solid and sound. The possibility of using the model forest money to leverage other funding sources is examined too. A recommendation of acceptance/rejection is made to the Board of Directors for approval.

If accepted then the following conditions must apply:

Twice yearly reports are to be submitted outlining progress to date relative to original work plan, rationale for deviations and any subsequent modifications to remainder of work plan.

A data sharing agreement and publication and tech transfer agreement are to be signed once the project is approved and before work commences.

Suggested process for evaluating unsolicited activities or projects to be done under the model forest programme.

Proponent submits the following:

1 Project statement outlining project and expected results

2 Project description describing

a) How project is relevant to existing activities by filling information gaps, providing useful tools (eq computer models) of addressing related questions.

b) How project addresses new activities that were not included in original proposal, but should be because of their value. Ideally they should address some facet of an activity not considered.

3 A letter of reference outlining previous experience.

4 Work plan for the duration of the project clearly outlining objectives, sampling methods and proposed analysis and project timelines and milestones.

Once all the information is received the project steering committee reviews work plan, merit of project relative to overall model forest objective and specific project goals and activity objectives and references and recommends acceptance/rejection to Board of Directors for approval.

If project is accepted then it would be placed in the appropriate working group and be required to follow the Foothills Forest reporting requirements and organizational structure. A data sharing agreement and publication and tech transfer agreement are to be signed as well.

Any publications would make reference to the Foothills Forest corporation, model forest programme and be required to meet the relevant Forestry Canada requirements.

Annual reports outlining progress to date relative to original work plan, rational for deviations and any subsequent modifications to remainder of work plan.

FORESTRY DEVELOPMENT IN ALBERTA

Over the past two years the Government of Alberta has announced the creation of eight new forestry development projects. These projects include expansion of existing facilities at Hinton and Grande Prairie, development of new pulp mills at Athabasca, Peace River, Slave Lake, and Whitecourt and other wood processing plants in Lac La Biche and Manning. These announcements have met with strong resistance from environmental groups and the general public. Much of the concern expressed by these groups has centered on whether there is a need for expansion of the forest sector. These groups have also questioned the environmental impacts of these projects as well as current forest management practices. In light of these criticisms, it is appropriate that the ROCKY MOUNTAIN SECTION of the Canadian Institute of Forestry, an organization of individuals concerned with the management of forest resources, state it's position on the need for forest development and appropriate forest management practices.

BACKGROUND

Timber has historically been a major factor in the settlement and development of Canada and the importance of forestry and forest products has not diminished over time. Half of the total land area of Canada and three-quarters of the land in the ten provinces is forested. Sixty percent of this forest land is considered capable of producing forest crops. The value of forest products in 1987 was approximately $38 billion

- the second highest manufacturing sector in Canada. In 1987 the value of forest products exports was $20.9 billion - the highest in Canada. Forest products provided a net balance of trade of $18.3 billion. In 1985, approximately 840,000 people were either directly or indirectly employed by the forest sector (7.4% of the Canadian workforce).

Although forestry is a major component of Alberta's economy, it does not enjoy the level of importance afforded forestry in many other parts of Canada. 33.2 million hectares of Alberta is considered to be forest land, with 19.9 million hectares of land capable of producing a forest crop (AFS Timber Management Statistics). 18.6 million hectares of the forest land base has been designated under Forest Management Agreement to be under sustained yield management (this would include land that is capable of producing forest crops and land that cannot produce forest crops such as wetlands). Approximately 94.5% of the total annual allowable cut has thus been committed and designated or is under negotiation for future development.

Of the forest land base, at least 10 percent has been protected from development through legislation or reservation. This includes prime recreation areas, bird and wildlife sanctuaries, ecological reserves, wilderness areas, parks, and natural areas.

SUSTAINABLE DEVELOPMENT

The ROCKY MOUNTAIN SECTION SUPPORTS FOREST LAND MANAGEMENT WITHIN THE CONTEXT OF SUSTAINABLE DEVELOPMENT, as presented in the Bruntland Report, 'Our Common Future' (World Commission on Environment and Development). The World Commission has called for economic growth that is based on the principle of sustainable development. Under this concept, development

must be based on economic and environmental considerations in such a manner that the needs of present generations can be met without compromising the ability of the environment to meet the needs of future generations. The Canadian Institute of Forestry has stated that: "....environmental degradation must be stopped and that we must begin to manage environmental resources to ensure both sustainable human progress and survival of the global ecosystem."

INTEGRATED RESOURCE MANAGEMENT

THE ROCKY MOUNTAIN SECTION SUPPORTS THE CONCEPT OF INTEGRATED RESOURCE MANAGEMENT. Forests sustain a variety of resources including timber, wildlife, water, forage, recreation, and aesthetics. Forest land management must occur in a manner that is consistent with conservation and the need to sustain all resources. Timber management practices that minimize the impacts of timber harvesting on other resources and uses of forest land should be employed. Every effort should be made to search for practices that complement the conservation and production of all resources.

CURRENT CONCERNS

Land Use Decisions

Forests are a heritage that demand sound and integrated management. The most complete use must be made of the forests to ensure that a wider range of needs are met. However, not every use MUST be accommodated on every piece of land in order to achieve sound integrated management. When land use decisions are not made initially, it is difficult to plan for sustained development. Rules for management must be identified upfront

before major committments are made. Through the integrated resource planning process, public lands are assessed for potential resource uses and land use allocation decisions made. It is imperative that integrated planning be completed for all public lands in the province. This will clearly and openly identify the land base available for sustained management and, in particular, timber development.

TIMBER HARVESTING PRACTICES

Although the knowledge and understanding of timber management practices change with the passage of time and the rapid advancement of technologies, forest managers must continually search for new and improved ways of harvesting timber. Increasing demands on the forest land base have identified the need for flexible and accommodating timber management systems. Timber harvesting practices must be compatible with the ecological requirements of the species and other land uses to ensure sustained environmental management. The ecological needs of Alberta tree species are most closely met by the practice of clear cutting. However, implementation of options such as multiple cuts, smaller blocks, and variable shaped blocks can minimize the impacts of timber harvesting to a point where it is acceptable or even beneficial to other resources. Forest managers must continually strive to develop new practices and technologies to ensure sustainable development opportunities for all resources.

In conclusion, the Rocky Mountain Section, supports the planned development of Alberta's forests. Integrated management of forest land will ensure achievement of sustainable development for all environmental resources. The committment of resources, through sustained development

and effective management practices will result in a necessary balance between progress and survival.

Foothills Forest Activity Outline

Prepared by: Ross Risvold Date: January 4, 1993

Title: **Development of an Ecotourism Product for the Foothills Forest**

Working Group Coordinator: Ross Risvold
Pat Golec

Activity Contact: Pat Golec

Activity Team Members: Ross Risvold
Pat Golec
Dr. Rich Revel, University of Calgary

Confirmed: Alberta Tourism

Potential: Hinton Good Companions
Jasper National Park
Evergreen Country Tourism Council
Yellowhead Highway Association

Purpose:

Development of an ecotourism product for the Foothills Forest which will illustrate the potential for establishing a tourism industry based on wildlife viewing opportunities and habitat interpretation.

End Results: Goals and Objectives

This activity relates to Goal 6, Goal 7/Objective 3 and Goal 8/Objectives 3 and 4 of the Foothills Forest Proposal.

General Objectives:

Development of an international-calibre tourism generator using criteria established by Alberta Tourism, the Western Diversification Office and the Activity Team.

Promotion of the demonstration projects (e.g. elk study) and existing resource management practices in the Foothills Forest region.

Establishment of an ecotourism product at the Cache Percotte Forest involving the Hinton Good Companions which will allow people to view and learn about resource management.

Development of a means for measuring the economic benefit of ecotourism in the Foothills Forest Region.

Identification of opportunities for cooperating with Jasper National Park in ecotourism and public information initiatives.

Preparation of field guides for client groups e.g. watchable wildlife component during spring and fall seasons. These have the highest probability of success and help the area during shoulder seasons.

Preparation of an auto-touring package, possibly with a cassette tape, which would interpret the natural features and resource management activities adjacent to roadways.

A review of the available literature related to the development of ecotourism products and assessment of their economic impacts.

Location:

Foothills Forest
Consideration will also be given to including Jasper National Park and trans-border concerns.

Methods:

The Faculty of Environmental Design of the University of Calgary has expertise in ecotourism, land use planning and resource management. These skills will be used to develop a product which can be utilized by the Foothills Forest.

Links to Other Activities:

One of the purposes of the project is to link activities (e.g. elk study) which are appropriate to the development of an ecotourism product. The development of this project is critical for disseminating information to the public.

Time Frame:

1 to 1½ years
This activity will begin very shortly after approval.

Budget:

Item	1992/93	1993/94	1994/95
Travel & Expenses		$ 1,000	$ 500
Graduate Student	$ 2,000	12,000	3,000
Development of Prototype		1,000	
Room & Board at F.T.S.	800	5,000	1,000
Vehicle provided by F.T.S.			
Publishing, tapes		1,000	1,000
Total	$ 2,800	$ 20,000	$ 5,500

Resources/Contributions:

Maggie Ellen has a MSc in Geology and is now completing a Master's degree in environmental science at the University of Calgary.

The Deputy Minister of Alberta Tourism has committed staff to help in the development of criteria which will result in successful ecotourism products.

The Hinton Good Companions have offered to assist in the development of the products.

There may be an opportunity for others such as the Town of Hinton and the Improvement District of Yellowhead No. 14 to contribute.

Status:

The graduate student is ready to start this project on approval.

Municipalities will be approached if the activity is approved by the Foothills Forest.

COMPANY	LOCATION	PROJECT DESCRIPTION	PROJECT COST
Daishowa Canada Co. Ltd.	Peace River	Greenfield bleached kraft pulp mill	$ 500 MM
Weldwood of Canada Ltd.	Hinton	Double capacity of bleached kraft pulp mill and build new sawmill	$ 443 MM
Alberta Newsprint Co. Ltd.	Whitecourt	Build CTMP/newsprint mill	$ 360 MM
Millar Western Pulp Ltd.	Whitecourt	Build CTMP mill	$204.5 MM
Sunpine Forest Prod. Ltd.	Rocky Mountain House	Build sawmill complex and fibreboard plant	$ 32.5 MM
Alberta-Pacific Forest Ind. Ltd.	Athabasca	Greenfield bleached kraft pulp mill and paper mill	$ 1300 MM
Alberta Energy Co. Ltd.	Slave Lake	Build CTMP mill	$168.4 MM
Northem Forest Ind. Ltd.	Lac La Biche	Sawmill using aspen	$ 16 MM
Procter & Gamble Cellulose Ltd.	Grande Prairie	Expand bleached kraft pulpmill	$ 365 MM
		Build new sawmill	$ 35 MM
		Total	$3.424 MM

TELECOPIER TRANSMITTAL
FROM
WELDWOOD OF CANADA LIMITED
Hinton Division
Forest Resources Department
Hinton, Alberta, Canada

TO: PAT GOLEC,
FOOTHILLS FOREST
C/O FTS
865-8266

DATE: JAN. 5, 1993

FROM: BOB UDELL
PHONE NO.: (403) 865-8181
OUR FACSIMILE NUMBER IS
403-865-8164 (AUTOMATIC)

NUMBER OF PAGES (INCLUDING THIS COVER SHEET) 13

MESSAGE: Attached are the public information program activity outlines I did for Foothills Forest. These appear to be similar to those you are working on, and could save you some time.

I can give you a diskette with these on if you drop down.

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell

Title: Tour Development

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members:

Confirmed: Bob Udell, Ross Risvold

Potential: Alberta Forest Products Association
Travel Alberta
Evergreen Tourist Association
Yellowhead Highway Association
Switzer Provincial Park
Cardinal River Coal
Gregg River Resources
Luscar Sterco Coal
Harry Collinge High School
Hinton Good Companions

Purpose:

Develop a tour package which is of interest to the general public, and students. The tours will highlight many of the forest landbase values which are considered in the management of the landscape contained within Foothills Forest.

End Results: Goals and Objectives

This activity relates to the following goals/objectives from the Foothills Forest Proposal: Goal 22 - Objective 1

General Objectives:

a. Public Awareness of Foothills Forest:
   - Natural Features
   - History
   - Resource Industries
   - Geology
   - Forest Resources
   - Reforestation
   - Recreation
   - Model Forest Activities

b. Develop Tourism Potential of Foothills Forest
   - Self-Guided Driving tours
   - Watchable Wildlife
   - Camping
   - Guided Industrial Tours

Location:

Tour packages will generally focus on the main travel corridors west and south of Hinton, as far south as Mountain Park and north to Robb, back to Hinton along the Robb Road.

Methods:

Catalogue features of interest; develop text and photos; enlist cooperators; design tours; develop brochures; advertise and promote. School tours and accommodations offered through the Forest Technology School.

Links to Other Activities:

Tours will include the demonstration projects as part of the interpretive program.

Time Frame:

Start winter of 1992-93 with the gathering and cataloguing of information. Continue throughout the five year term with the production of various brochures and packages.

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell Date: November 22, 1992

Title: Newsletter

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members

Confirmed: Bob Udell, Rick Bonar
Potential: Alberta Forest Products Association
Forestry Canada
Alberta Forestry, Lands & Wildlife

Purpose

Produce a bi-monthly newsletter to inform partners, natural resource agencies, the Model Forest Network and the general public on activities and progress of Foothills Forest.

End Results: Goals and Objectives

This activity relates to Goal 22, objective 1 from the Foothills Forest proposal.

General Objectives:

a. Regular Reporting of Foothills Forest News (InForM)

Projects and Activities
People
Partners
Other Model Forests
Staff

b. Public Information

As an educational/ informational medium to inform the public of the purpose and progress of Foothills Forest.

Methods

The newsletter will be produced every second month throughout the project, and receive wide distribution to partners, the Model Forest Network, local and Provincial media and interested members of the public.

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell **Date:** November 22, 1992

Title: Speakers' Bureau

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members:

Confirmed: Bob Udell, Ross Risvold

Potential: Individuals from all partner organizations

Purpose:

Provide support for a speakers' bureau comprising foresters, biologists, scientists and others involved in Foothills Forest projects for presentations to public groups, schools, etc.

End Results: **Goals and Objectives**

This activity relates to Goal 22, objective 1 from the Foothills Forest proposal.

Time Frame:

Ongoing

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell **Date:** November 22, 1992

Title: Develop Interactive Computer Models

Working Group Coordinator: Ross Risvold

Activity Content: Ross Risvold

Activity Team Members:

Confirmed: Ross Risvold

Potential: Alberta Forest Products Association
Travel Alberta
Evergreen Tourist Association
Yellowhead Highway Association
Switzer Provincial Park
Cardinal River Coal
Gregg River Resources
Luscar Sterco Coal
Parks Canada

Purpose:

Develop interactive computer models to provide information on integrated resource management principles and activities, tour opportunities and features for public information and tourism purposes.

End Results: Goals and Objectives

This activity relates to Goal 22, objective 1 from the Foothills Forest proposal.

General Objectives:

Technology Development
- Develop the computer models for such programs
- Use existing computer technology, modified for this project

Public Information
- What natural resource industries are in the area?
- What do they contribute to local/ regional/ provincial/ national economies?

Public Education
- History of the area
- Integrated resource management principles
- Principle of Sustainable Development as expressed in Foothills Forest activities
- Forestry practices and Forest Care principles

Tourism
- What features are of interest in tours?
- How do you find them?

Location:

- Major tourist sites, e.g. Tourist Information Bureaus, major hotels
- Available for tourist shows
- Forest Technology School

Methods:

The computer models will respond to queries or present quizzes to the user. Similar approaches are used at the National Science Centre, Ontario Science Centre. The potential of this tool as a means of attracting and informing tourism is recognized, but not well developed.

Links to Other Activities:

This Activity has strong links to the development of tour packages for Foothills Forest, also to most of the other projects and activities.

Time Frame:

Undefined, funding dependant.

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell **Date:** November 22, 1992

Title: Video Production

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members:

Confirmed: Bob Udell

Potential: Alberta Forest Products Association
Alberta Forestry, Lands and Wildlife
Weldwood of Canada
Forest Technology School
Cardinal River Coal
Gregg River Resources
Luscar Sterco Coal
Parks Canada
Alberta Forestry Association

Purpose:

Produce a video which details the history, development, features and accomplishments of Foothills Forest.

End Results: Goals and Objectives

This activity relates to Goal 22, objective 1 from the Foothills Forest proposal.

General Objectives:

Public Information
Inform Alberta audiences of Foothills Forest
Available for national and international audiences

Canadian Image
Use for response to campaigns targeting Canadian forest practices and the Canadian forest industry

Tourism
Can be used for international tour operators to encourage inclusion of Foothills Forest on package tours

Education
Explain resource management principles and practices as they occur on Foothills Forest.

Location:

Throughout Foothills Forest.

Methods:

Video footage will be gathered throughout the life of the project. Potential scripts developed, themes chosen, scripted and produced.

Links to Other Activities:

Project has potential links to all activities.

Time Frame:

Video production towards the end of the five year term.

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell **Date:** November 22, 1992

Title: Major Signs and Brochures

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members:

Confirmed: Bob Udell, Ross Risvold

Potential: Alberta Forest Products Association
Switzer Provincial Park
Cardinal River Coal
Gregg River Resources
Luscar Sterco Coal

Purpose:

Place major signs along numbered highways entering Foothills Forest, supported by interpretive signs, pullouts and brochures.

End Results: Goals and Objectives

This activity relates to Goal 22, objective 1 from the Foothills Forest proposal.

General Objectives:

a. Public Awareness of Foothills Forest:
   - Natural Features
   - History
   - Resource Industries
   - Geology
   - Forest Resources
   - Reforestation
   - Recreation
   - Model Forest Activities

b. Develop Tourism Potential of Foothills Forest
   - Maps and interpretive features
   - Watchable Wildlife
   - Camping
   - Self-guided Tours

Location:

Signs to be placed on Highways 16, 40 and 47. Interpretive pullouts where appropriate.

Links to Other Activities:

This activity has links to the programs and activities of many agencies and cooperators contained within Foothills Forest.

Time Frame:

Signs will be placed in 1993. Pullouts and tour packages 1993-97.

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell Date: November 22, 1992

Title: Develop and Implement an Environmental Audit Process

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members

Confirmed: Bob Udell, Ross Risvold

Potential: Alberta Forest Products Association
Ernst and Young
Lake Abitibi Model Forest

Purpose:

Develop and implement a prototype environmental audit on Foothills Forest.

End Results: Goals and Objectives

This activity relates to Goal 23, objective 2 from the Foothills Forest proposal.

General Objectives:

Improve Forest Practices
Develop an annual audit which examines activities, issues addressed, and recommendations for adjustments to forest practices.

Public Information
Provide information to the public on resource stewardship in Foothills Forest activities.

Time Frame
Start 1993, first audit 1994

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell **Date:** November 22, 1992

Title: Open Houses

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members:

Confirmed: Bob Udell, Ross Risvold

Potential: Project Steering Committee
Partners Advisory Committee
Forestry Canada
Model Forest Network

Purpose:

Hold open houses annually in local communities to inform the public of activities and results of Foothills Forest, including the Annual Report.

End Results: **Goals and Objectives**

This activity relates to Goal 23, objective 3 from the Foothills Forest proposal.

General Objectives:

Public Information
. Provide information to the public on Foothills Forest activities

Location:
Community centres or shopping malls in Hinton, Edson, Grande Cache and Jasper

Links to Other Activities:
Has links to all Foothills Forest Activities and projects, as well as the National Program.

Time Frame:
Annually

Public Information Program
Foothills Forest Activity Outline

Prepared by: Bob Udell Date: November 22, 1992

Title: Annual Report

Working Group Coordinator: Ross Risvold

Activity Content: Bob Udell

Activity Team Members:

Confirmed: Board of Foothills Forest
Project Steering Committee
Partners Advisory Committee

Purpose:

Produce and distribute an annual report of Foothills Forest activities and progress.

End Results: **Goals and Objectives**

This activity relates to Goal 23, objective 1 from the Foothills Forest proposal.

General Objectives:

Public Information
Provide information to the public on Foothills Forest activities

Forestry Canada
An annual report is a condition of the Agreement with Forestry Canada

Partners
The annual report will provide a capsule summary of activities and accomplishments the previous year.

Methods:
Reports on activities will be prepared by the Project Steering Committee project coordinators, based on discussion and documentation of activity leaders. The financial accountability will be reported by the Administrator/Coordinator and Treasurer of Foothills Forest. The President and Chairman of the Board will report on overall progress and issues.

Links to Other Activities:
All activities will feed information to the annual report.

ARC/FOREST data model

A data model creates a stable consistent format for storing information and allows applications and models to be developed with available information and ensures compatibility between applications. The current version of ARCForest will be configured to fit the data needs of the Foothills Forest. ESRI is contributing $21,000 as a 50% reduction in the market cost of ARC Forest. The $27,500 is allocated for and ARCForest licence and support and travel costs for workshops.

GIS system administration (operational and technology transfer)

The GIS component has two streams - operational and tech transfer. The operational stream will support development of the Foothills Forest DSS and provide the necessary computing power to allow many simultaneous users of the system. The items identified for funding are; ESRI licence support, SUN O/S maintenance, Oracle development licence and support, spreadsheet and word processing support, and an electrostatic plotter lease. The tech transfer stream is designed to support a 10 seat GIS training centre at the Forest Technology School. The items identified for funding are; Oracle run time licence and support, laser printer and support, and SUN O/S support.

Habitat supply module

Four of the habitat suitability index models have been converted to run in a UNIX environment and use the spatial capabilities of a GIS. A pilot study will be conducted on a small area (30,000 hectares) of the Foothills Forest to determine the interactions between forest level habitat goals, stand level assessment of habitat, long-term wood supply and operational implementation. The four habitat models will be used in conjunction with a spatial inventory projection model. The pilot will identify modelling constraints as well as define the scope of the task over 1,200,000 hectares. This is a two-year activity.

Ecologically based pre-harvest planning

This objective of this activity is to develop an ecologic ally based pre-harvest planning process to ensure timber and non-timber management objectives are translated into site specific operations. A workshop will determine the data to be collected, the methodology for collection and how it relates and supports other plans. Operational level trails will be conducted to evaluate and demonstrate the site classification system and procedures.

Spatial ecosystem projection model

The objective of this activity is to develop a spatial ecosystem projection model, that incorporates spatial timber harvest constraints (two pass harvest system). The model will also be able to simulate various management (harvest design) strategies, project future ecosystem conditions and depict the forest landbase at periodic intervals in the future. The periodic output will be used as input to various assessment models. This activity forms the core of the Foothills Forest DSS.

ArcForest Data Loading *

Work will be carried out to create an ArcForest module that will allow the loading of digital data for the Foothills Forest.

Inventory Late Successional and Other Special Ecosystems *

Database queries will be run to determine the amount and distribution of forest cover types and ecosystem associations across the Foothills Forest area. This information will provide the

baselines needed for long-term management goals.

2. Integrated Resource Management

Elk study
This activity is continued from last year. The objective is to improve management of elk and elk habitat by developing better relationships between elk ecology in forested habitat various disturbances and impacts related to forestry practices, and potential range enhancement. A preliminary HIS model will be evaluated.

Pileated woodpecker study
The objective of this activity is to obtain ecological data on pileated woodpeckers to evaluate and revise the preliminary HSI model. This in turn will be used to develop a management strategy for pileated woodpeckers. To start the multi-year activity, forest structure around nesting sites will be evaluated, and up to 10 breeding pairs will be captured and fitted with radio transmitters. Birds will be relocated using telemetry equipment and monitored as to habitat use.

Lichen study
This study will examine the survival and regeneration of terrestrial lichen species used by caribou in response to various harvesting and silviculture practices. Pre-treatment and post-treatment lichen densities and species composition will be examined.

Snag Dynamics
This activity will describe the underlying patterns and population dynamics of snags in common fire-origin forest cover types in the Eastern Slopes of Alberta. In addition it will describe how those attributes and characteristics of snags necessary for birds, change over time. The intent of establishing the underlying relationships is to provide a baseline against which habitat values can be measured, and from which habitat goals can be set. Information gaps will be filled in and some of the HSI models will be validated.

Management effects on genetic diversity of white spruce and lodgepole pine
The objective of this activity is to determine the impact of forest harvesting and reforestation activities on the genetic variation in populations of white spruce and lodgepole pine. The genetic variation among several gene pools will be examined and compared using techniques that fall within the general area of DNA fingerprinting.

Aquatic/watershed contingency
$50,000 will be directed towards fisheries, aquatic and watershed activities. An aquatic/watershed sub-committee has been struck to develop activity proposals.

Caribou contingency
$20,000 will be directed toward a cooperative assessment of the impacts of harvesting and silviculture practices on winter range. Information on winter habitat distribution, use of fragmented vs. unfragmented habitat and alternate prey distributions will be collected.

Minimizing the Effects of Stream Crossings on Watershed Quality *
This study will evaluate present watercourse crossings, structures, site disturbance levels and improvement trials on existing structures in an effort to improve guidelines, standards and operational practices, especially erosion control, to minimize the effects of roads and stream crossings on fish and fish habitat.

River Corridor Management *
This program will inventory and develop management strategies for major river corridors within the Foothills Forest, including recreation, watershed management, riparian zone management, and adjacent upland areas.

Trail Enhancement *
Efforts will be made to expand existing hiking/equestrian trails to preserve historic and/or provide access to significant features occurring within the Foothills Forest.

Non-Timber Valuation *
The current study occurring in the Model Forest and surrounding area involves a detailed examination of the non-market values of moose hunting. An attempt will be made to measure how these values change with forest management activities that affect access, congestion, moose populations, quality of roads, and direct evidence of tree harvesting.

Conversion of Provincial Fisheries Inventory to Digital Format for GIS Use *
This project will provide a reference for the fisheries resource that will readily identify fish species composition, fish distribution, and eventually show critical habitats such as spawning areas, migration routes and winter habitat.

3. Commercial Use

Geophysical timber avoidance/salvage
The objective of this activity is to decrease the amount of timber lost through geophysical exploration by examining current timber avoidance policies and practices and investigating new alternatives. In addition, alternative methods for increasing timber salvage will be explored.

Horse grazing
Current grazing practices do not balance other resource needs and licences are often issued in areas where there is insufficient forage available. This activity will develop relationships between the amount of forage in regeneration stands and the amount of damage caused during grazing. The objective is to develop a better balance between grazing practices and regenerated stand survival and performance.

Furbearer Collection *
This project will involve the design and implementation of a cooperative furbearer data collection program with local trappers, Foothills Forest, Company, and Government Biologists with the hopes of developing cooperative management strategies for wildlife.

Backcountry Lodge Integration *
This program is designed to determine whether a specific tourism activity, a backcountry lodge, can be operated within a commercial forest and to investigate those mechanisms which can be used to effectively integrate this opportunity within an area of timber commitment.

4. Environment, Land Status

Protected area permanent sample plots
The objective of this activity is to establish a system of permanent sample plots in protected areas within the Foothills Forest and in adjacent areas. The information collected will provide a baseline for monitoring long term ecological succession patterns and general forest health patterns.

Carbon Budget *
Work will be carried out by Environment Canada on the development of a carbon budget and energy conservation plan for the Foothills Forest.

Hog Fuel/Sludge to Ameliorate Soil Conditions *
The target of this study will be to assess the effects of utilizing hog fuel, sludge, yard reclaimer materials and boiler ash on revegetation of sites, short-term tree establishment and growth, and long-term site productivity.

5. Forest Operations - Timber Harvesting

Understory preservation in mixedwoods
This activity will assess harvesting and tending options in mixedwood stands, develop selection criteria based on tree and stand stability, develop an initial growth and yield framework for mixedwood stands and monitor and evaluate wildlife habitat use. Site location and pre harvest evaluation will be the primary tasks this year.

Steep Slope Logging *
A comparison of harvesting systems will be carried out to operate on slopes of 31-45% and 46-65% to gain access to and extend the economic wood supply while minimizing the environmental, soil and site disturbance impacts on other resources.

Environmental Impacts of Forestry Practices on Boreal Mixedwood Ecosystems *
This study will attempt to determine the impact of selected forestry practices (organic matter removal and soil compaction) on short and long-term site productivity, composition and structure of plant communities, and biodiversity.

Improve Operational Planning Standards *
Ongoing work will be carried out to improve the process for internal, government, and public review, approval, monitoring and evaluation of operational forest resource planning.

6. Forest Operations - Silviculture

Chipper residue disposal impacts
This activity will assess the effects of remote chipper residue on the establishment and performance of both natural and planted regeneration. The organic and inorganic properties of the residue will be analyzed, the effect on regeneration growth and vigour (root egress, root collar and height increment, survival) will be examined and soil amendments will be investigated.

Aspen regrowth after mechanical release of conifers
The goal of this activity is to improve the understanding of the biological processes controlling vegetative reproduction of aspen and to determine the best timing and cutting technique for reducing aspen competition from regrowth following tending.

Pre-harvest treatment of aspen
The intent of this study is to investigate the biological impact of preharvest girdling and injection treatments in low aspen component conifer stands with the hope of reducing future needs for subsequent Free-To-Grow brushing treatments.

White spruce shelterwood
In mixed, mature white spruce/aspen stands, a "seed" cut will be sequenced to remove all of the mature aspen. The study will attempt to investigate the feasibility of promoting spruce "seed" regeneration in mature mixedwood stands.

Basal area competition index
This study is intended to test the application of the basal diameter ratio competition index (CI) developed by Forestry Canada in making stand tending decisions. Competing aspen will be removed based on this competition index and growth response of the remaining lodgepole pine monitored over the course of the Foothills Forest project.

7. Community Forest *

The concept of a community forest is one that has received a fair amount of press over the past few years in Canada. In fact, a number of these community forests now exist in British Columbia and Ontario. This project is designed to evaluate the current state of community forests across Canada, provide that information to the local residents of the Foothills Forest area and entertain ideas on the development of such a forest within the heart of the Foothills Forest area. Detailed inventory work on all resources will be carried out to aid in long-term management planning for this project. Active public participation will be a major component of this initiative.

8. Tech transfer, Public Awareness

Ecotourism
Technology Transfer will work on developing an ecotourism component for the Foothills Forest to illustrate the potential for establishing a tourism industry based on wildlife habitat viewing opportunities and habitat interpretation.

Newsletter
A quarterly newsletter will be produced to inform partners, natural resource management agencies, members of the Model Forest Network, and the general public about activities and progress of the Foothills Forest.

Signs and brochures
Major signs will be placed along all major access routes entering the Foothills Forest. Supportive brochures and interpretive signage will also be produced.

Environmental audit process
The Foothills Forest will work on a prototype environmental audit which examines activities, issues addressed, and recommendations for adjustments to forest management practices.

Peer review/Open house
A Peer Review/Open House will involve the assembly of professional participants for possibly two days of discussion on activity proposals, status reports, preliminary discussion on results and feedback on possible enhancement of existing projects.

Annual Report
An Annual Report will be produced by the Technology Transfer Officer and the Administrator that highlights progress made over the course of the year and consolidates the budget.

International Technology Transfer
By establishing partnerships with other countries, agencies and individuals, the Foothills Forest hopes to provide expertise and training to other countries of the world.

Tour Development
This activity will involve the development of a tour package that highlights many of the forest landbase values that are considered in the management of the area comprising the Foothills Forest.

Speakers' Bureau
The Foothills Forest will provide support for a speakers' bureau comprised of foresters, biologists, scientists and other interested individuals or groups involved in the Foothills Forest. Presentations will be made to public groups, schools, etc.

Budget

	FOOTHILLS FOREST 1993/94 BUDGET		LABOR & TRAVEL TOTAL % REALLOCATION	TOTAL AMOUNT
	1993 / 94 AMOUNT	% OF TOTAL		
ADMINISTRATION:				
Committees:				
Board of Directors	1,000			
Model Forest Network	2,000			
Project Steering Committee	1,000			
Partners Advisory Committee	3,500			
Advertising & Notices	1,000			
Sub-total Committees	**8,500**	0.86%		
Contracted Staff:				
Consultants	**273,000**	27.70%		
W.C.Brd.	**1,590**	0.16%		
Travel:				
Conferences	9,000			
Seminars	7,000			
Meetings	4,000			
General	4,000			
Total travel	**24,000**	2.43%		
Sub-total Contracted Staff	**298,590**	30.29%		
Allocated to Activities: Labour	(193,000)	193,166	64.69%	
Allocated to Activities: Travel	(14,000)	14,381	64.69%	
Total Unallocated Contract Costs:	**91,590**	9.29%		
General:				
Office supplies	800			
Post Office & postage	1,500			
Telephone & Fax	500			
Bank charges	100			
Insurance	1,500			
Sub-total General	**4,400**	0.45%		
Computers:				
Maintenance	1,000			
Supplies	1,000			
Equipment & Furniture	2,500			
Sub-total Computers	**4,500**	0.46%		
Vehicles:				
Unit #21101(1989)3/4T 4X4				
Gas & oil	5,000			
Radio	1,500			
Maintenance	1,000			
Insurance	660			
Lease cost	2,100			
Sub-total Unit #21101	10,260	1.04%		

	FOOTHILLS FOREST 1993/94 BUDGET 1993 / 94 AMOUNT	% OF TOTAL	LABOR & TRAVEL TOTAL % REALLOCATION	TOTAL AMOUNT
Unit #23145 (1992)3/4T2WD				
Gas & oil	3,000			
Radio	0			
Maintenance	300			
Insurance	660			
Lease cost	2,400			
Sub-total Unit #23145	**6,360**	0.65%		
Unit (LEASED) (1993)3/4T 4X4 SC				
Gas & oil	5,000			
Radio	1,500			
Maintenance	400			
Insurance	660			
Lease cost	6,000			
Sub-total Unit #18871	**13,560**	1.38%		
Unit (LEASED) (1993)3/4T 4x4SC				
Gas & oil	5,000			
Radio	1,500			
Maintenance	400			
Insurance	660			
Lease cost	6,000			
Sub-total Unit #23145	**13,560**	1.38%		
Unit #18579 (1985)1/2 T2WD (RETURNED)				
Unit #18907 (1985) 3/4 T4X4(RETURNED)				
Unit #18871 (1985) 3/4T 4X4(RETURNED)				
	0			
Private Vehicle	**2,500**	0.25%		
Sub-total Vehicles	**46,240**	4.69%		
TOTAL FOR ADMINISTRATION	**155,230**	15.75%		

PROJECTS:			LABOR & TRAVEL TOTAL % REALLOCATION	TOTAL AMOUNT	(INCLUDES LABOUR AND TRAV MELISSA %	MELISSA 59,640	ROGER %	ROGER 59,640	PAT %	PAT 59,640	CAROL %	CAROL 59,640
ACTIVITIES / DELIVERABLES PROJECTS:												
INTEGRATED RESOURCE MANAGEMENT												
Assessment of Land Status / Mgt. Mandates	**0**	0.00%	**0.00%**	0								

	FOOTHILLS FOREST 1993/94 BUDGET		LABOR & TRAVEL TOTAL % REALLOCATION	TOTAL AMOUNT						
	1993 / 94 AMOUNT	% OF TOTAL								
RESOURCE INFORMATION & PLANNING SYSTEMS:										
GIS Operational	38,982	3.96%	5.00%	2,982					5.00%	2,982
GIS Tech. Transfer	26,671	2.71%	22.00%	13,121				2.00%	1,193 20.00%	11,928
Landscape Planning Module	596	0.06%	1.00%	596					1.00%	596
Extend & Upgrade Digital Inv. of F.H.F.	64,193	6.51%	2.00%	1,193					2.00%	1,193
ArcForest Data Model	60,302	6.12%	55.00%	32,802					55.00%	32,802
ArcForest Data Loading	5,964	0.61%	10.00%	5,964					10.00%	5,964
Habitat Supply Module	11,078	1.12%	6.00%	3,578	6.00%	3,578				
HSI Model Testing	5,368	0.54%	9.00%	5,368	9.00%	5,368				
Mammal Inventories	11,768	1.19%	9.00%	5,368	9.00%	5,368				
Habitat Yield Curves	13,578	1.38%	6.00%	3,578 0	6.00%	3,578				
Wildlife Reponses to Partial Cutting	5,368	0.54%	9.00%	5,368	9.00%	5,368				
Ecological Classification Design	5,000	0.51%	0.00%	0						
Ecologically Based Pre-harvesting Plan	25,000	2.54%	0.00%	0						
TOTAL RESOURCE INFORM'TN & PLAN'G. SYS:	**273,868**	27.79%	**134%**	**79,918**						
COMMERCIAL USE:										
Timber Avoidance & Salvage	12,000	1.22%	0.00%	0						
Horse Grazing	23,500	2.38%	0.00%	0						
Back Country Lodge Integration	1,193	0.12%	2.00%	1,193				2.00%	1,193	
TOTAL COMMERCIAL USE	**36,693**	3.72%	**2.00%**	**1,193**						
ENVIRONMENT / LAND STATUS:										
Protected Area PSP's.	15,000	1.52%	0.00%	0						
Old Growth Study	596	0.06%	1.00%	596	1.00%	596				
Successional Development of Pine Forests	596	0.06%	1.00%	596	1.00%	596				

	FOOTHILLS FOREST 1993/94 BUDGET		LABOR & TRAVEL TOTAL % REALLOCATION	TOTAL AMOUNT						
	1993 / 94 AMOUNT	% OF TOTAL								
Topography/Drainage / Mixedwood Succession	596	0.06%	1.00%	596	1.00%	596				
Forest Fragmentation/Arthropod Diversity	596	0.06%	1.00%	596	1.00%	596				
TOTAL ENVIRONMENT / LAND STATUS:	**17,386**	1.76%	**4.00%**	**2,386**						
SILVICULTURE:										
Basal Diameter CI	14,175	1.44%	7.00%	4,175			7.00%	4,175		
Chipper Residue Disposal Impacts	14,771	1.50%	8.00%	4,771			8.00%	4,771		
TOTAL SILVICULTURE	**28,946**	2.94%	**15.00%**	**8,946**						
TECH. TRANSFER / PUBLIC AWARENESS & EDUC.										
Ecotourism	28,946	2.94%	15.00%	8,946					15.00%	8,946
Peer Review & Open House	7,982	0.81%	5.00%	2,982					5.00%	2,982
Develop & Implement Environmental Audit	11,193	1.14%	2.00%	1,193					2.00%	1,193
Newsletter	21,964	2.23%	10.00%	5,964					10.00%	5,964
Major Signs & Brochures	6,193	0.63%	2.00%	1,193					2.00%	1,193
Annual Report	10,964	1.11%	10.00%	5,964				CAM	10.00%	5,964
International Tech. Transfer	5,964	0.61%	10.00%	5,964					10.00%	5,964
Tour Development	11,928	1.21%	20.00%	11,928					20.00%	11,928
Speakers' Bureau	8,946	0.91%	15.00%	8,946					15.00%	8,946
TOTAL TECH. TRSF. / PUBLIC AWARE. & EDUC.	**114,080**	11.57%	**89.00%**	**53,080**						
TOTAL ACTIVITIES / DELIVERABLES PROJECTS	**470,972**	47.78%	**244%**	**145,522**						
RESEARCH PROJECTS:										
INTEGRATED RESOURCE MANAGEMENT:										
Lichen Study	11,789	1.20%	3.00%	1,789	3.00%	1,789				
Management Effects On Spruce & Pine Genetics	10,596	1.08%	1.00%	596	1.00%	596				
Elk Study	18,578	1.88%	6.00%	3,578	6.00%	3,578				

	FOOTHILLS FOREST 1993/94 BUDGET 1993 / 94 AMOUNT	% OF TOTAL	LABOR & TRAVEL TOTAL % REALLOCATION	TOTAL AMOUNT							
Snag Dynamics	596	0.06%	1.00%	596	1.00%	596					
Long-toed Salamander	596	0.06%	1.00%	596	1.00%	596					
Pileated Woodpecker Study	6,789	0.69%	3.00%	1,789	3.00%	1,789					
Trail Enhancement	1,789	0.18%	3.00%	1,789	1.00%	596			2.00%	1,193	
Caribou Study (contingency)	23,578	2.39%	6.00%	3,578	6.00%	3,578					
Fisheries / Watershed (contingency)	51,193	5.19%	2.00%	1,193	2.00%	1,193				0.00%	0
Digitize Fisheries Inventory	1,193	0.12%	2.00%	1,193	1.00%	596				1.00%	596
TOTAL INTEGRATED RESOURCE MANAGEMENT:	**126,699**	12.85%	**28.00%**	**16,699**							
RESOURCE INFORMATION & PLANNING SYSTEMS:											
Spatial Resource Supply Model	39,193	3.98%	2.00%	1,193	1.00%	596				1.00%	596
Bird Inventories	596	0.06%	1.00%	596	1.00%	596					
Habitat Supply Ouside FMA	596	0.06%	1.00%	596	1.00%	596					
Integrate Wildlife Habitat w. Forest Land Mapping	596	0.06%	1.00%	596	1.00%	596					
Watercourse Inventory	596	0.06%	1.00%	596	1.00%	596					
Minimizing Effects Of Stream Crossings	596	0.06%	1.00%	596	1.00%	596					
River Corridor Management	596	0.06%	1.00%	596	1.00%	596					
Non-timber Valuation	596	0.06%	1.00%	596	1.00%	596					
TOTAL RESOURCE INFOR. & PLANNING SYSTEMS:	**43,368**	4.40%	**9.00%**	**5,368**							
FOREST OPERATIONS - TIMBER HARVESTING											
Understory Preservation in Mixedwoods	34,771	3.53%	8.00%	4,771			8.00%	4,771			
White Spruce Shelterwood	24,771	2.51%	8.00%	4,771			8.00%	4,771			
Envirn. Impacts on Boreal Mixedwood	3,578	0.36%	6.00%	3,578	1.00%	596	5.00%	2,982			
Effects of Harvesting on Soil Veg. / Seeding Perf.	1,193	0.12%	2.00%	1,193			2.00%	1,193			
Stumpside vs. Roadside Delimbing	2,982	0.30%	5.00%	2,982			5.00%	2,982			

	FOOTHILLS FOREST 1993/94 BUDGET		LABOR & TRAVEL TOTAL %	TOTAL AMOUNT						
	1993 / 94 AMOUNT	% OF TOTAL	REALLOCATION							
Steep Slope Logging	1,193	0.12%	2.00%	1,193			2.00%	1,193		
TOTAL FOREST OPER. / TIMBER HARVESTING	68,488	6.95%	31.00%	18,488						
ENVIRONMENTAL LAND STATUS:										
Hog Fuel & Sludge/Sewage to Ameliorate Soils	1,193	0.12%	2.00%	1,193			2.00%	1,193		
SILVICULTURE										
Basal Girdling by Rodents	2,982	0.30%	5.00%	2,982			5.00%	2,982		
Aspen Regrowth After Mechanical Release	19,771	2.01%	8.00%	4,771			8.00%	4,771		
Preharvest Treatment of Aspen	14,175	1.44%	7.00%	4,175			7.00%	4,175		
Aspen Regrowth After Chemical Release	1,789	0.18%	3.00%	1,789			3.00%	1,789		
TOTAL SILVICULTURE	38,717	3.93%	23.00%	13,717						
TOTAL RESEARCH PROJECTS	307,869	31.24%	92.00%	54,869						
COMMUNITY FOREST:										
Inventory	596	0.06%	1.00%	596	1.00%	596	0.00%	0		
Urban / Wildland Interface	0	0.00%	0.00%	0						
TOTAL COMMUNITY FOREST:	596	0.06%	1.00%	596						
DEMONSTRATION PROJECTS:										
McLeod River	2,982	0.30%	5.00%	2,982			5.00%	2,982		
Athabasca Mixedwood	2,982	0.30%	5.00%	2,982			5.00%	2,982		
Cache Percotte	0	0.00%	0.00%	0			0.00%	0		
TOTAL DEMONSTRATION PROJECTS:	5,964	0.61%	10.00%	5,964						
CONTINGENCY	45,000	4.57%	45,000	45,000						
TOTAL 1993/94 BUDGET	985,631	100.00%	348%	207,547	78%	46,519	80.00%	47,712	95%	56,658	95%	56,658