THE SOCIO-ECONOMIC REALITIES OF BRUSHING AND WEEDING

PROCEEDINGS:
NORTHERN INTERIOR VEGETATION MANAGEMENT ASSOCIATION
ANNUAL GENERAL MEETING

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Introduction

Steve Thorpe
NIVMA Manager

On behalf of the NIVMA Executive I would like to welcome everyone to the Northern Interior Vegetation Management Association’s Annual General Meeting. The theme of this year’s meeting is "The Socio-Economic Realities of Brushing and Weeding".

This year’s AGM is timely. We know from experience that as we undertake more intensive forest management practices we enter into new realms of public involvement and potential conflict. Various forestry practices are coming under increasing public scrutiny. In particular, herbicide use has recently been on the decrease in a large part due to public opinion; not to poor treatment efficacy. While this trend is continuing the forestry community has expended substantial effort in justifying its case.

A typical question being posed is, "...can the presentation of sound technical information reduce public concern and allow for the continued use of herbicides or, are our efforts futile as the public is not willing to accept herbicide methods of brush control?" While herbicides best illustrate the dilemma, they are not the only brushing and weeding tool of concern. Prescribed fire, mechanical, manual and sheep grazing tools all have their proponents and opponents. This increased public concern and the question of the effectiveness of technical and environmental justification in the face of perception is the underlying theme of our meeting.

As a consequence of public involvement and improvements in both knowledge and technology, alternative vegetation management techniques have increased in efficacy. In fact when coupled with increased local employment some manual treatments are considered very successful. The reality remains, however, that most non-herbicide treatments are, in some cases logistically impossible, can be more environmentally damaging (despite perceptions otherwise) and are usually more costly.

Present free growing standards and legislation make vegetation management a "cost of doing business". Despite this, economic analyses are seldom done. We do know that the costs of doing nothing will be high not only due to rehabilitation expenses but also in long term growth losses. Commitment to monitoring programs by NIVMA members will further document this. While the initial reaction might be that costs are the industry’s problem I suggest this is only true in the short term sense. With over 90 percent of forest land in BC being a public resource the long term costs of vegetation management decisions will ultimately be born by the public. Short term decisions today may well affect the long term socio-economic viability of our forest lands.

This year’s AGM topic was decided upon after choosing Smithers as the host community. Smithers is an ideal location to not only address the "Realities" but also to solicit "Solutions". This and surrounding communities have a high dependence on the forest industry and maintain a strong environmental and native "consciousness". They have also figured prominently in recent
forest management issues. We are fortunate that there is considerable expertise in dealing with socio-economic realities of brush control locally. We are also pleased to have Steve Radosevich of the CRAFTS Co-operative at Oregon State University to speak on these subjects from the Oregon socio-economic perspective. Knowledge on how these issues have been dealt with in the Pacific Northwest over a longer time line should help stimulate more local and innovative solutions.

I would like to thank in advance all the speakers and participants for attending. We expect constructive interaction between the speakers and the audience and have provided opportunities within the Agenda to encourage these discussions. Special thanks should also go to those in the Smithers Forest Region for their help in organizing, and Forestry Canada for sponsoring this meeting.
Forestry is involved in a societal debate over the tools and tactics presently used to manage forests. The focus of the debate concerns the environmental and human consequences and, therefore, societal acceptability of continuing to produce wood as it is done now. Forest vegetation management is only a microcosm of this larger debate, even though the tools and tactics used to control weeds are sometimes the object of discussion. It is necessary for people doing forest vegetation management to look critically at their roles in the debate and then to work actively toward a resolution of it.

Forest vegetation management has existed for approximately forty years. During this time, a technology has been developed to intensively manage vegetation in young forest plantations. People involved with vegetation management also have evolved in their thinking about this technology. I identify three stages in that thinking: (1) attempting to explain or justify the technology, (2) trying to understand the full depth of the issue or question, and (3) making a choice to continue being the problem or to have a part in its resolution. The third stage has two components—a reassessment of the technology and the incorporation of new types of information into decision making about forest vegetation management. Both components are addressed in this presentation.

The history of forest vegetation management can be summarized with three questions: what tool, why, and whether to control weeds in forest environments. Various scientific approaches have been used to address those questions, which range from simple tool screens and observations of vegetative responses to more formal types of experiments that usually alter spatial relationships among the species being tested. The third question of whether vegetation management should be implemented is the most recent concern of the discipline. It arises from a better understanding of the ecological and economic underpinnings of forest vegetation management and societal issues generated from the tools and tactics currently used by forest vegetation managers. We developed a conceptual deterministic model to integrate the influences of management inputs, weed and tree responses, and crop value to examine the profitability of forest vegetation management scenarios. Two stable scenarios were found: (1) high input/high yield, which requires subsidy to maintain production, and (2) low input/low yield which is profitable but less productive. These scenarios suggest fruitful and necessary areas for continued research in forest vegetation management. For example, from where do the subsidies suggested in scenario 1 arise, and is it possible to develop a forest management system that is both profitable and productive (scenario 2)?

1 Dr. Steve Radosevich is with the CRAFTS Co-operative, Oregon State University.
We also must recognize that there is a broader, often contradictory, range of interest, perspectives, and information that can be brought to bear on forest vegetation management. The important question is how do we incorporate differing information and perspectives into decisions. Stankey, Clark, and Cullen\(^1\) suggest several guidelines: We must recognize that wider society has an important stock of knowledge pertinent to the issue, and that is not necessarily scientific or technical. Forums should be created that are collaborative rather than competitive or confrontational. This can be accomplished by (1) avoiding compartmentalized thinking and institutional structures that reinforce organizational, disciplinary, professional, or territorial boundaries; (2) shunning the dictatorship of the professional or "expert" opinion and using a decentralized, local, ground-up approach vs. a centralized, top-down approach; and (3) adopting an anti-technocratic approach--one that holds that technology does not have the monopoly on relevant information.

Competition Indices and Decision Making

Phil Comeau

Deciding whether or not there is a brush problem, or whether a brush problem will develop within the next few years are key decisions in the development of a brushing prescription. Such decisions are currently based on a subjective evaluation of present and expected competition levels. The evaluation is generally based on field experience and background technical information. Objective techniques are needed for evaluating competition levels and describing their effects on crop seedlings to facilitate communication and to serve as guidelines for inexperienced staff.

Results from several studies in B.C. and elsewhere have contributed to our understanding of interactions between crop and non-crop vegetation. A variety of competition indices have been proposed as a basis for field assessment of competition. I will present only a few examples which I feel are most applicable to field use in B.C.

Competition Indices

Brand (1986) proposed using a competition index that incorporates vegetation cover, vegetation height, seedling height, and proximity of vegetation to the crop seedling. Wagner and Radosevich (1991) found that percent cover of vegetation above a certain proportion of seedling height was more effective at describing variation in seedling performance than other measurements.

DeLong (1991) reports that an index, calculated using measurements of vegetation cover, height, and proximity to the tree was useful for describing light penetration through vegetation canopies.

In mixed-shrub and fireweed communities Comeau et al. (1993) report that a competition index based on vegetation cover, vegetation height, and seedling height is useful for describing variations in light reaching spruce seedlings (Figure 1) and variations in their performance (Figure 2). Adding proximity into the calculation of competition index increased the amount of work without improving the predictive power of the index.

Measurements of the fraction of full sunlight reaching crop seedlings can also be used as quantitative measures of competition (Jobidon 1992; Comeau et al. 1993). Such measurements can be made quickly and easily, and can be at least as effective at describing competition for light as other indices. The primary drawbacks to using this technique are: 1) the cost of equipment, and, 2) limitations on when light measuring instruments can be used (i.e. bright summer days, between 10:00 a.m. and 2:00 p.m.).

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1 Dr. Phil Comeau is currently the Technical Advisor for Vegetation Management, Ministry of Forests, Forest Science Research Branch, Victoria, B.C.
Figure 1. The fraction of full sunlight (transmittance) that reaches the top branch whorl of a spruce seedling declines as competition index increases. (Based on information collected in fireweed and mixed-shrub communities in the southern interior of B.C. (Comeau et al. 1993). Competition index was calculated using the formula: \( CI = \text{sum (\% cover x height)} / (\text{crop height}) \).)

\[ T = \exp(-0.007886 \times CI) \]

Figure 2. Growth and survival of Engelmann spruce declines as CI increases. (Based on information collected in fireweed and mixed-shrub communities in the southern interior of B.C. (Comeau et al. 1993). (Competition index was calculated using the formula: \( CI = \text{sum (\% cover x height)} / (\text{crop height}) \). Survival is estimated using models presented by Wagner et al. 1989 adjusted on the basis of field observations.)

Growth estimated from models
Survival based on literature and observations
Morphological traits of crop seedling such as height:diameter ratio, number of buds on the leader, and size of terminal buds have been found to be good indicators of competitive stress (Harrington and Tappeiner 1991; Tappeiner et al. 1987). Cole and Newton (1987 suggest that long-term growth is jeopardized when the height:diameter ratio of Douglas-fir seedlings exceeds 60. A serious problem with using these morphological characteristics as competition indices is that these traits will only become evident after seedlings are suffering from competitive stresses. They may be most useful in determining whether or not seedlings are likely to respond favorably to treatment.

What is the "ideal" competition index?

The "ideal" index: 1) should be relatively easy to measure or estimate; 2) should apply under a broad range of conditions; and, 3) should effectively describe the level of competition to which crop seedlings are exposed. The indices described above all generally fit this criteria. Therefore, the best index is probably one that combines vegetation cover, vegetation height, seedling height, and perhaps proximity.

Decision Making

Information presented in figure 3 provides a useful framework for applying a competition index in brushing decisions. Areas that do not require treatment will fall below lines that describe acceptable threshold values for competition index. At present there are no standard guidelines regarding what these threshold values are. However, one should be cautious about setting

![Figure 3. Relative height and percent cover values for different threshold CI values. (CI = sum (% cover x height) / (crop height) (After Szauer 1992).](image-url)
threshold values below CI of 100-150 because of the large amount of variability in seedling growth and responses to brushing treatments encountered at such low levels of competition. To assist field staff in identifying possible threshold values, Table 1 provides a summary of predicted survival and growth of spruce seedlings at different CI values.

Table 1. Survival and growth of Engelmann spruce seedlings and light levels associated with different levels of competition index. (Based on information shown in figures 1 and 2 and presented by Comeau et al. 1993.)

<table>
<thead>
<tr>
<th>CI</th>
<th>Survival (%)</th>
<th>Growth (% of potential)</th>
<th>Light Level (% of full sunlight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>95</td>
<td>50</td>
<td>45</td>
</tr>
<tr>
<td>150</td>
<td>90</td>
<td>35</td>
<td>30</td>
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<tr>
<td>200</td>
<td>85</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>250</td>
<td>75</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>300</td>
<td>65</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

1. CI = competition index = sum (% cover x height) / crop height
2. Survival represents % of original trees surviving over a one year period. Survival is estimated using curves presented by Wagner et al. 1989 adjusted using local field observation (Figure 2).
3. Growth represents % of growth that would be achieved by seedlings grown in the absence of competition (CI=0) (Figure 2).
4. Light level (fractional irradiance) is the % of full sunlight that reaches the top branch whorl of the crop seedling (Figure 1).

Survey Procedures

The addition of competition index assessment to surveys is currently being tested. Standards for these surveys, and guidelines for their analysis and interpretation have yet to be developed.

Need for a "Dynamic" Index

Static indices work when brush problems are well developed and evident. However, a substantial body of research indicates that treatments applied to avoid competition problems usually give better results than treatments applied to deal with problems after they become very serious.

All of the indices discussed above provide only short-term or static descriptions of competition. They do not include consideration of how competition changes through time due to changes in vegetation cover, vegetation height, and crop seedling size. Burton (1993) suggests that dynamic indices are needed in order to make projections about future effects of competition. In addition, dynamic indices or competition models will permit simulation of treatment effects on crop growth.

Work on such models is currently underway in Oregon, British Columbia, Alberta, and elsewhere. However, it will be a while before they will be ready for field use.
Conclusions

To summarize: 1) substantial progress has been made in evaluating competition indices; 2) a competition index based on cover and height of vegetation, and seedling height appears to be the most useful static index. We still need to decide whether or not it is worth measuring proximity; 3) as an objective alternative to competition indices based on vegetation cover, we can use instruments that measure irradiance; 4) relationships between seedling performance and CI can be used as a basis for deciding on the need for brushing. This does require identification of treatment thresholds that describe acceptable seedling performance; 5) Standardized procedures for competition assessment surveys have yet to be developed; and, 6) Dynamic competition indices or models are needed as a basis for prescribing treatments timed at avoiding competition, and at achieving desired responses.

It is important to note that, as with most work on competition indices, the focus of this presentation has been on short-term performance of crop seedlings based on studies designed to show competitive effects. When considered over the longer term (i.e., one or more rotations) or when other resource values are considered, it is desirable to accept and possibly maintain a certain level of non-crop vegetation cover to protect soil resources, to maintain or improve nutrient availability, to reduce risks of pest damage, or to provide forage and habitat for wildlife.

While competition indices provide a useful tool for evaluating the amount of, and short-term effects of competition on crop seedlings, the final decision to apply any treatment must be based on well informed professional judgment that includes evaluation of all resource values and potential treatment impacts.

References


The Socio-Economic Realities of Brushing and Weeding


Maintaining Biological Diversity  
In British Columbia's Forests

Jim Pojar

The conservation of biological diversity ("biodiversity") has become an important goal of forest land stewardship. The logical way to maintain forest biodiversity while continuing to produce commodities if to practice forest ecosystem management. Such management must be applied over a wide range of scales: regional landscape, and stand. Biodiversity at the regional level of planning is being addressed in part through the provincial Protected Area Strategy. The recommendations that follow here deal with landscape and stand level management. I have drawn much of the material from Steventon (1993) and the draft coastal guidelines.

Definition

Biodiversity is commonly defined as the diversity of life in all its forms and levels of organization, including genes, species, ecosystems, and the evolutionary and functional processes that link them.

Goals And Objectives

The goal is to sustain biological diversity in the forests of British Columbia. The proposed strategy has two objectives:

1) To ensure that the ecological processes of natural forests continue; and

2) To maintain populations of native species well distributed across their ranges by:

- establishing a network of old forest and special habitats within each landscape unit (watershed or equivalent chunk of terrain, 5 000 to 90 000 ha in size)
- planning harvesting activities to distribute a variety of seral stages across the landscape unit.
- using stand-level practices to provide structural and species diversity in the managed forests within the landscape unit.

Assumptions

The strategy relies on two key assumptions that acknowledge the major limitations in knowledge of biodiversity and in ability to manage at different scales:

1Dr. Jim Pojar is the Forest Sciences Officer, Ministry of Forests, Prince Rupert Forest Region (Smithers).

1) By maintaining broad geographical distribution of species and ecosystems, genetic and functional diversity will be maintained.

2) The maintenance of a variety of seral stages, stand structures and patch sizes, across a variety of ecosystems and landscapes, will meet the habitat needs of most forest organisms.

Principles

The strategy attempts to embody four important principles:

1) Management for biodiversity must be flexible and adaptive.

2) We must manage at a variety of scales: regional, landscape, stand, and even individual tree.

3) Not all elements of biodiversity need to be maintained on every hectare, but stand management for biodiversity should be applied to every cutblock or treatment unit.

4) We cannot manage for all species individually, but some species, ecosystems, or habitats will require special management attention.

Landscape-Level Recommendations

1) Delineate landscapes of 5 000 to 90 000 ha, based on watershed or similar physiographic unit, as the primary planning unit for biodiversity.

Ideally, regional-level forest plans would be based on ecological units like regional ecosystems or ecossections. Realistically, the Timber Supply Area or Tree Farm License will continue to be the management unit at this level of planning. These management units are usually 500 000 to 2 000 000 ha in size, and they should be mapped into smaller, 5 000 to 90 000 ha landscape units based on watersheds or other geographic feature (fig. 1). Watersheds are also useful units for dealing with other management concerns such as fisheries, hydrology, recreation, and access management.

2) Stratify each landscape ecologically; i.e., by biogeoclimatic subzone and by generalized habitat unit.

The landscape should first be stratified by biogeoclimatic zone/subzone (see Meidinger and Pojar 1991), then mapped into generalized ecosystem or habitat units. Depending on the complexity of terrain and ecosystems, this mapping could be done at scales from 1:50 000 to 1:250 000. Detailed habitat mapping usually is not available, 90 the broad habitat units will have to be derived from British Columbia Ministry of Environment biophysical habitat mapping (1:250 000) or from interpretation of terrain and forest cover information from
Figure 1. Landscape Units of the 528,000 ha Bulkley Timber Supply Area, West Central British Columbia. Unit 12 is the Copper River Landscape.
inventory maps, air photos, and satellite imagery. Riparian units would be highlighted, as well as wetlands, azonal or rare/sensitive ecosystems, and special wildlife habitats.

3) Develop a landscape summary.

Derive summaries based on the ecological stratification and mapping, for each landscape:

- tabulation of the area of each biogeoclimatic subzone and of each habitat unit by seral stage (figs. 2 and 3).
- presence (known or expected) of rare or sensitive ecosystems and species (especially red or blue listed species; see British Columbia Wildlife Branch 1991).
- degree of existing development (kilometers of road, ha logged).

This information allows landscapes to be compared and opportunities and limitations for maintaining diversity identified.

Figure 2. Biogeoclimatic Units of the Copper River Landscape. AT, Alpine Tundra; CWH, Coastal Western Hemlock; ESSF, Engelmann Spruce - Subalpine Fir; MH, Mountain Hemlock; SBS, Sub-Boreal Spruce (Meidinger and Pojar 1991).

Figure 3. Generalized Habitat Units and Seral Stages in the Sub-Boreal Spruce Zone, Copper River Landscape. AL, Abies lasiocarpa; PX, Picea glauca x engelmannii; PBT, Populus balsamifera ssp. trichocarpa.
4) Establish and maintain a network of unmanaged areas, including old forest stands, representative of the range of ecosystems over the landscape.

This recommendation is aimed at maintaining a network (often referred to as a Forest Ecosystem Network [I. McDougall pers. comm. 1992]) of unmanaged habitats representative of the range of ecosystems in the landscape, with emphasis on old forest and ecosystems that are rare, sensitive, or especially productive. The Forest Ecosystem Network consists of "permanent" reserve areas and the linkages that connect them. Linkages are temporary and can "move" over the landscape, being replaced over time with other suitable areas. For example, an old-growth linkage could be replaced with an adjacent second-growth stand managed for old-growth attributes. The size, configuration, and location of this network must be a landscape-specific decision. A broad range of ecosystems should be included. Inoperable and non-commercial areas and reserves established for other purposes should be part of the network (figs. 4 and 5), provided ecosystem representation is assured, thus reducing impact on timber availability.

Figure 4. Distribution of a Forest Ecosystem Network Within a Hypothetical Landscape With Three Biogeoclimatic Zones.
5) Manage for a well-distributed variety of seral stages, stand structures, patch sizes, and habitat types over the landscape, through time, heeding the natural pattern.

The intent of this recommendation is to maintain a full range of seral stages and habitat types, appropriate to the landscape unit and its biogeoclimatic zones (Table 1).

**Table 1. General seral stage objectives (% of habitat unit) by biogeoclimatic zone for the 80,000 ha Copper River Landscape**

<table>
<thead>
<tr>
<th>Biogeoclimatic Zone(^1)</th>
<th>ESSF/MH</th>
<th>SBS</th>
<th>CWH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Seral(^2) (0-20 yrs)</td>
<td>&lt;30%</td>
<td>5-50%</td>
<td>&lt;30%</td>
</tr>
<tr>
<td>Mature(^3) (80+ yrs)</td>
<td>&gt;50%</td>
<td>&gt;30%</td>
<td>&gt;40%</td>
</tr>
<tr>
<td>Harvest Unit Size(^4)</td>
<td>0-100 ha</td>
<td>0-200 ha</td>
<td>0-100 ha</td>
</tr>
</tbody>
</table>

1. ESSF - Engelmann Spruce Subalpine Fir zone; MH - Mountain Hemlock zone; SBS - Sub-Boreal Spruce zone; CWH - Coastal Western Hemlock zone (Meidinger and Pojar 1991).
2. Stand ages are approximate. Includes protected areas in the "Forest Ecosystem Network" and managed uneven-aged stands that structurally resemble mature stands.
3. There should be more smaller than larger units, averaging perhaps 40 ha. Larger units may consist of a cluster of small blocks.
Early seral stands, including cut-overs and naturally disturbed sites, should not exceed 50% of the landscape or the habitat unit. For seral stage objectives, two adjacent 20 ha clearcuts 5 to 10 years apart in age will, in most respects, function as one 40 ha early seral patch. A 30% limit is preferable in coastal forests, or if species such as marten (Lofroth and Steventon 1990) that depend on mature forest are emphasized in the landscape objectives.

We also recommend that a minimum of 30% of the landscape or habitat it be maintained in mature forest, which should be defined structurally not merely by age (see Table 2). This figure would include reserved areas and stands where partial cutting systems maintain the mature forest structure.

Coastal forests (CWH, MH) and high elevation interior forests (ESSF have less dramatic disturbance histories and a greater proportion of older forests than do lower elevation, drier interior forests (SBS). Landscape structure and stand attributes reflect disturbance regime, therefore we recommend that a greater proportion of mature forest be maintained in forest zones that experience less frequent, less extensive disturbances.

In addition to range of seral stages, the array of stand and habitat types would be maintained. For example, if deciduous forests is a natural component of the landscape or habitat unit, it should also be a component of the managed landscape. Or, if deciduous trees are components of natural stands, they should also be maintained in managed stands.

6) Maintain biodiversity elements that are at risk or of special management concern.

Some species, ecosystems, or habitats are too sensitive, significant, or threatened to entrust to the "coarse filter" management outlined above. In British Columbia, 95 wildlife and freshwater fish species are on the Red list (legally designated, or being considered for legal designation as endangered or threatened), and another 96 species are on the Blue List (considered sensitive or vulnerable) (M. Fenger pers. comm. 1993). Some 630 vascular plant species are provincially rare, and of these, 153 are considered threatened or endangered (G.W. Douglas pers. comm. 1993). The British Columbia Conservation Data Centre, a cooperative project of the Ministry of Environment, Lands and Parks, The Nature Trust and other private conservation agencies, is conducting inventories and compiling information on vertebrates, plants, and ecosystems. These elements of biodiversity, be they grizzly bears, Garry oaks or marl fens, require special management.

7) Minimize the negative effects of fragmentation.

In even-aged management, we should attempt to impose a variety of sizes and shapes in each seral stage. More smaller than larger blocks should be applied, but we need some large patches in early and mid-seral stages to ensure a continuing supply of large patches of mature forest for those organisms that rely on such habitat. A "checkerboard" pattern of equal-sized harvest units uniformly spaced across the landscape is generally not desirable. Such cutting patterns accelerate fragmentation and edge effects, especially at high rates of cut with small (e.g., 10 ha) blocks. For the same proportion of landscape cut, "clustering" of small cutblocks reduces total edge, maintains larger patches of older forest, and better emulates natural
disturbance patterns. Clustering small blocks, or opening larger blocks with some sort of partial cutting or patch retention, can provide opportunities for varying the effective unit size while meeting visual and other cutblock size objectives. Late seral stages should, if possible, be distributed 90 as to link reserved areas in the Forest Ecosystem Network.

Stand-Level Recommendations

These recommendations are aimed at maintaining biodiversity in managed stands outside the Forest Ecosystem Networks. They address the important stand attributes required to do this and the methods recommended for attaining these attributes. All stands should be managed to maintain biodiversity, and the intensity of application should reflect management objectives. The degree to which these guidelines are applied should also consider the characteristics of adjacent stands within the landscape unit.

If adjacent stands are lacking important habitat attributes, extra effort should be made to retain or create those attributes in the stand being treated. Alternatively, if the stand being treated is adjacent to mature forest that will not be harvested (such as reserved or inoperable areas), less emphasis will be needed on managing habitat attributes.

Ideally, specific tactics should be developed for each ecological unit, but our present knowledge does not yet allow such refinement. Instead, this section sets out a general approach for maintaining and enhancing biodiversity in all stands. Some habitats, such as Environmentally Sensitive Areas for caribou, grizzly bear and eagles, will, nevertheless, require special management practices.

These recommendations are designed to be used in the preparation of:

- Pre-harvest Silviculture Prescriptions
- Post-harvest (including stand conversion) silviculture prescriptions, treatments and contracts

Stand management activities should be tailored to each stand site, and should attempt to mimic the natural conditions of that ecological unit. Innovative, site-specific prescriptions are required rather than strict formulas.

Stand Attribute Recommendations

To maintain and enhance biodiversity in managed stands, some or all of the following attributes should be present.

1) Dead Wood

Many organisms depend on the natural decay cycle. Decaying wood, for example, provides habitat for numerous vertebrates, fungi, invertebrates, lichens, plants and micro-organisms. Dead wood also plays an important role in nutrient cycling. Standing dead trees (snags) and
fallen logs (coarse woody debris) are important to retain, as are dying trees, which provide a source of future snags and downed logs.

Snags:

Existing snags should be retained, and the recruitment of new snags planned for the future. Small diameter snags are suitable for some species, but large diameter snags are needed by others and endure longer. For example, approximately 20-30 large diameter snags (greater than 40 cm in diameter) are needed per hectare to maintain natural population densities of cavity-nesting birds in Coastal Western Hemlock forests.

Snags in various stages of decay should be retained. Those with hard heartwood are preferable since they persist longer and provide better cavities for cavity nesting birds. In general, at least 10 relatively large diameter snags per hectare should be retained on the landscape (see Table 2). Those snags can be distributed evenly but are probably more easily and effectively concentrated in patches, leave areas, inoperable areas, or reserves around the perimeter of a cutblock.

Table 2. Structural Objectives for Mature Stands (values in brackets are averages for "zonal sites from ecoplot data").

<table>
<thead>
<tr>
<th></th>
<th>SBSm&lt;sup&gt;c&lt;/sup&gt;</th>
<th>SBSd&lt;sup&gt;k&lt;/sup&gt;/ SBPS</th>
<th>ESSF</th>
<th>ICH</th>
<th>CWH</th>
<th>MH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snags/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;17.5 cm dbh</td>
<td>9 (99)</td>
<td>6 (67)</td>
<td>10 (121)</td>
<td>5 (53)</td>
<td>5 (23)</td>
<td>5</td>
</tr>
<tr>
<td>&gt;27.5</td>
<td>3 (24)</td>
<td>3 (12)</td>
<td>8 (84)</td>
<td>2 (13)</td>
<td>2 (11)</td>
<td>3</td>
</tr>
<tr>
<td>&gt;37.5</td>
<td>2 (11)</td>
<td>1 (2)</td>
<td>4 (40)</td>
<td>3 (25)</td>
<td>3 (13)</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>14 (134)</td>
<td>10 (81)</td>
<td>22 (245)</td>
<td>10 (91)</td>
<td>10 (47)</td>
<td>10</td>
</tr>
<tr>
<td>Coarse Woody Debris</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m&lt;sup&gt;3&lt;/sup&gt;/ha &gt;10 cm diam.</td>
<td>50 (100)</td>
<td>&gt;25</td>
<td>&gt;50 (100)</td>
<td>&gt;50</td>
<td>&gt;50 (100)</td>
<td>&gt;50 (100)</td>
</tr>
<tr>
<td>Stems/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;17.5 cm dbh</td>
<td>&gt;40 (798)</td>
<td>&gt;400 (805)</td>
<td>&gt;400 (887)</td>
<td>&gt;400 (689)</td>
<td>&gt;300</td>
<td>&gt;400</td>
</tr>
<tr>
<td>Large Trees/ha.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;37.5 cm dbh</td>
<td>15 (83)</td>
<td>10 (37)</td>
<td>15 (145)</td>
<td>&gt;20 (175)</td>
<td>&gt;30 (144)</td>
<td>&gt;15</td>
</tr>
</tbody>
</table>

All tree species provide potentially useful snags and should be considered.

Techniques to maintain an adequate number of snags and provide future snags in managed stands include:

- retaining snags during harvesting;
- retaining green trees during harvesting as a source of large diameter snags in the subsequent rotation;
- creating stand conditions that will result in the production of future snags;
The Socio-Economic Realities of Brushing and Weeding

- retaining snags during spacing and thinning; and
- creating snags.

**Coarse woody debris:**

Decaying logs on the forest floor provide cover, microclimates, and breeding habitat for a wide variety of decomposer organisms, as well as for small mammals and amphibians. Sufficient amounts of woody debris--larger size pieces are preferable--should be retained in the stand when utilization standards are being applied and site preparation treatments undertaken.

**2) Large green trees**

Large, old, living trees, which offer several habitat attributes that young trees do not, should be retained. Arboreal lichens and other epiphytes are most abundant in older trees. Large green trees also provide a source of future snags.

Large green trees can be retained through a variety of silvicultural systems and harvesting activities.

**3) Tree species diversity**

A variety of tree species, including hardwoods, should be retained in a stand. Such diversity can meet the habitat requirements for a greater variety of organisms than in a homogeneous stand.

Tree species composition can be managed by harvesting, site preparation, regeneration; and stand tending activities.

**4) Diversity in understory plant communities**

The full range of native plants and plant communities naturally found in a forest stand should be maintained, at least in some stage of stand development. Understory shrubs and forbs provide food and cover for numerous species. To maintain understory vegetation, a partially open or patchy forest canopy is required.

Understory diversity can be achieved with site preparation, vegetation management, and stand tending techniques.

**5) Diversity in vertical and horizontal structure**

A variety of canopy layers--"vertical structure"--and variable stand and understory densities (including gaps)--"horizontal structure"--should be maintained. Such variety can create more habitat and microclimate diversity than could be created in a homogeneous stand.
Vertical and horizontal structure diversity can be maintained or created by silvicultural systems, site preparation, variable stocking, and stand tending activities.

Stand Management Recommendations

To achieve the stand attributes needed to maintain or enhance biodiversity at the stand level, the following methods should be adopted, where appropriate.

1) **Modified Silvicultural systems**

   **Clearcutting system**

   - Clearcutting initially converts the forest into an early seral habitat. It therefore benefits some species, but provides few of the habitat attributes required by mature forest species. Clearcutting practices, if used, should be modified so that the value of the early seral habitat is improved during harvesting and mature-forest attributes develop faster in the second-growth forest.

   - Some safe snags and green trees should be retained on all cutblocks. For safety, however, snags are not acceptable in work areas. They should be retained only within patches that are to be designated as no-work zones, or along cutblock boundaries if the snags are leaning away from the work area. Some options to consider are leaving patches of snags and green trees along small streams or swampy areas, in gullies or on rocky outcrops, and in other areas that are likely to pose harvesting, yarding or regeneration problems. Corridors for snag retention should also be designated along the cutblock boundary that will be retained when the adjacent cutblock is harvested.

   - Along with those left in snag retention patches, additional green trees should be left within the stand for their current biodiversity value as well as future snag value. Low vigour trees and trees with broken tops, for example, are good candidates to leave as snag sources. These trees can be left along the cutblock boundary to produce a feathered edge, or distributed within the cutblock.

   **Seed-tree and shelterwood system**

   Like clearcutting, seed-tree and shelterwood systems also convert the forest to an early seral habitat, but the leave trees initially provide more structural diversity than clearcutting does. That difference is lost, however, if all the leave trees are harvested once the site is regenerated. Furthermore, all snags are usually removed during harvesting.

   - If a seed-tree or shelterwood system is used, some of the leave trees should be retained throughout the rotation.

   - Within cutblocks or along their boundaries, no-work zones should be designated as snag retention areas.
Selection

Selection systems maintain many of the habitat attributes mature forests, although snag retention may be low if all snags have to be felled for safety reasons during each harvest entry.

- If a selection system is to be used, no-work zones should be designated within cutblocks as snag retention areas.

2) Harvesting and utilization standards

Different harvesting systems for a cutblock (ground skidding, cable, skyline, etc.) greatly affect an operator's ability to retain snags, coarse woody debris, live trees and, to a lesser extent, diversity of tree species and understory plant communities. The pros and cons of all these methods for maintaining biodiversity should be considered in the selection of a harvesting system.

- If mechanical harvesters are used to cut merchantable timber, and if snags and cull trees in the stand must be felled, then the stumps of the felled and culled trees should be cut as high above ground level as possible. High stumps hold some value for snag-dependent species.

- Harvesting in old-growth coastal forests usually leaves behind large amounts of slash. Retaining enough coarse woody debris to meet biodiversity needs is usually not a problem. Grapple yarders, however, often yard slash to the landing and create large slash piles. Slash should therefore be left distributed on the cutblock, not yarded to the landing.

- Harvesting in second-growth stands may not leave behind enough coarse woody debris to meet biodiversity needs. If that is likely to happen, then some marginal value logs should be left on the cutblock.

3) Site preparation

Site preparation can be a major factor affecting the presence and extent of coarse woody debris, tree and understory species diversity, horizontal structural diversity and, to a lesser degree, snags and large green trees.

- Slashburning is incompatible with the retention of snags and green trees. By charring the wood, it also reduces the value of coarse woody debris to some wildlife and other organisms. Slash should therefore not be burned unless it is essential for regenerating the site effectively or reducing fuel loading.

4) Regeneration

Regeneration can affect tree species diversity and vertical and horizontal structure.
- When it is ecologically appropriate to do so, stands should be regenerated with a mixture of tree species (natural and planted) rather than with a single species.

- To promote some spatial diversity in stands, the density and spatial distribution of stock would be varied at planting.

5) Vegetation management

Vegetation management can have a major effect on the diversity of tree species and the understory plant community.

- Some untreated patches or shrub-rows should be retained on a cutblock. Spot treatments are preferable to broadcast treatments.

- Untreated buffers should be left along permanent streams.

- Difficult sites, such as wet areas, should not be treated if successful control is unlikely.

- A component of hardwoods should be retained in a stand.

6) Spacing and commercial thinning

Juvenile spacing and commercial thinning can affect snags, tree species diversity, horizontal diversity and, to a lesser degree, large green trees and understory diversity.

- All safe snags should be retained, as well as some declining green trees that are likely to become snags.

- All large live trees (vets) left over from previous harvesting or disturbance should be retained.

- A variable stand density should be promoted:

- Some areas should be left unthinned so that dense patches develop. The mortality that results from plant suppression will create more snags.

- Wider spacing should be used in other areas to maintain a partially open canopy that will promote understory vegetation.

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  - Wider spacing should be used in other areas to maintain a partially open canopy that will promote understory vegetation.

For example, for each 40-ha area to be thinned, 2-8 ha (5-20-) should be left unthinned in patches of 0.5-1 ha in size; 2-8 ha should be thinned to lower stocking densities to create canopy gaps; and the remainder of the area should be thinned to normal stocking standards. These patch treatments should be matched to suitable site and terrain conditions.

- A mixed species stand, including a hardwood component, should be promoted.

- Obvious wildlife trails should be kept free of slash. There should also be sufficient breaks in slash distribution to allow plant and animal species to move across the treatment unit.

- Some of the trees to be removed should be left dead and standing to act as small snags.
7) Pruning

Pruning methods can affect understory plant community and vertical structure.

- A visual barrier of unpruned trees should be left along roadways to reduce disturbance of wildlife.

- Some unpruned patches should be retained within large pruning blocks to promote structural diversity in the stand.

- Pruning should be used to maintain or enhance the understory component of the stand.

8) Pest management

The management of pests affects snags, large green trees and, to a lesser extent, tree and understory species diversity and horizontal structure.

- Root rot pockets provide snags and gaps in the forest. Retention of these values should be considered before treatments are prescribed.

- In stands where green tree retention conflicts with mistletoe (or other pathogen) control, the selection of less infected hemlock and other species for green tree retention should be considered. If infected trees must be killed, they should be left standing as snags.

Table 3. Summary of Interactions Between Management Activities and Biodiversity Attributes

<table>
<thead>
<tr>
<th>Management Activity</th>
<th>Biodiversity Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Snags</td>
</tr>
<tr>
<td>Silvicultural System</td>
<td>**</td>
</tr>
<tr>
<td>Harvest Method</td>
<td>**</td>
</tr>
<tr>
<td>Utilization Standards</td>
<td>*</td>
</tr>
<tr>
<td>Site Preparation</td>
<td>*</td>
</tr>
<tr>
<td>Regeneration</td>
<td>*</td>
</tr>
<tr>
<td>Vegetation Management</td>
<td>*</td>
</tr>
<tr>
<td>Spacing and Thinning</td>
<td>**</td>
</tr>
<tr>
<td>Pruning</td>
<td>**</td>
</tr>
</tbody>
</table>

Note:  
** Indicates significant interactions (where the management activity has a major impact on the biodiversity attribute)  
* Indicates an important but less significant interaction.
The Socio-Economic Realities of Brushing and Weeding

References


Brushing and Weeding - Methods, Costs and Realities 
From an Industrial Forester's Perspective¹

Gary Hanson²

Table 1 summarizes P.I.R.'s total brushing & weeding program for the last 6 years. The company has logged approximately 8,000 hectares and has chemically and manually treated approximately 2,000 hectares (or 25% of the total). Our goal is to reduce that further to approximately 15%. How are we going to do that?

Planting:

Plant approximately 15% more trees/hectare than recommended by the Ministry of Forests.

Seed Orchards:

West Fraser Mills is currently involved in the Vernon Seed Orchard. Trees to be on line within 8 - 10 years. In the meantime, we are purchasing genetically improved trees from the Ministry of Forests.

Siberian Larch:

West Fraser Mills is tied to a seed orchard in Finland and this year will be planting approximately 8,000 seedlings of Siberian Larch. These trees are extremely fast growing according to our experience.

Table 1. Treatment / Harvesting Area Summary

<table>
<thead>
<tr>
<th>Year</th>
<th>Chemical B&amp;W (ha)</th>
<th>Manual B&amp;W (ha)</th>
<th>Grazing (ha)</th>
<th>Productive Area Harvested (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>141.5</td>
<td>-</td>
<td>Minor (cattle)</td>
<td>1575</td>
</tr>
<tr>
<td>1988</td>
<td>235.0</td>
<td>-</td>
<td>Minor (cattle)</td>
<td>1165</td>
</tr>
<tr>
<td>1989</td>
<td>465.3</td>
<td>-</td>
<td>Minor (cattle)</td>
<td>1483</td>
</tr>
<tr>
<td>1990</td>
<td>962.9</td>
<td>-</td>
<td>Minor (cattle)</td>
<td>1445</td>
</tr>
<tr>
<td>1991</td>
<td>51.6</td>
<td>13.2</td>
<td>Minor (cattle)</td>
<td>1194</td>
</tr>
<tr>
<td>1992</td>
<td>150.6</td>
<td>62.8</td>
<td>50 (sheep)</td>
<td>1300</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2006.9</td>
<td>76.0</td>
<td></td>
<td>8162</td>
</tr>
</tbody>
</table>

¹ This presentation was based primarily on a slide show.
² Gary Hanson is a forester with Pacific Inland Resources Ltd. (a division of West Fraser Mills Ltd.) in Smithers, B.C.
The Socio-Economic Realities of Brushing and Weeding

Local Nurseries:

We are extremely fortunate to have two local nurseries to deal with. We have developed good working relationships with the growers, allowing us to experiment with certain stock types and to ensure our stock is handled with utmost care.

Use Of Gromax:

We have been using Gromax operationally now for two years. The results, in terms of top and root growth, are very encouraging.

Grass Seeding:

We have been involved with the Ministry of Forests and local ranchers on grass seeding projects for approximately five years. Results are encouraging. We have not tried any of the new grass mixes that inhibit brush.

Stock Types:

Our program consists mainly of pine and spruce 313, however, we are moving towards 20% of two year old plugs. Gromax will be tried on the 415's this spring.

Timing:

Probably the single most important way to reduce brushing and weeding is to reduce regen delay. Prompt site treatment, followed by planting and brushing and weeding (if needed) has a major influence on our brushing and weeding and fill planting program down the line (see case history in Table 2).

Table 2. Case History - C.P. 511 (4)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Year</th>
<th>Species</th>
<th>Stocking (s.p.h.)</th>
<th>Mean Height (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logged</td>
<td>Feb. 1985</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine Treated</td>
<td>Mar. 1985</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planted</td>
<td>May 1985</td>
<td>Sx</td>
<td>1338</td>
<td>0.16</td>
</tr>
<tr>
<td>Survey</td>
<td>1987</td>
<td>Decid./Sx</td>
<td>6456/1274</td>
<td>-/0.32</td>
</tr>
<tr>
<td>Vision Treated</td>
<td>1987</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F.G. Survey</td>
<td>1992</td>
<td>Decid./Sx</td>
<td>225/1643</td>
<td>-/1.80</td>
</tr>
</tbody>
</table>

So this is how we plan on reducing our brushing and weeding program, but what factors could turn around and increase the program in the future?
Harvesting at Higher Elevations:

We are definitely moving higher on the hillside to address the Bulkley T.S.A. species and quality profile. Machinery has been developed to harvest these sites in an environmentally safe manner, but what about silviculture in the ESSF? There have been many problems with seedling survival and growth reported elsewhere in the province at the higher elevations. Our experience is limited, however, our six year old plantations are performing well with an absolute minimum of brushing and weeding.

Harvesting Systems:

As we move away from 80 hectare clearcuts to an average of 40 hectare, with many blocks containing "New Forestry", partial cuts, etc., a certain amount of uncertainty exists re brushing and weeding.

Reduction in Prescribed Fire:

The past 10 - 15 years has seen an aggressive prescribed fire program with associated successful plantations and minimal brushing and weeding. With a reduction of that program on the horizon (public pressure, small blocks, high costs), the effects on our brushing and weeding program remain unclear (i.e., more mechanical site prep, planting direct, etc.).

In spite of our best efforts to limit brushing and weeding, certain areas will be in need of it. We use Vision® for the majority of these areas, however, girdling (with an all native crew) and cattle and sheep have been used to a lesser extent. Our approach is to work with people for reasonable solutions on the whole brushing & weeding issue; it's going to require that our staff, the various agencies, native groups, environmental groups, etc., reach common ground. Talk is relatively simple, but action, results, and success stories take a lot of hard work.
The Socio-Economic Realities of Brushing and Weeding

Zen And The Art Of Forest
Vegetation Management

Glenda Ferris

In the succession, pioneer species are the sprinters, old-forest species the long-distance runners. The violent changes and a clearing of land bring all species briefly to the same starting line.

The Diversity of Life
Edward O. Wilson

How do we believe that we can predict and control the natural forces of the universe (earth) (forest)? Through clever intellectual manipulations and tool usage.

Magical Child
Joseph Chilton Pearse

I would like to thank the Association members and in particular, Steve Thorpe, for giving me this opportunity to talk with you today about "vegetation" management on our public forest lands. To correct the agenda page I must tell you that I am not from the Smithers area. I have lived for over twenty years on the Buck Flats, south of Houston.

I am also not an environmental group, nor do I come here today speaking on behalf of one. My husband and I have close ties and affiliations with various organizations such as the Lakes' District Friends of the Environment, but I prefer to speak to you as a local resident, a member of the public at large.

Since 1989 I have become involved with forestry issues within the Morice Forest District. My education and refinement continue as each day passes. I have been a member of the Morice River Local Resource Use Plan (LRUP) Committee and participated within other planning projects. I am a member representing local residents of the Morice Forest District Advisory Committee.

My husband, Hap, works at the Northwood Pulp and Timber mill in Houston. We live in a log house that we built ourselves on a wild quarter section in the middle of forest land next to Buck Creek.

I have never personally appealed a pesticide use permit application. The structure of the appeal process insures that members of the public, while expending great amounts of energy, time, and personal resources, will lose as long as these chemical poisons are licensed for use in Canada. Since Forest Ministry policy is to continue approving chemical intervention within

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1 Glenda Ferris is a concerned citizen living near Houston B.C. She has been an active participant in several public involvement initiatives of the Ministry of Forests.
reforestation/silviculture programs, appealing pesticide applications is a political statement of opposition to policy, the appeals are usually denied, and the spraying continues.

Today I intend to address my comments to the environmental cost of present-day vegetation management: how damage to ecosystem function may impact upon our long-term timber production goals and the maintenance of our forest resources. However, I must also say that there are socio-economic costs associated with a continuation of forest-policy chemical dependence and the commerce involving hazardous materials. Each day the public is exposed to risk from the factories producing these poisons to the flawed transportation system of derailments and defective tanker cars to the cost of land-filling the waste stream of contaminated plastic containers. In spite of these costs, the spraying continues.

Within the Morice District I have on many occasions discussed specific herbicide treatments with forest industry and Ministry personnel. I have spent many hours walking through helicopter sprayed blocks discussing "reality", vegetative response, with Dave Mayer and Doug McRae from Northwood and Gord Wolfe from the Fish and Wildlife Branch. Forest industry professionals Mike Dunbar, Tim Smith, Lowell Johnson and John VanderEnde have also shared their perspectives with me. Dave Francis, Ray Schultz, Brian Simpson and Rod DeBoise from the Morice District Office have also taken the time to listen to my objections regarding specific herbicide treatments. Lots of talk and the spraying continues.

Some of you may have been having variations of my conversations. Some of you may have noticed the excessive impact to and the destruction of habitat and forage vegetation across the spectrum of herbicide treated blocks. The poisoning of pioneer species naturally occurring within initial seral stages has been implemented to enhance crop tree survival and growth. What if this silviculture paradigm is not true?

It has become obvious to me that the silviculture professionals consider long-term time frames in years, say 5 to 8, or until crop trees are "free-to-grow", 10 to 12 years. A real forest manager, however, should view this forest land in its appropriate scale of time. Even if we are only managing for timber, the long-term must extend to 60 years or more here in the Morice District. Herbicide applications do indeed produce initial increased crop tree growth short-term but how well will these stands continue to grow?

Is it possible that only habitat biologists and some forest ecologists are aware that there are many subtle and dynamic relationships functioning during initial seral stages of forest succession, such as nitrogen fixation by alder, that are beneficial to crop trees? Will our forestry policies continue to be so short-sighted and limited that we will not only damage long-term biodiversity objectives but will also sacrifice long-term timber productivity as well?

Even in areas, such as the Morice River LRUP, where an attempt has been made to protect biodiversity, contravention of our long-term objectives occurs on a block by block, PHSP by PHSP basis. The Plan states that there will be no volume reduction of aspen. Each year the river corridor loses aspen to age and to natural spruce succession. Yet recruitment of new aspen regeneration is prevented because the herbicide spraying continues.
We do not manage for early seral forest stages; we modify them all into tree plantations. There is no management plan, only a block by block search and destroy mission.

How did we get to this place? I feel distrustful of and abused by a group of forestry professionals that have aligned themselves and their management policies to a chemical corporation, Monsanto, that now has a criminal record. You forest managers in turn are certain that I am too stupid or too ignorant to understand the tools you need to use to raise a new crop of trees. You are worried that I am going to take away your chemical weapon. I in turn am convinced that your policies and practices have already damaged important natural components cut-block by cut-block across our new "managed" forest landscape.

Since there is a great resonance among the people of this province that we do not want anyone using poison on our public forest lands, professionals have begun to concern themselves with placating our objections with an "information" campaign attempting to convince us that these herbicides are safe. These professionals also continue to insist that sound, productive forest management demands chemical intervention. It is a mistake for any of you to view public opposition to herbicide use in simplistic terms of human safety and of acute toxicity. These aspects are a concern to me but my main concern is the viability and health of our forest resources.

Our socio-economic structure has allowed accelerated rates of timber harvest throughout British Columbia that are not sustainable. The base upon which this exploitation has been justified continues to be reforestation and silviculture. "Don't worry, folks, we'll grow all this back in 140, 120, 100, 90, 60 years. The operational imperative has become implicit; "we" need to grow more trees, faster. This is when you people became very important and TIME, while always a consideration, became a critical obstacle to be overcome.

Herbicides are used to save time. All of us know that we cannot save time; we can only spend it. We can spend it wisely by creating long term plans that work to insure self-sustaining functional productivity on our forest land. Or we can squander our precious time pursuing unrealistic management goals that actually compromise and endanger our reforestation objectives.

Many of us have the opportunity to walk through your place of "vegetation management" work because it is our public forest land. The reality is everywhere. Initial seral stages containing wildlife habitat, preserving nutrient cycle, maintaining hydrology and soil stability, even providing protection to crop trees from insect pests, frost, and snow damage are gone, replaced by single species tree plantations.

Forestry professionals inform the public that they are creating a mosaic of seral forest stages across the landscape of British Columbia. The most recent version from the Forest Alliance is a little more honest. The latest statements are that we are creating a mosaic of age classes (trees) across the landscape. Unfortunately, both of these statements are simply not true. The natural ecosystems disrupted and the timber volumes removed from forest land in the last twenty years represent the vast majority of management in British Columbia history. To a human, particularly the short-sighted North American variety, 20 years may seem like a long time, but to a forest 20
years (even in our human terminology) is ONE AGE CLASS. We have created an unprecedented
forest-land disruption that is essentially all the same age.

This collection of tree plantations will be completely vulnerable to a wide variety of "forest
pests" and disease. For the most part our silviculture policies have removed many of the natural
symbiotic protection systems that pioneer species would have provided these crop trees.
Herbicide treatment of forest land may only be the initial chemical stage that will soon require
forest "managers" to provide fertilizer and regular pesticide applications. It is time to re-think the
policy and begin to recognize value in the diversity of natural systems.

Biodiversity is not a cause or conspiracy inspired by the preservationist radicals of society. It is
real. This diversity protects and enhances the long-term growth of trees, of forests, and of
humankind.
I have been asked to address a couple of difficult questions related to the controversy over herbicide use in B.C. Forestry. They are: "Is there any Compromise?" and "Are chemicals still part of the Formula?"

Well today you have been hearing different perspectives on this controversy and I am sure that most of you have been involved in herbicide appeals or have witnessed public demonstrations or otherwise experienced this controversy in some way. So given that there is so much controversy, how likely is it that herbicides will continue to be used by silviculturists in the management of our forests?

Well to tell you the truth I don't really know. What I do know is that there are many forest managers who believe that the writing is clearly on the wall and that within the next few years herbicide use in B.C. forestry will no longer be an option. There is certainly a great deal of evidence to support this contention. Here are a few examples:

- As you all know, there is a determined, knowledgeable, and skilled network of organizations and individuals actively opposed to herbicide use in B.C. and in the world. These people utilize the media, the environmental appeal board, protests, civil disobedience, political lobby pressure, and many other effective techniques which make herbicide use; at best difficult and time consuming; and sometimes perhaps even impractical.

- Both media coverage and the treatment of herbicides in the education system tend to be unfavourable.

- Many other forestry jurisdictions have reached the point where forest pesticide use has been severely restricted or banned outright. Sweden, Alberta and U.S. public forest lands in the Pacific North West are examples which you are probably all familiar with.

- In B.C. we have seen a steady increase in the number of forest districts and forest companies abandoning the use of herbicides.

- Finally, and most importantly, the general public is clearly concerned about forest herbicide use. This has been demonstrated in some recent public opinion polls. A 1991 Environics Research poll commissioned by Forestry Canada showed that 81% of Canadians think that "Chemicals used in forest management pose a hazard to human health and the environment" (Forestry Canada, 1991). Interestingly, a similar poll conducted in 1990
showed that 37% of Canadian professional foresters also shared that view (Forestry Canada, 1991). In a 1989 national survey, Environics determined that 71% of Canadians "strongly or somewhat oppose the use of chemicals in Canada's Forests." (Forestry Canada, 1989). Figure 1 shows how that statistic looks regionally, and you can see that it is fairly consistent across the country with B.C. slightly below the average.

So back to the questions I was asked to address. Given that there are all of these indicators suggesting that the days are numbered for herbicide use in B.C., is there some way that we can put forward scientific or economic arguments that will change public opinion and alter this direction.

Well the best that I can do is to give you a resounding "Maybe".

There are examples in B.C. where public communication efforts have been successful in implementing pesticide use programs. The spraying of Bt over Vancouver last year comes to mind and there are examples of districts like Chilliwack that have managed to overcome initial local opposition to herbicide use by knocking on doors and communicating with the people affected. There are also examples where communication efforts have not been successful.

What I would like to suggest to you is that even though the outcome is uncertain or even if you believe that herbicides are on the way out, there are some compelling arguments for attempting to find a compromise and to continue with the judicious use of herbicides in B.C. forest management.

Figure 1.

FAVOUR OR OPPOSE USE OF CHEMICALS IN CANADA'S FORESTS?
The Socio-Economic Realities of Brushing and Weeding

One of the reasons I was asked to address this topic was because of my experience in the Nelson Forest Region herbicide controversy. I think the degree of controversy in the West Kootenays was about as high as we have seen in B.C. Some of you may recall that we progressed through public meetings to appeal hearings, protest rallies, and even a few cases of civil disobedience. This ultimately led to the suspension of spraying plans.

Throughout that conflict we learned a lot about controversy management. But more importantly, our experience with alternative vegetation management treatments in the Kootenay Lake and Arrow districts convinced me, and most of the district and regional staff involved, that it was worth trying to arrive at some form of compromise to get herbicides back into the formula. What I'd like to do for the next few minutes is discuss some of the reasons why we came to that conclusion.

Why Bother?

One of the first questions that we asked ourselves was "why bother"? Dealing with the herbicide controversy is very time consuming, it's clearly an unpopular pursuit with some of the public and special interest groups, and it can be an unpopular pursuit with management and colleagues within an organization. I have seen many examples of this because as I noted earlier many people feel that the herbicide issue is a lost cause and not worth the effort or frustration. We felt it was worth the effort for the following reasons:

- Costs or economics
- Long and Short Term Timber Supply Impacts,
- Worker Safety, and even
- Environmental Impacts.

Let's look at these in a little more detail.

I'm sure you are all familiar with the differences in costs between alternative vegetation management treatments so I won't spend too much time on this, but consider what would happen if herbicides were suddenly no longer available for use in B.C.

Newhouse Woodland Consultants did a provincial brushing cost evaluation in 1992. (Newhouse and Newhouse 1992). Table 1 lists average costs per hectare to achieve the vegetation management objective for different treatment and brush type combinations from 31 Ministry projects conducted in 5 districts. The management objective is "free growing" or plantation survival and the costs are all found in that they include planning, prescriptions, agency approvals, overhead and supervision. Also included is a measure of the costs of alternative methods relative to those of herbicide application. For example, to achieve the management objective in herbaceous types, weed whipping at $2410/ha costs about 8.5 times more than aerial application of herbicides at $283/ha. These figures clearly show that alternatives to herbicides significantly increase brushing program costs on a per hectare basis, but what is this impact in terms of annual budgets?
Table 1. Average Costs for 31 Brushing and Weeding Projects in Five Forest Districts

<table>
<thead>
<tr>
<th></th>
<th>Power Saw Mixedwood</th>
<th>Weed Whip Herbaceous</th>
<th>Back Pack Mixedwood</th>
<th>Backpack Herbaceous</th>
<th>Aerial All</th>
<th>Sheep Herbaceous</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Cost/ha</strong></td>
<td>$670</td>
<td>$2410</td>
<td>$850</td>
<td>$579</td>
<td>$283</td>
<td>$840</td>
</tr>
<tr>
<td><strong>Cost Relative to Aerial Herbicides</strong></td>
<td>2.4</td>
<td>8.5</td>
<td>3.0</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Notes:  
- Values represent costs to reach management objectives (free growing).  
- Costs are all found including planning, prescriptions, agency approvals, and overhead/supervision.  

Figure 2 illustrates Silviculture Branch estimates of the increases required to fund the Ministry's 1993/94 program goals at various levels of herbicide use. The difference between no decrease and eliminating herbicide use is about 15 million dollars (Ministry of Forests, 1993). This only considers the added cost for one treatment. In the Newhouse study it appears that manual brushing on sites where herbicides are the preferred option has to be repeated about 3 times and this is certainly consistent with my experience. This means then that there is a compounding effect from year to year and even if we use a conservative figure of two manual treatments the required budget increase could be more like 30 million dollars each year. Also remember that this figure accounts for ministry funded brushing only. Industry undertook 62% of the herbicide use in 1991 (Boateng, 1992), so if we directly extrapolate the ministry figures, industry could be looking at increased annual budgets in the order of 49 million dollars. Obviously I haven't derived these figures from any detailed analysis (and such an analysis needs to be done), but I think they serve to illustrate in very rough terms that there is a huge potential cost associated with a decision to ban herbicide use in forestry.

Given the economic and fiscal climate which industry and government are currently operating in, and are likely to continue to operate in, I think we need to seriously ask ourselves if there is evidence to support abandoning herbicides in consideration of these costs. This is a social decision but I believe that it is our responsibility to ensure that the
question be examined with full knowledge of the costs. It is my view that herbicide use decisions are currently being made in B.C. without fully assessing these cost implications.

Now, after having looked at this cost issue in isolation I would like to say that what I think is more likely to happen if herbicide use was abandoned is a combination of increased costs and a reduction in areas treated. Less area will be treated because the required budget levels I just mentioned will probably not be available and foresters will be reluctant from an economic perspective to spend that kind of money on many sites. In response to this and other factors I have no doubt that there would be tremendous pressure to lower our free growing standards and reduce the amount of brushing done in the province.

So what would be the implications of a reduction in the amount of area treated? Well these implications are the long and short term timber supply impacts that I mentioned earlier:

1. Long term timber supply will be reduced primarily due to the effects of increased regeneration delay and establishment of less than full stocking; both of these factors reduce mean annual increment (MAI) and therefore long run sustained yield (LRSY). In a 1992 case study conducted by Deloitte and Touche management consultants, it was concluded that "In the Fraser TSA, uncontrolled competing vegetation can reduce the sustainable harvest level by as much as 9.4 per cent."(Ministry of Forests, 1992). It was also concluded that vegetation management with herbicides could yield a 4% increase in added wood supply over manual methods at about one half the cost. Table 2 shows the expected impact on regeneration delay for three treatment types. Regeneration delay is expected to increase significantly with no treatment and even with manual treatments in various analysis units within the Fraser TSA. The impact of these increases on LRSY are illustrated in Figure 3 where projected LRSY with herbicide vegetation management is significantly higher than the "no treatment", levels.

<table>
<thead>
<tr>
<th>Analysis Unit</th>
<th>Chemical</th>
<th>Expected Additional Regeneration Delay (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Manual</td>
<td>Do Nothing</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>20</td>
</tr>
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<td>10</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

1. Low and high range estimates were used in all instances to reflect the degree of uncertainty of efficacy.
Source: Deloitte & Touche (1990)
2. In addition to these long term impacts the short term wood supply would also be affected because it will take longer for cutovers to reach green up, thereby delaying the availability of adjacent blocks.

These timber supply impacts cannot be taken lightly. Many people speculate that allowable annual cuts will soon decline in Timber supply areas and TFL’s throughout the province in response to a number of factors. Considering that it is estimated that each 1000 m$^3$ of wood harvested creates 2.6 jobs and $97,000 of value added in B.C. (Ministry of Forests, 1992), the impact of reductions in timber supply to resource based communities is of great concern. In consideration of the socioeconomic implications I would contend that it is critical that we identify options in forest land management planning which optimize productivity on those lands designated for timber production, in a manner consistent with integrated resource management objectives.

Moving from timber supply let’s take a look at worker safety. I wasn’t able to come up with any B.C. data on this but I did come across a report prepared by the Ministry of Natural resources in Ontario, (undated), which stated that reportable injuries were 14 times more frequent on manual tending projects than on aerial or ground herbicide projects. It also noted that the ratio of time loss is 39 days for manual work for every one day of time loss associated with herbicide work. If
only aerial application is considered the injury rate is 95:1 and time loss is 263:1. Incidentally, none of the herbicide project injuries were related to exposure to the chemical but were in fact back and ankle sprains. These figures are certainly significant from a human welfare point of view but they also can be considered in terms of real social and fiscal costs to the health system, WCB and so on. There is of course the argument that this compares acute health effects and not chronic or long term effects. I won't argue that point other than to say that I am not aware of conclusive evidence to suggest that there is a significant long term health risk associated with properly using Vision® herbicide.

My final point on the rationale for continued herbicide use is environmental impact. All I'd like to say on this is that would contend that herbicide treatments on backlog site rehabilitation projects can be environmentally much softer some of the mechanical work that I have seen.

How to Reach a Compromise Solution

There are two fundamental things that must happen in order to reach a compromise:

1. First we need to clearly and accurately (emphasis on accurate), define the vegetation management problem. Or in other words, we need to quantify the implications of discontinued use of herbicides in terms of annual costs, timber production effects, and worker safety (all those things mentioned earlier about why we should bother pursuing a compromise). If this were to accomplish nothing else it would at least ensure that policy decisions would be made with full knowledge of the implications.

However, just defining the problem alone won't be enough. In the 1991 Environics survey, Canadians valued the forest as a source of economic wealth and jobs fifth in importance while protection of Canada's water, air and soil was ranked first. (Forestry Canada, 1991). So clearly if we are going to reach a compromise we will need to demonstrate to the public and the decision makers that herbicide use is sound from both an environmental and human health perspective.

2. The best way to do this through the development and implementation of a provincial controversy management (or communications) strategy which is widely supported by the forest service, industry, government, and the professional and academic institutions. Some preliminary ideas on what such an effective strategy would address and/or establish are listed below. This assumes that the problem definition supports continued herbicide use and that herbicide use is considered to be sound from an environmental and human health perspective.

- First it must be recognized that long term commitment and focus is required. It has taken several years for public opinion to form and it is not going to change over night.

- Accurate and understandable technical and scientific information about vegetation management and herbicides must be produced, and this information must be effectively communicated to the public at provincial, regional and local levels.
Communications should be directed at local opinion leaders, the general public and the education system.

- The effectiveness of communications would be enhanced by addressing all forestry issues in an integrated fashion. For example it is difficult to discuss vegetation management without addressing issues such as clear cutting, biological diversity, and hardwood management.

- Inaccurate information in the media should be responded to pro-actively. In his paper titled "Pesticides and People. How Environmentalist Politics and Bad Journalism Banned DDT", Dr. J. Gordon Edwards (1983), states that "The major obstacle to the dissemination of truthful factual information about nutritional and environmental matters has been the apparent bias of much of the news media. The press is eager to publicize 'kooky' views, while refusing to report well-documented data provided by qualified authorities." Fairly harsh words but I am sure that most of you have encountered what you would consider to be sensationalist journalism associated with the pesticide issue.

- Accurate estimates of planned herbicide use must be established. In my experience one of the issues which frequently surfaced was that some people were concerned that the herbicide program would grow out of control. I think we should tell people how much herbicide use is needed to catch up on backlog reforestation and how much is estimated to be required on an ongoing basis for current areas.

- Our performance in implementing vegetation management programs must be credible. We must be seen to be actively pursuing and using all vegetation management techniques where they are most suitable (including a clear emphasis on preventing vegetation management problems). And clearly we must demonstrate excellence in implementing herbicide programs.

- Development of demonstration areas showing various vegetation management techniques would be extremely useful in communication efforts.

- Cost benefit analyses, like the Fraser TSA study I referred to earlier, and other research programs are critical to the further development of the information that we want to communicate.

- Consistency in controversy management activities within and between the forest service, industry, and professional and academic institutions is very important. We have to remember that actions taken in one forest management unit affect the rest of the province. For example, the efforts of one district or company that has a lot at stake in maintaining herbicide use can be severely denigrated by other districts or companies who choose to abandon herbicide use if they do so in a manner which supports contentions that herbicide use is environmentally unsound. I believe that there are TSA's where it is not worth managing a herbicide controversy because climate and site conditions are such that vegetation management problems are
The Socio-Economic Realities of Brushing and Weeding

minimal and alternatives are feasible. Or perhaps it's because other forest management issues are a priority. Regardless, I think it is very important that operators in these areas continue to publicly support the judicious use of herbicides in those areas where they are needed.

- Senior Management commitment and support of the strategy is a must.

- Finally, implementation of the strategy must be directed by an action plan which includes the identification of the fiscal, human and other resources needed to implement the strategy. As I discussed earlier it seems evident that there are significant benefits in maintaining the herbicide program so surely a good case can be made to secure the appropriate level of fiscal and human resources needed to effectively manage the controversy.

As mentioned earlier, there are no guarantees that a strategy like this will work and certainly the development and implementation of the strategy would be a mammoth task. I do think however, that we must accurately quantify the implications of reduced herbicide use and following that, if we do not adopt a strategic approach to managing the controversy it is likely that we will lose the herbicide option.

References


Vegetation Management In The Mid 90's: Future Direction Of The Ministry Of Forests

Jim Snetsinger¹

WHERE ARE WE AT TODAY???

BUDGETS

- the provincial government is in a very tough financial situation as are other governments throughout Canada and North America

- we are all being asked to do more with less

- this year the Ministry of Forests was asked to return approximately $21,000,000 to assist in reducing the provincial deficit for Fiscal '92/93

- the budget projections for next fiscal year don't look rosy. The Ministry of Forests will be very lucky to maintain the same level of funding which we received this year.

Provincial Brushing and Weeding Budget in 1991

<table>
<thead>
<tr>
<th>Goals (ha)</th>
<th>$</th>
<th>% of Total B&amp;W Costs</th>
</tr>
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<tbody>
<tr>
<td>Chemical</td>
<td>20,682</td>
<td>4,812,870</td>
</tr>
<tr>
<td>Man/Mech</td>
<td>16,497</td>
<td>10,725,925</td>
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</table>

B & W GOAL ACHIEVEMENT

- over the past few years the goal achievement in both the Ministry Outstanding and Industry Outstanding Programs has been significantly less than planned (73% in 1991)

- at the third quarter of this fiscal year we were projecting to achieve approximately 70% of our provincial brushing and weeding goals.

- this red flags a very disturbing trend: B & W treatments are not being carried out to planned levels. So either the plans were inaccurate or decisions to delay/not complete B & W treatments are being made.

- plans are continually fine tuned so this would account for part of the under achievement. However, it certainly appears that the bulk of the situation arises from decisions to delay or not treat.

¹ Jim Snetsinger is the Regional Staff Manager, Forestry, Prince Rupert Forest Region, Smithers
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- the implication of this is that we could be and likely are creating a significant silvicultural liability which could have serious timber supply impacts if not addressed.

SHIFT IN THINKING AND APPROACHES

- as a result of public controversy surrounding herbicides a number of forest managers have been trying innovative techniques to deal with vegetation management problems

- we've seen increased use of biological techniques such as sheep, cattle, managing vegetation with grass seeding, etc.

- we've also seen the introduction of biodiversity concepts into forest management and many are questioning how this fits into our vegetation management programs and standards such as "free growing".

FUTURE DIRECTION OF THE MINISTRY OF FORESTS

Given the tight fiscal situation we are facing, the Ministry of Forests will be taking an even tighter look at how its dollars are being spent. Gone are the days of a bottomless bucket of silviculture funds.

WHAT ARE WE GOING TO BE DOING?
CONTINUE TO DEVELOP ECONOMIC ALTERNATIVES

- sheep in the Prince Rupert Forest Region are costing as much as $600/ha/yr

- in most instances in this region where sheep are used they will be required two years in a row.

- Other areas in the province have managed to get their costs down but they have been using sheep for a number of years now and have their costs down to a reasonable level (i.e. approx. $150/ha). This may not be comparable to the Prince Rupert Forest Region for a number of reasons.

- Sheep use is a relatively small component of the total program and will likely continue that way. MOELP has numerous concerns with sheep use.

STRESS TIMELY BRUSHING

- Deloitte and Touche have conducted an analysis for the Ministry of Forests in the Fraser TSA

- as mentioned by a previous speaker, there is a significant impact on LRSY if we don't manage competing vegetation and a significant yield gain if we do carry out treatments using herbicides vs. manual at approx. half the cost.

- foresters must be looking at regen survey results early and determining if a treatment is required or if it can be postponed. We must not miss that first window to carry out ecologically appropriate and cost effective treatments.

- by the same token there may be many sites where treatments can be delayed and reassessed at the next critical stage of stand development.
WE NEED BETTER CROP PLANNING AND DEFINITIONS OF DELETERIOUS VEGETATION

- management objectives need to be clearly stated up front and not created by default.
- how many hardwoods do we want to see left on a site
- at present we are managing for conifers, this is not to say that hardwoods are not wanted or beneficial (i.e. biodiversity and weevil proofing). It is coming up with that optimal mix that we must strive for. In the meantime we can not abrogate our basic silviculture responsibilities.
- There is a lot of work going on around the province related to this subject. This is a very high priority for the Ministry of Forests.

INTERNAL MINISTRY REVIEW

- The MOF is presently completing a review of 12 Districts in order to assess the impacts (i.e. costs and wood supply impacts) of reduced herbicide use.
- This information will be presented to the MOF Executive and they will decide how far they want to go in endorsing judicious use of herbicides.

At present we have one District who is spending approximately 11% of the provincial B&W budget due to a decision not to use herbicides. There is no apparent benefit or recognition to Districts who use herbicides and endure the personal abuse or threats when trying to implement a balanced cost effective brushing program.

At some point our Ministry is going to have to decide if they want to ask the government for the $14 Million dollars should the decision be made to discontinue the use of herbicides.

This is really a social question as increased expenditures in B&W likely mean decreased services somewhere else in the system.

Ministry staff are looking for a more well defined policy environment to guide our vegetation management program.

PREVENTIVE TECHNIQUES

In combination with better crop planning and defining competitive vegetation we must continue to emphasize the other silvicultural techniques which will minimize the need for B&W generally and herbicides more specifically. Techniques such as:

- timely planting
- optimal site prep methods
- larger/improved stock
- species selection
- planting techniques
- seeding with non competitive species to dampen effect of competing vegetation and also improve range.
- alternate silvicultural systems
CONCLUSION

- continue to develop (economic) alternatives
- stress timely brushing
- better crop planning and definitions of deleterious vegetation
- complete the internal review; develop a more well defined policy environment concerning vegetation management
- stress the implementation of ecologically appropriate and cost effective treatments.

- COMMUNICATIONS/KNOWLEDGE!!!
Corporate Pest Management Plans

Jerry Vakenti

As vegetation managers in forestry, you are clearly facing a variety of challenges and a pace of change that is unparalleled in living memory. You are subjected to complex and often conflicting demands from government agencies, environmental groups, other stakeholders and the general public like no other field. In some cases, these external pressures can leave you between the proverbial "rock and hard place" with few options in sight.

The pace of change I alluded to is a result of both societal pressures and our own evolving perceptions of environmental standards and desirable management practices. Overlaying this with the unfortunately familiar experience of being asked "to do more with less" in an economic environment that provides increasingly scarce resources to fund our activities, further impacts your options. The challenge of using or not using herbicides in forestry vegetation management programs is not going to be easy considering these factors.

Our Ministry is affected by many of these same factors (in issuing a permit we find our judgment questioned often). Given our close relationship with forestry, changes in the approach the Pesticide Management Program takes in fulfilling its mandate will inevitably impact your operations.

What we would like to do is give you a sense of where our program is now and where it is going.

The Pesticide Management Program is responding to the ongoing controversy regarding the use of pesticides in B.C. in a number of ways. There is an increasing expectation for us to be stewards of the environment as are our colleagues in Waste Management, Water and the Fish and Wildlife Branch. This has meant a fundamental shift in emphasis for our Program. Webster's definition of stewardship, "... responsibility to manage his life and property with proper regard to the rights of others" has meant a fundamental shift in emphasis for our program.

We have been primarily considered as an agency which trains people to apply pesticides responsibly, to license use (i.e. the permit system) and to react to incidents of misuse and complaints. During the past two years, our program has spent a great deal of effort in formulating a Strategic Plan, which we expect will begin to address concerns regarding the regulation and use of pesticides in B.C. (some copies of our New Directions in Pesticide Management are available if you haven't seen it as yet).

Of the 3 main strategic objectives, promote IPM (pest management activities), regulate pesticides and monitor their effects and inform the public, promotion of pest management activities has been viewed as a catalyst for change in the way pesticides are used. Stakeholders from around the province agreed in principle that our program should move in this direction, although an unanimously acceptable definition of IPM (pest management) was not agreed upon at a meeting in Vancouver last March.

1 The author holds the position of Regional Manager, Pesticide Management Program, Skeena Regional Headquarters (Smithers), Ministry of Environment, Lands and Parks. The paper was presented at the meeting by Susan Hoyles, Regional Manager, Pesticide Management Program, Northern Regional Headquarters (Prince George), Ministry of Environment, Lands and Parks.
Integrated Pest Management, or IPM as it is commonly called, is both a widely accepted approach to pest management, and it is now a primary core strategy for the Pesticide Management Program.

IPM is a term familiar to all of you in that you have been using elements of this approach for some time. Among other initiatives, one of our major policies will be to encourage major pesticide users, including applicants for pesticide use permits, to design and implement Pest Management Plans (PMP's). As part of our legislative renewal starting in 1993, PMP's will be introduced into legislation and become enforceable. In many sectors, pesticide use in the future will only be allowed under the umbrella of an approved PMP (forestry, industrial veg., mosquito, urban). "Pest Management Plan" means an ongoing comprehensive plan which evaluates and utilizes available techniques in managing pest populations in an environmentally and effective manner.

Steve Thorpe's invitation to talk about pest management plans at this meeting was timely in that it kick-started our program to move from a strategic idea to the process that defines the contents of pest management plans. This meeting becomes our first opportunity to discuss where we are in this process. I think you will find that we have more questions than answers and we look forward to your comments today and over the next few months.

Many of the comments we receive from the public in 8.C. indicates there is a perception that forest herbicide treatments are applied on a routine, ad hoc basis with little regard for vegetation management planning and that non-chemical options are never considered. In many respects, the pesticide use permit process has not been an effective vehicle for conveying the level of planning involved in deciding why a specific herbicide application was chosen for a particular target species or vegetation complex. PMP's, we believe, will help to answer these perceptions in that they will describe in greater detail the basic components of IPM planning which have already taken place to reduce the level of competition between crop trees and other vegetation. A talk on pest management plans would not be complete without some reference to the basic components of IPM and definitions. I intend to keep this short other than to key in on several elements which describe optimum pest management planning and the underlying principles behind IPM.

**IPM Definition (Beirne 1967)**

"Integrated control, or pest management, does not imply the use of any particular kinds of control agents or procedures. It is the use of the best combinations of controls in organized ways that are designed to avoid harm to anything but pests. Most controls are applied with one objective: to control the harm that pest cause."

It is interesting to note the wording, "defined to avoid harm to anything but pests". The definition expresses a duality in purpose associated with pest management planning and plans. It also suggests a balance between producing a productive forest crop and other beneficial resource values.

**Basic Components of IPM**

1. preventing pest problems, e.g. harvesting techniques, site preparation, optimum scheduling of planting, stock size

2. monitoring pest damage, e.g. percent vegetation cover surveys

3. establishing treatment thresholds, e.g. competition indices, free growing and stocking standards
4. Use best combination of controls to reduce populations below thresholds in consideration of other values, e.g. reduced rates, selective application, manual methods, sheep

5. Evaluating the effects and efficacy of pest treatments, e.g. NIVMA plots, vegetation recovery studies

I will have with you the notion that the selectivity of the controls used in forestry vegetation management programs will be a key element in optimum pest management planning.

It is highly probable that the design and implementation of a Pest Management Plan that addresses all the components of IPM will involve an increase in time and resource commitments. Economic and other real world realities will dictate the level of pest management possible but communicating the direction of a vegetation management program is a vital step.

We would like to let you know where we are in defining the content of PMP's and the process for introducing them into legislation. We expect the process to begin with the drafting of a generic pest management plan that addresses some of the following questions:

1. Contents of Plans
   - Plan specificity, e.g. to accommodate differences between ecological zones, vegetation complexes
   - Decision making and information on implementation
     - Core IPM planning
     - Environmental assessment of treatment impacts
     - Short and long term objectives, historical records
     - Public information plans
     - Training
     - Pesticide handling (disposal, emergency response, etc.)

2. Scope of PMP's - e.g. overall business plan with specific geographical working plans?
   - Should a maximum area be defined for a plan?
   - How to build in flexibility?
   - How to enforce?

3. Responsibility for PMP's
   - Level in organization?
   - Executive committee or chief officer?

4. Public involvement with PMP's
   - Advertising requirements?
   - Appeal procedures?

5. Who will review and approve PMP's
   - Technical committees
   - Local pest management committees
   - Current Regional Permit Review committee

6. How often will PMP's be reviewed?
   - 3 year to 5 year period
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7. Process for handling pesticide use within PMP's
   - Maintain specific permit requirements within broader, overall plan
   - use old method of advertising permits to seek public input
   - Use "intent to apply pesticide notices"
   - site posting
   - advertising

As you can see from the above, we have many as yet unanswered questions about the process.

So, what happens next?

A small stakeholder group will likely be involved in the process over the next few months

drawing assistance from current example of PMP's, such as those utilized by B.C. Hydro. As
well, we will also be talking to groups like NIVMA, other agencies, the public and companies to
get comments and suggestions on these and other questions. The next step will be to circulate a
draft generic PMP to "key" stakeholders for review and comment. PMP's are expected to be
included with other revisions to our legislation by Fall, 1993. Revised legislation will be out for
review as a parallel process. We expect a stakeholder process (i.e. round-table) may be required
based on the response to draft legislation to ensure that PMP's are workable. We hope to be able
to provide a guide (similar to the current "Guide to Applicants" and assistance to make the
process as workable as possible. We are currently forecasting formal appearance of PMP's in

While these developmental activities are being carried out, day to day operations are a reality,
and most of you will want to know how the move to PMP's impacts on what information to
supply with new PUP applications. In this region, we will want to see basic elements of pest
management planning as part of your PUP applications. Applicants in this region have already
been moving in this direction, e.g. selective rates, spot spraying, leave areas, use of decision
making matrices, etc. The evaluation process for applications will continue to include field
assessments of herbicide prescriptions and their impact on other beneficial values. Because of
these activities, I think the transition to PMP's will be an easy one.

Whether PMP's will help to avoid controversy in vegetation management is an impossible
question to answer. After reviewing our strategic plan, seventy stakeholders thought they would
help.

In conclusion, several major benefits associated with IPM planning and the use of Pest
Management Plans are possible:

1. Treatments are only carried out when necessary and site/environmental impacts are
   minimized.

2. Plans can serve to inform senior administrators, other employees, government agencies
   and the public on why pesticides are applied, that alternatives are considered and used
   where possible, and that pesticides are used in the context of an overall plan designed
to control pests in an ecologically sound manner.

Effective, ecologically sound pest management programs, I think, are a common goal and
challenge. I will leave you with one last quote:

"The relationship between people and pests has no foreseeable
end. Pests are not sufficiently sentient (sensitive) to recognize
defeat and to agree not to harm us henceforth if we agree to stop
attacking them." Beirne(1969).
References

THANK YOU
FOR PARTICIPATING!