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BRITISH COLUMBIA

Roberts Creek Study Forest: Worker Safety in Partial Harvesting Silvicultural Experiments and Operations

By Fred Nuszdorfer and Brian D'Anjou

INTRODUCTION

In October 1997, a group of staff from the Vancouver Forest Region of the British Columbia Ministry of Forests (BCMOF), and from the Workers' Compensation Board of BC (WCB), undertook a one-day excursion to the Roberts Creek Study Forest to examine worker safety in silvicultural experiments and operations that involve some retention of the overstory. The Roberts Creek Study Forest is located on the mainland coast, about 40 km north of Vancouver, BC.

To assist other forest managers in planning and executing safe harvesting operations, this report presents the group's observations and recommendations regarding:

1. Safety issues related to using even-aged silvicultural systems.

2. Safety issues related to the possibility of carrying out an "ecoforestry" harvesting experiment.

The recommendations made in this report are based on the interpretations made by the members of the group during the field trip, and on the group's collective experience and expertise influenced the design and operations within the study forest. The reader is cautioned that authority regarding worker safety in any area where harvesting is underway rests with the local WCB inspector. Also, the discussion and interpretations are based on the WCB guidelines that were in place in 1997; readers should check the current WCB guidelines to ascertain what changes have occurred to both the "5-m rule" and the "25% rule" that were in effect in 1997. The rules of the day, however, did influence the harvesting practices utilized in the study forest.

EXPERIMENTAL ACTIVITIES IN THE ROBERTS CREEK STUDY FOREST

The forests in and around the Roberts Creek area fall into the Dry Maritime Coastal Western Hemlock biogeoclimatic subzone (CWHdm). The forest matrix in this area is generally even-aged, continuous, and dominated by Douglas-fir in the main canopy, with understories of western hemlock and western redcedar. Zonal ecosystems and ecosystems that are slightly wetter than zonal dominate the area. Trees are often ^{3}50 m tall, with some in the Study Forest exceeding 1 m in diameter. Slopes are gentle to moderate, i.e., generally <30%.

In the early 1990s the Roberts Creek Study Forest (RCSF) was proposed to demonstrate, evaluate, and develop a range of alternative silvicultural systems that could potentially be applied to meet a variety of biological, social, and economic objectives. Designed as a collection of adaptive management case studies, a range of treatments (or silvicultural systems) have been established including:

1. Dispersed retention: two-pass systems that retained dispersed, dominant trees after each entry. Two examples of this system have been established.

2. Clearcut with reserves.

3. Extended rotation system: Multi-pass sys-

tems (extended rotation) that remove <20% of the existing volume in a combination of strips and lateral yarding.

4. Strip shelterwood: Two-pass systems that remove trees in a series of strips ranging from 50 to 100 m wide.

SAFETY ISSUES

Blowdown/Windthrow

The retention of sound, mature trees is not in and of itself a safety concern, except in relation to the windfirmness of residual trees. Blowdown (or windthrow)[1], both during and after harvesting, poses risks to workers. The potential for blowdown should be minimized wherever possible by using such techniques as proper block design, retaining only sound trees in operating areas, "feathering" the stand edges, pruning branches, and topping trees.

Two important elements of the biodiversity of stands of the Roberts Creek Study Forest are veteran trees and snags. The following sections deal with worker safety related to retaining these elements of biodiversity.

Veteran Trees

Veteran trees[2] are an important element of the biodiversity of stands of the Roberts Creek Study Forest.

Veteran Douglas-fir and western redcedar trees that are sound can be left uncut during and after harvesting, and workers may work near such trees.

Veteran Douglas-fir and western redcedar with dead tops that are <25% of the height of the tree, and that appear to be otherwise sound, may be left uncut during and after harvesting. It is preferable to have a no-work zone[3] around such trees. The no-work zone should be 1.5 times the height of the dead top as per the danger tree[4] guidelines for silvicultural operations (Guy 1994).

The following veteran Douglas-fir and western redcedar trees should be felled unless they are within a wildlife tree patch[5] and are more than 1.5 times their height away from the work zone:

• Unsound trees (e.g., trees with obvious structural defects).

• Sound trees with dead tops that are >25% of the height of the tree.

• Unsound trees with dead tops that are <25% of the height of the tree.

All veteran western hemlock trees in a work zone, or which could reach a work zone upon falling, should be felled because of the tendency of older individuals of this species to have decay. These trees present a significant risk to worker safety if they are left standing in or near a work zone.

Snags

Snags[6] are also an important element of biodiversity in the Study Forest.

Snags have been removed from areas that were harvested as part of the Roberts Creek Study Forest, as required by WCB. Local WCB inspectors have the latest information on requirements regarding snags in operating areas.

Larger diameter snags (i.e., over ~30 cm in diameter) that are in a work zone, or which could reach a work zone upon falling, and which are under 5 m tall may be left standing. Snags that are in a work zone, under 5 m tall, and smaller than ~30 cm in diameter should be felled. All snags that are in a work zone and over 5 m tall must be felled. In order to retain snags that are >5 m tall within an area that is being harvested they must be in a marked no-work zone. The size of the no-work zone must be a minimum of 1.5 times the height of the snag but it may be larger depending on the danger of the snag and the slope of the area. The no-work zones in a harvesting area must be laid out and marked by someone trained to do wildlife/danger tree assessments. Snags that are near a work zone, but cannot reach it if they fall, do not have to be cut.

Larger diameter snags can be left in a work zone if they are shortened to <5 m using a feller-buncher. This kind of equipment is typically not used in this area.

Snags could be created in an area by killing parts of, or entire, live trees. However, after the tree or part died, a no-work zone which is 1.5 times the height of the tree or dead part would have to be established.

Meeting "Ecoforestry" Objectives

The notion of using "ecoforestry" to manage forests in the area was first put forward by the Mount Elphinstone Local Resource Use Planning (LRUP) Committee. Since the termination of the committee in February 1997, the Elphinstone Forest Plan Committee (1997) continues to promote this approach.

The objectives of ecoforestry include the following principles:

1. Non-timber values supersede timber values.

2. Forest cover must be maintained on all areas at all times, which implies using a single-tree selection system

[1] Blowdown/windthrow: Trees that have been uprooted and toppled over by the wind.

[2] Veteran trees (vets): Trees that are much older, often by several hundred years, than the majority of the stand—old trees that have survived previous wildfires.

[3] No-work zone: Area in which equipment and people are not allowed during forestry operations, usually for safety or ecological reasons.

[4] Danger tree: A live or dead tree whose trunk, root system or branches have deteriorated or been damaged to such an extent as to be a potential danger to human safety, i.e. because branches may fall off or the tree may topple.

[5] Wildlife tree (patch): A tree or group (patch) of trees that are identified in an operational plan to provide present or future wildlife habitat. A wildlife tree is a standing live or dead tree with special characteristics that provide valuable habitat for the conservation or enhancement of wildlife.

[6] Snags: Trees that have died but not fallen over.

(i.e., no use of clearcuts or most other recognized silvicultural systems).

3. Downed wood, snags, and wildlife trees, maintained to at least natural (undefined) levels.

4. Regeneration through natural means (no planting).

From a worker safety perspective, harvesting according to ecoforestry principles (e.g., maintaining forest cover, snags, and wildlife trees) could not be done in the zonal- and wetter-site forests of the area without conflicting with WCB requirements. None of the silvicultural systems described in the *Silvicultural Systems Guidebook* (BC Ministry of Forests and BC Ministry of Environment 1995) would satisfy all of the ecoforestry objectives. Individual tree selection[7] may be applied to accomplish the "no clearcut" objective of ecoforestry. However, it is not likely that using this approach in the Roberts Creek Study Forest would meet the ecoforestry criteria, in part because snags and danger trees would have to be removed for safety reasons.

Also, the presence of large trees with large branches and interlocking crowns, which are found throughout the Robert Creek Study Forest area, would make it physically impossible to remove some individual trees as they would tend to "hang up" in adjacent tree crowns during falling creating a severe safety hazard. Safety aspects are also compounded by the need to fell trees in specific directions to facilitate yarding and to minimize damage to residuals and regeneration. Finally, when these trees fall, there is typically a rain of large branches, some of which can remain hanging in the upper crowns, and become potentially lethal to the faller and other workers who may follow.

From a worker safety viewpoint, it would be possible to carry out an "ecoforestry" cut using individual tree selection in areas where stands are more open, tree branches are smaller, and the crowns are not interlocked. In the Roberts Creek area these forest conditions exist on the driest ecosystems (shallow soils over bedrock) and in young second-growth stands. The distribution of the dry ecosystems is patchy, and they are heterogeneous. There are some young second-growth stands with open canopies that may be suitable for testing an individual tree selection approach, however forestry criteria may not be necessarily met.

Relying on natural regeneration on dry sites and zonal sites would be expected to consist of shade-tolerant western hemlock and western redcedar rather than the preferred shade-intolerant Douglas-fir. Establishment of dwarf mistletoe, a serious forest health concern, would be expected to be a significant factor in reducing growth of western hemlock regeneration and future forest productivity. Also, salal is a major understory species and would strongly reduce regeneration establishment and the growth of young trees. Western white pine, usually found as solitary specimens in the stands in this area, is also unlikely to regenerate on these sites if individual tree selection is used.

PARTIAL CUTTING IN THE CWHdm

Individual tree selection has been ruled out for the most common ecosystems of the Roberts Creek Study Forest. However, other silvicultural systems that involve partial stand removal have been implemented in the area while meeting the WCB requirements, including the extended rotation.

At the time of the field visit to the Study Forest, the Silvicultural Prescription for all harvested blocks prescribed even-aged management. It appears theoretically possible, from a worker safety perspective, to initiate a group selection system[8] in the mature forests of this area. As is the case for individual tree selection, snags and dangerous wildlife trees would have to be cut or placed in no-work zones.

UPPER ELEVATION FORESTS

A planned visit to forests in the Mountain Hemlock biogeoclimatic zone was not possible due to log truck traffic on the roads to the area. However, the group did discuss the potential of using individual tree selection in the old-growth forests of the Mountain Hemlock zone, and related safety issues.

If cable yarding were to be used, all trees within yarding corridors would have to be removed. Small trees that remain standing outside of such corridors are potentially dangerous because they could fall or be pulled down on workers during falling and yarding operations. All snags that are >5 m high and are in or near the operating area would have to be cut. The use of ground-based yarding in this area was not considered viable because of wet soils or unsuitable ground conditions (e.g., steep slopes). From a worker safety perspective, if uneven-aged management is desired, a group selection system should be used.

CONCLUSIONS

In October 1997, a group of staff from the Vancouver Forest Region of the British Columbia Ministry of Forests (BCMOF), and from the Workers' Compensation Board of BC (WCB), undertook a one-day excursion to the Roberts Creek Study Forest to examine worker safety in silvicultural experiments and operations that involve some retention of the overstory.

Based on the observations made during the field trip, and on the group's collective experience and expertise, the group makes the following recommendations regarding safety issues related to using even-aged silvicultural systems, and related to ecoforestry.

• Worker safety will not be compromised if sound Douglas-fir and western redcedar veterans are left uncut in a

[7] Individual (single) tree selection: An uneven-aged silvicultural system in which new age classes are created by the removal of individual trees of all size classes, more or less uniformly throughout the stand.

[8] Group selection system: A type of selection silvicultural system that removes trees in defined groups to create stand openings with a width less than two times the height of adjacent mature trees, and that manages the area as an uneven-aged stand.

work zone. Veterans that are deemed to be dangerous by the faller or a wildlife tree assessor must be cut if they are in a work zone or can reach it upon falling.

• Larger diameter snags (i.e., >~30 cm in diameter) that are in a work zone and are under 5 m tall may be left standing. Taller and smaller diameter snags must be removed from the work zone and the vicinity of the work zone. Thus, snags can be left in an operating area only if they are in a marked wildlife tree patch or other no-work area.

• The mature forests of the Roberts Creek area are unsuitable for application of an "ecoforestry" or an individual tree selection system. It is possible that an individual tree selection system could be used in second-growth areas that have not yet closed canopy. However, it is not likely that individual tree selection in second-growth would meet the criteria for ecoforestry.

• A group selection system could be established in the mature forests of the Roberts Creek area, however it is unlikely to meet the criteria for "ecoforestry".

• Concerns about the safety of using an individual tree selection system in the Mountain Hemlock zone probably preclude this alternative for harvesting. A group selection system could be established in these forests, i.e., similar to what was described earlier in this document for the mature forests of the CWHdm.

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