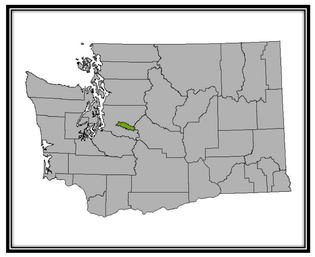
SILVICULTURE TO FACILITATE MARBLED MURRELET NESTING STRUCTURE

INTRODUCTION

In Washington State, marbled murrelets (*Brachyramphus marmoratus*) typically nest on large branches in the upper canopy of old-growth trees within 52 miles of marine foraging habitat. They are federally listed as threatened primarily because of the loss of nesting habitat to timber harvest. Given the temporal scale of old-growth structural development, the recovery of the species will likely require decades, if not centuries, of preserving current nesting habitat while restoring degraded habitat.

This experiment addresses the efficacy of using silvicultural treatments to facilitate murrelet nesting structure in forests where tree growth is limited by light.



HYPOTHESES

1) Removing competition for light resources between trees will maintain/increase tree growth and stimulate branch diameter growth in the upper canopy.
2) Topping of trees will stimulate the reallocation of within-tree resources to the upper-most branches as they compete to be the new "leader," ultimately increasing branch diameter and creating nesting structure.
3) There will be little difference in upper canopy branch growth between western hemlock and Douglas fir.

METHODS

The eight-block design incorporated gaps, tree topping, two tree species, and controls. The **gap** treatment resulted in removing all canopy competitors from within 40 feet of targeted dominant/co-dominant trees, effectively leaving a single target tree in a gap. The **topping** treatment resulted in removing the upper-most branches by topping the upper 20' of the tree (e.g., at 4-6" tree bole diameter). Both of these treatments were intended to increase the branch growth in the upper canopy. Dominant/co-dominant western hemlock and Douglas fir trees were targeted for their documented use by nesting murrelets (Tom Hamer, pers. com.).

Forty-eight target trees were identified in the field at least 100' apart to minimize edge effects of gaps on neighboring target trees, resulting in an effective sample size of six for each block.

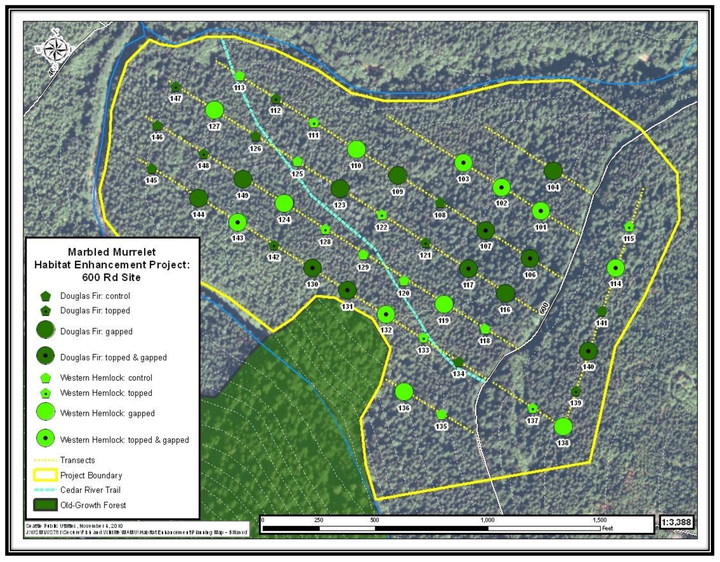
	Gapped	Topped	Gapped and Topped	Control
Western Hemlock	6	6	6	6
Douglas fir	6	6	6	6

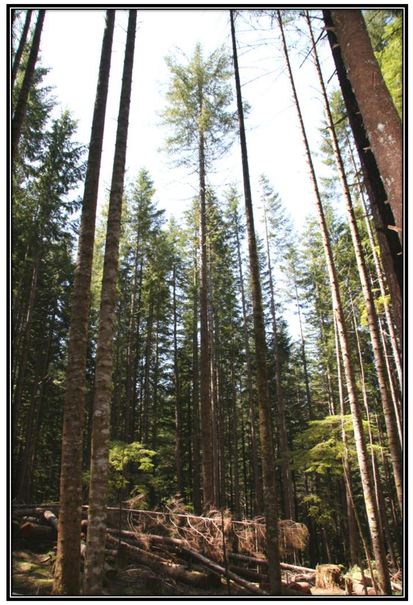
The branch diameter of five branches just below the "topping site" were measured, along with tree species, tree dbh, tree height, live crown length, tree diameter at topping site, height above topping site, and the presence of moss, dwarf mistletoe, or epicormic branching on the target tree.

The experiment was installed by a contractor over six days in October, 2010, on a budget of $12,000. Though it can be difficult to allocate precise costs, each tree climbed cost roughly $72, and each gap cost about $360.

SITE DESCRIPTION

The site chosen for this initial installation is in the protected Cedar River Municipal Watershed and about 38 miles from marine foraging areas. The 75-acre stand is roughly 65 years old, 1,900-2,000' asl, site class 3, and dominated by Douglas fir, western hemlock, and Pacific silver fir. The dominant trees are <26" dbh and the tree density is severely limiting the growth of understory vegetation. The site is adjacent to old-growth forest and roughly 1.5 miles downstream from an occupied murrelet nest stand.





RESULTS & DISCUSSION

Initial measurements indicate that co-dominant western hemlock trees grow (both in height and diameter) slower than Douglas fir, and there is some evidence that upper canopy branches in western hemlock are slightly smaller than in Douglas fir ($p=0.078$). There is strong evidence of larger variation in upper canopy branch sizes for western hemlock than for Douglas fir ($p=0.012$). Treatment effects on branch growth will be evaluated with remeasurements beginning in 2020.

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