Evaluation & Monitoring of Swiss needle cast in the Oregon Cascades 3 years (FY 2001- FY 2003)

To provide baseline information on Swiss needle cast in selected stands in the Cascades and monitor SNC infection levels on an annual basis for up to 3 years.

Background

In addition to the well documented Swiss needle cast (SNC) infestations in the Oregon Coast Range, there is a light to moderate infection level of SNC in the Oregon Cascades and other parts of the Pacific Northwest. There have been past episodes of SNC outbreaks in the Cascades but no significant monitoring. In the Oregon Coast Range the current SNC episode has reduced Douglas-fir growth and yield by 25%. Because of the severity of the Oregon Coast Range infestation and since it has no historical precedent it is prudent to systematically evaluate the extent of the Oregon Cascades infestations and monitor changes in severity for a period of several years. Fifteen years ago SNC was considered to be only a problem in Christmas tree plantations by the Forest Pathologists. This project will document existing conditions of the current SNC episode in the Oregon Cascades and can be used to monitor it's continuing development as well as compare it to future outbreaks.

Twenty stands within a localized area of 5 townships (Intensive Strata) had transects systematically installed in the fall of 2000. These townships were chosen because SNC was known to be found within them. One stand in every 7th section was chosen within these townships under cooperator management. This limited array of monitoring transects was installed because funding for a larger and more thorough sampling was not considered likely.

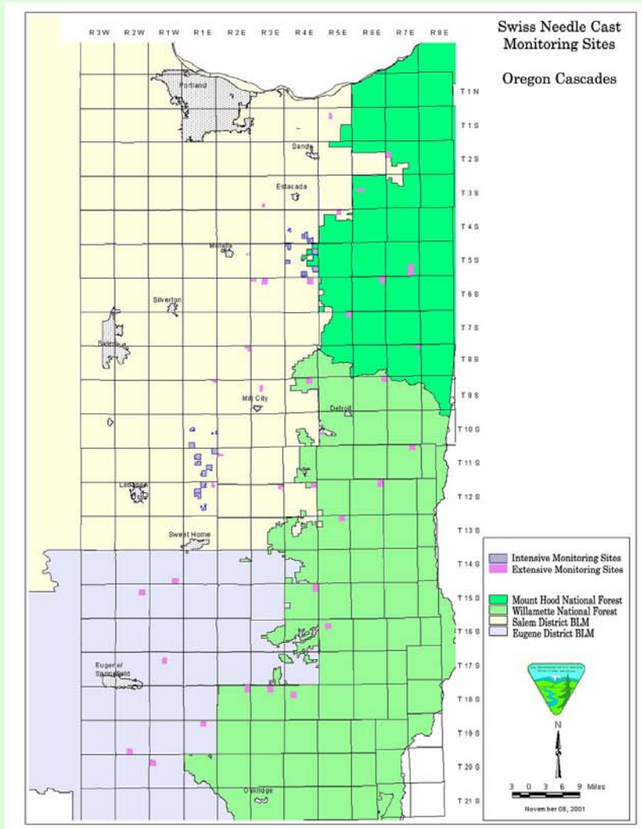
FHM funding was secured in March 2001 just as field training for Oregon Cascades crews was beginning. During the following April and May 37 stands had transects systematically installed in an area extending from the Columbia Gorge south to Oakridge OR and east from the Willamette Valley forested foothills margin to the crest of the Oregon Cascades. The sampling intensity was about 1 stand in every 3rd township and is described as the Extensive Strata since it covers such a wide geographic area.

Methods

Transects in all 57 stands were sampled according to Swiss Needle Cast Cooperative (SNCC) protocol (Kanaskie and Maguire 1999). Selected stands had more than 50% of their stocking in Douglas-fir, ranged in age from 10 to 20 years, and were located on lands administered by US Forest Service, Bureau of Land Management and cooperating private industrial forest ownerships in the Western Oregon Cascades. This sampling intensity is comparable in scale to what Oregon Department of Forestry (ODF) did in the Oregon Coast Range. Many of the tree measurements for crown condition are the same as those used by the FHM program. These surveys are done in conjunction with aerial surveys flown by ODF although the signature of Cascade SNC is much less distinguishable than that observed over the Oregon Coast. ODF Pathologists trained the Oregon Cascade crews so that Oregon Cascade sampling can be directly compared to that done in the Oregon Coast Range.

Each stand had 1 transect (a few very large stands in the intensive strata had 2 transects) installed with 5 measure points at 50 foot intervals. Transects were established in locations representative of the entire stand. At every measure point the nearest co-dominant or dominant Douglas-fir on each side of the transect was selected for a total of 10 trees for each transect. Sample trees were selected that were not damaged by agents other than SNC.

The data collected included:
Stand Data: Stand Number, Discoloration rating, overall SNC rating.
Tree Data: Tree Number, DBH, Height, Height to lowest live branch, Needle Retention (by annual needle complement for each 1/3 of crown and for whorl 5 from the top of the tree), Crown Description, Color of upper ½ to 1/3 crown.



Plans for Next year

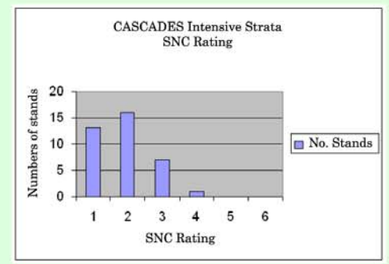
Dr. Will Littke, a Weyerhaeuser Forest Pathologist, has offered to provide Pseuodothecia counting on about 200 trees; 5 trees in each of the 37 stands in the extensive strata. This would validate the presence of SNC in our samples and provide a quantitative measure of infection; our current assessment of SNC presence has been weak. These collections will be from north and south sides of the middle 1/3 of the crown, an area of the crown well exposed to light and easy to see or collect samples from. Branchlets will be sealed into ziplock bags and stored in coolers, placed in refrigerators at the end of the day and mailed to Will Littke weekly. Some type of pole pruning saw or clipper will be necessary for taller trees.

Collected samples will also be sent to Oregon State University Swiss needle cast researcher Dr. Lori Winton. She is known for her development of methods SNC DNA analysis and discovery that there are two different SNC strains. Lori will determine the level of infection by quantifying the SNC DNA presence and determining which of the two strains it is.

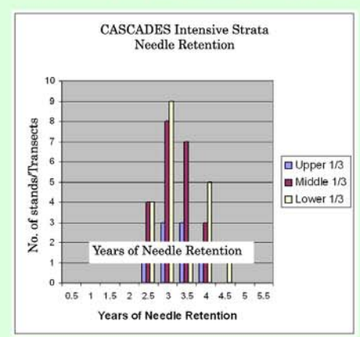
RESULTS Extensive Strata

The extensive strata of 37 stands had the following SNC rating:

SNC Rating	No Stands	
1	13	Healthy normal-appearing Douglas-fir stand, 3.5 years of needle retention at mid crown
2	16	Almost normal but showing slight yellowing, 3.5 years of needle retention at mid crown
3	7	Yellowing obvious, most trees retaining 2.5 to 3 years of needles at mid crown
4	1	Most trees retaining 1.5 to 2 years of needles at mid crown, some reductions in height
5	0	Very yellow stand, most trees retaining 1 to 1.5 years of needles at mid crown, height growth reduced by at least 25% for the last 1 to 3 years for at least half of the trees
6	0	Extreme yellow to yellow brown, most trees retaining 1 years or less needles, obvious height reduction for 4 or more years



The middle 1/3 of the crown needle retention observations for these 37 stands ranged from 2.5 to 5 years of needles, and averaged 3.5 for the entire sample. This is the strongest measure of needle retention, the middle 1/3 of the crown is relatively easy to see and is well exposed to light. Upper 1/3 of the crown needle retentions ranged from 1.5 to 4 years, in taller trees this is more difficult to see; in many instances there were fewer than 3 years of needles, in these instances an "X " was recorded and these observations not further analyzed. The lower 1/3 needle retention ranged from 2.5 to 5.5; sometimes lower branches were shaded.

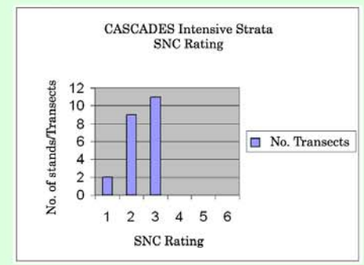


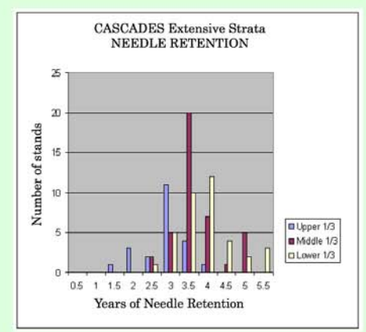
RESULTS Intensive Strata

The intensive strata of 20 stands in 5 townships had the following SNC rating:

SNC Rating	No Stands/Transects	
1	2	Healthy normal-appearing Douglas-fir stand, 3.5 years of needle retention at mid crown
2	9	Almost normal but showing slight yellowing, 3.5 years of needle retention at mid crown
3	11	Yellowing obvious, most trees retaining 2.5 to 3 years of needles at mid crown
4	0	Most trees retaining 1.5 to 2 years of needles at mid crown, some reductions in height
5	0	Very yellow stand, most trees retaining 1 to 1.5 years of needles at mid crown, height growth reduced by at least 25% for the last 1 to 3 years for at least half of the trees
6	0	Extreme yellow to yellow brown, most trees retaining 1 years or less needles, obvious height reduction for 4 or more years

No SNC class 4 stands were sampled but some are likely within the population.





About 1/4 of the stands in the extensive strata have normal color and no SNC symptoms whereas only 1/10 of the intensive strata stands meet the least amount of SNC criteria.

Douglas-fir is traditionally thought to have needle retentions of 5 to 8 years. Coastal Douglas-fir sapling stands on the northeast side of Mount Hood often have up to 8 years worth of needles. In the extensive strata of 37 stands only 5 had middle 1/3 crown needle retentions of 5 or more years.

The average middle 1/3 crown complement of needles for the Oregon Cascade extensive strata is 3.5 years. For comparison the Oregon Coast average middle 1/3 crown complement is 2.5. The difference in average needle retention between the Oregon Coast and Oregon Cascades is only 1 years worth of needles.

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