

TITLE: Impacts of Swiss Needle Cast in the Cascade Mountains of Northern Oregon: Monitoring of Permanent Plots after Ten Years

LOCATION: Oregon Cascade Mountains, Westside from Columbia River to Oakridge, OR

DURATION: Year one of a one-year project **FUNDING SOURCE:** Base

PROJECT LEADERS: Gregory Filip, FHP, Portland, OR, 503-808-2997, [gmfilip@fs.fed.us](mailto:gmf Filip@fs.fed.us); Alan Kanaskie, Oregon Department of Forestry (ODF), Salem, OR; Kristen Chadwick, FHP, Sandy, OR; and David Shaw, Oregon State University (OSU), Corvallis, OR

COOPERATORS: Mike McWilliams, ODF; Doug Maguire, OSU; Willis Littke and John Browning, Weyerhaeuser Corp; Bob Ohrn and Charlie Thompson, Salem BLM; Nancy Lankford, Mt. Hood NF; Norm Michaels, Willamette NF; Jeff Madsen, Port Blakely Tree Farms; and Eric Lease, Longview Fiber.

FHP SPONSOR/CONTACT: Gregory Filip (see above)

PROJECT OBJECTIVES: Determine changes after 10-years (2001 to 2011) in 1) tree diameter and height growth and 2) Swiss needle cast (SNC) severity as estimated by needle retention in 59 stands in the northern Oregon Cascade Mountains.

JUSTIFICATION:

- a. **Linkage** to Detection Monitoring: SNC is surveyed aerially in western Oregon by a special flight conducted annually by FHP and ODF personnel. Moderate to heavy damage is digitally mapped.
- b. **Significance in terms of geographic scale:** In 2010, the FHP/ODF aerial detection survey mapped 393,923 ac of Douglas-fir forest with obvious symptoms of SNC, the largest area mapped with disease since 1996. Although impact from SNC occurs in the northern Cascade Mountains of Oregon, damage is less than in the Oregon Coast Range, but increased severity in coastal forests in 2010 may also be occurring in the Cascade Range. Damage also occurs in western Washington.
- c. **Biological Impact and/or political importance:** Swiss needle cast, caused by the fungus, *Phaeocryptopus gaeumannii*, is one of the most damaging diseases affecting Douglas-fir in the Pacific Northwest (Hansen et al. 2000). Biological impact is particularly acute on the Oregon and Washington coast, one of the most productive regions for forest growth in the temperate world. Annual Douglas-fir volume-growth losses from SNC are estimated at about 23% over 187,000 ac with some losses as high as 52% in NW Oregon (Maguire et al. 2002). In 2001, baseline monitoring plots were established in 59 stands covering 2 million ac in the Cascade Mountains in Oregon and re-measured in 2002, 2003, and 2006 with FHM funding. It is essential that these plots be re-measured in order to determine the 10-year change and biological impact of SNC on Douglas-fir growth in the Oregon Cascades. These plots are the only source of data for SNC impact in the Cascade Range.
- d. **Scientific Basis/Feasibility**-likelihood that this project will be successfully completed: This project has a high probability of successful completion since plots are already established and SNC-experienced field crews will ensure that data are collected consistently and efficiently.
- e. **Priority Issues:** Published results indicate that Swiss needle cast in Oregon has increased in severity as a result of *climate change* with warmer winter temperatures being one of the main variables affecting disease severity (Stone et al. 2008). Needle infection results in *poor crown conditions* caused by premature casting of most needle cohorts during severe disease episodes.

DESCRIPTION:

a. Background: In 2011, we plan to re-measure 59 stands with permanent plots that were established on public and private forestland in the north Oregon Cascades. These plots were established in 2001 using protocols established and published by the OSU-based Swiss Needle Cast Cooperative (Freeman 2001; Maguire

et al. 2002). From the permanent plots, Douglas-fir 10-year-diameter and height growth will be calculated and correlated with disease severity as estimated by needle retention and fruit-body density.

b. Methods: In 2001, transects were installed in 59 stands that were 10- to 20-years old and more than 50% Douglas-fir. Sampled stands were systematically located on lands administered by USDA Forest Service, BLM, Weyerhaeuser Corp, Port Blakely Trees Farms, and Longview Fibre in the western Oregon Cascade Mountains. Each stand has one transect with five sample points located at 50-foot intervals. Transects were established in a location representative of the stand. At each sample point, the nearest co-dominant or dominant Douglas-fir on each side of the transect was selected for a total of 10 trees per stand. Sample trees were marked with plastic tags and were without damage from agents other than SNC.

Data collected for each tree in 2001 and 2006 included: 1) stand no., 2) point no., 3) tree no., 4) dbh (at 4.5 ft. above ground, nearest 0.1 in.), 5) total height (nearest ft.), 6) height to lowest live branch (nearest ft.), and 7) mid-crown needle retention. In 2006, sampled stands averaged 15-years old (range 10-22), 7.8 in. dbh (range 4.3-12.5), and 42.5 ft. in total height (range 25-68) with 4.6 years (range 3.4-6.1) of needle retention (Filip et al. 2006).

In 2011, the same data as above will be collected for each tree in the 59 stands. For three trees per stand, one secondary or lateral branch on a primary or main branch on the south side of the tree will be removed from the center of the crown, and the average number of needle age classes present will be estimated visually on a scale of 0 to 9: 0=0 to 10% of full compliment present, 1=11 to 20% present, 2=21 to 30% present, and 9=90 to 100% present. Branches from the taller trees will be removed with a pole pruner or climbed and, and the main branch severed at the stem. Foliage from severed branches will be placed in a sample bag, labeled as to stand, plot, and tree number; and sent to Willis Littke and John Browning at the Weyerhaeuser lab in Centralia, WA for pseudothecial (fruit body) counts on 2-yr-old needles, a standard infection-severity measurement.

Tree and branch heights will be measured with a laser height measurer. Total basal area/acre and basal area/acre of Douglas-fir will be calculated at each of the five sample points. Ten-year tree-growth data will be analyzed with appropriate statistical techniques to determine significant correlations with SNC severity.

c. Products: This project will provide landowners and managers with knowledge of the extent, development, and impact of SNC from 2001 to 2011 in the Oregon Cascades and provide the basis for them to develop and adapt management strategies (Filip et al. 2000) if and when SNC increases in this area. In addition, the results of this project will be included in a report, a poster, and submitted to a refereed journal. The results will also be presented at workshops and conferences on Swiss needle cast.

d. Schedule of Activities:

February 2011 – Begin hiring process for project crews

April 15 to June 15 – Examine stands in approximately the same order as in 2006 with lowest elevations (<2000ft) first and highest elevations (>3500ft) last to avoid snow closures.

July to September – Input and analyze data

September to November 2011 – Write SNC co-operative report and journal paper

January 2012 – Present results (poster) at the annual FHM working-group meeting

e. Progress/Accomplishments:

2001: Transects were established in 59 stands by Salem BLM, Eugene BLM, Mt Hood NF, and Willamette NF crews (Freeman 2001). Needle retention averaged 3.5 years.

2006: Five-year measurement of transects occurred in 59 stands by the Oregon Department of Forestry crews (Filip et al. 2006). Needle retention averaged 4.6 years.

COSTS:

Year - 2011	Item	Requested FHM EM Funding	Other Source Funding	Source
Administration	Salary+OPE	\$14,100	\$18,000	FHP-OSU-
	Overhead	9,870	8,000	ODF-BLM-
	Travel	4,750	2,000	Weyco, etc.
Procurements	Contracting (climbing)	0	5,000	OSU-FHP
	Equipment	250	0	
	Supplies	250	0	
	Indirect costs (12.64%)	3,695	0	
Total		\$32,915	\$33,000	

Budget Justification: Requested salary+overhead are for 2 temporary employees for 8 weeks needed to measure 59 plots at 2 plots per day. Requested travel includes per diem and vehicle costs for 8 weeks. Other source funding salaries and travel are for the 4 project leaders (10% each) and 10 cooperators (1% each). Tree climbing will be done by certified climbers from OSU and USFS.

Non-federal matching-fund requirements:

Total FHM request:	\$32,915
Amount excluded from match requirement (70% of project is on federal land):	\$23,040
Amount requiring 1:1 matching funds:	\$9,875

Non-federal matching-fund contributions:

OSU-SNC co-op (technical assistance, field work, climbing; Shaw & Mulvey):	\$5,875
ODF (technical assistance; Kanaskie):	\$2,000
Weyerhaeuser Corp. (technical assistance; Littke & Browning):	\$2,000
Total non-federal match:	\$9,875

References: also see <http://www.cof.orst.edu/coops/sncc/> for a complete list of SNC references

Filip, G.M., A. Kanaskie, K. Kavanagh, G. Johnson, R. Johnson, and D. Maguire. 2000. Silviculture and Swiss needle cast: research and recommendations. For. Res. Lab, Res. Cont. 30, Ore. State Univ., Corvallis. 16p.

Filip, G., A. Kanaskie, W. Littke, J. Browning, D. Hildebrand, and D. Maguire. 2006. Impacts of Swiss needle cast on Douglas-fir in the Cascade foothills of northern Oregon after five years. P. 12-19 *in* Swiss Needle Cast Cooperative annual report. Shaw, D. (ed.), College of Forestry, Ore. State Univ., Corvallis. 64p.

Freeman, F. 2001. Swiss needle cast monitoring transects in the Oregon Cascades. P. 11-13 *in* Swiss Needle Cast Cooperative annual report. Filip, G. (ed.), College of Forestry, Ore. State Univ., Corvallis. 98p.

Hansen, E.M., J.K. Stone, B.R. Capitano, P. Rosso, W. Sutton, and L. Winton, A. Kanaskie, and M.G. McWilliams. 2000. Incidence and impact of Swiss needle cast in forest plantations of Douglas-fir in Coastal Oregon. *Plant Disease* 84:773-778.

Maguire, D., A. Kanaskie, W. Voelker, R. Johnson, and G. Johnson. 2002. Growth of young Douglas-fir plantations across a gradient in Swiss needle cast severity. *West. J. Appl. For.* 17(2):86-95.

Stone, J.K., L.B. Coop, and D.K. Manter. 2008. Predicting the effects of climate change on Swiss needle cast severity in Pacific Northwest forests. *Can. J. Plant Path.* 30:169-176.