

TITLE: Pre-and post-fire fuel loads: empirical vs. simulated results for mixed-conifer forests of the Cascade Range

LOCATION: Gifford Pinchot National Forest, Washington

DURATION: Year 1 of 1-year project **FUNDING SOURCE:** Fire Plan

PROJECT LEADER: Susan Hummel, USDA Forest Service, PNW Research Station, Portland Forestry Science Lab, 503-808-2084, shummel@fs.fed.us

COOPERATORS: Bruce Holmson, Gifford Pinchot National Forest, Mt. Adams RD silviculturist, Trout Lake WA.

PROJECT OBJECTIVES: The objectives of this project are to (1) compare pre-fire (2001) and post-fire (2005) fuel loads on sample plots that were burned by a 2004 wildfire and (2) use the post-fire data to validate pre-fire projections made using the Fire and Fuels Extension to the Forest Vegetation Simulator (FVS-FFE) (Reinhardt and Crookston 2003).

JUSTIFICATION:

a. Link to FHM Detection Monitoring Data:

Region 6 Aerial Insect Detection surveys mapped western spruce budworm defoliation over thousands of acres in the project area between 1994 and 2000 (Willhite 1999) and CVS plot data revealed accumulating fuel loads over the same period. The proposed project builds on an earlier study of potential fire behavior associated with budworm defoliation that originated from this monitoring (Hummel and Agee 2003).

b. Biological, geographic, and political significance:

The project area, which is located on the east slope of the Cascade Range, is a late-successional reserve (LSR) established by the 1994 Northwest Forest Plan. It lies within a transitional zone between coastal forests dominated by Douglas-fir (*Pseudotsuga menziesii*) and interior forests of ponderosa pine (*Pinus ponderosa*). These transitional forests, which have a mixed-severity fire regime, extend in a north-south strip from British Columbia to California and are increasingly popular sites for new homes and for recreation. Managing fuel loads in such forests is a political priority, especially where they are proximate to existing communities or urban development (USDI and USDA 2001).

c. Feasibility:

The proposed project has a high probability of success because the pre-fire data were collected and analyzed in 2001. Further, the FVS-FFE model is well developed and documented, and sampling methods to collect post-fire data are established. The project leader is experienced in measuring forest structure and fuels, in using simulation models, and in producing annual progress reports and scientific publications.

DESCRIPTION:

a. Background:

Due to the difficulty of establishing designed experiments that require deliberate ignition, empirical data are sparse for many forest types on pre-fire structure, fire behavior, and post-fire

conditions. Many fire models, therefore, rely on assumptions about relations between forest structure and fire behavior. It is important to validate these assumptions with pre- and post-fire fuels data, especially when fire models are used to simulate fire behavior, project effects associated with different fuels reduction treatments, and allocate public resources. Mistakes can be costly. One prudent way to obtain empirical data is to capitalize on opportunities created when wildfires burn areas where pre-fire sample data exist on fuel loads and forest structure. Such an opportunity was created by the 2004 McDonald Ridge Complex (McDonald fires) on the Gifford Pinchot National Forest (GPNF). Lightning ignited the McDonald fires, which burned approximately 100 acres in four days before being contained by rain and by fire crews in late August. The McDonald fires burned in one of the sample units in which measurements of forest structure had been made in 2001 as part of a landscape study of the Gotchen LSR (Hummel et al. 2002). The wildfire site is particularly valuable for increasing knowledge on fuel dynamics because of the limited history of harvesting and fire suppression activities within it.

b. Methods:

Post-fire data will be collected on the 20 plots previously measured in 2001 that are located in the unit burned by the 2004 McDonald fires. Approximately half of the plots burned. Measurements of all live and dead standing trees (diameter, height, species) and down wood (large- and small-end diameters, length, species) will be collected according to established guidelines for Region 6 stand exams and log inventories (Bull et al. 1997). The post-fire (2005) data will be compared with the pre-fire (2001) data, which were collected according to the same guidelines, to evaluate fire severity (percent live and dead tree basal area) and net changes in fuels by size class (1-1000 hour) per plot. Pre-fire estimates of severity made using FVS-FFE (9- and 14-mph windspeed, 95% fire weather) and the 2001 data will be compared with measured observations of burned and unburned plots to characterize the classification accuracy of the model.

c. Products:

This project will provide quantitative information on total fuel loads by size class and on changes in them associated with wildfire in mid-elevation (3500-4500 ft), mixed-conifer forests of the east slope Cascade Range. Specific products will include (1) pre-fire (2001) and post-fire (2005) data summarized into files suitable for FVS-FFE (2) comparison of fuel loads between the two measurement years (3) estimates of fire severity on each burned plot associated with different fuel conditions, and (4) comparison of empirical vs. simulated results. These products will be made available to GPNF staff, the research, management, and fire communities, and interested citizens via scientific publications and technical presentations.

d. Schedule of Activities:

Measurements of fuel loads in project area	July/August 2005
Data entry and analysis	Sept 2005-Dec 2005
Manuscript preparation and presentations	Jan 2005-April 2006 Submit
final FHM report and manuscript	July 2006

e. Progress/Accomplishments:

This proposal is not for a multi-year project. The requested budget includes salaries for a GS12 post-doc/scientist and a GS 8 technician for three pay periods and travel expenses for three

weeks of field work.

COSTS:

	Item	Requested FHM EM Funding	Other- Source Funding	Source
YEAR 1 (July 05-July 06)			n.a.	n.a.
Administration	Salary	17,900.00		
	Overhead (11% PNW)	2,398.00		
	Travel	3,500.00		
Procurements	Contracting			
	Equipment	200.00		
	Supplies	200.00		
TOTAL REQUEST		24,198.00		

CITATIONS:

- Bull, E.L., Parks, C.G., and Torgersen, T.R.** 1997. Trees and logs important to wildlife in the Interior Columbia River Basin.
- Hummel, S., and Agee, J.K.**, 2003. Western spruce budworm defoliation effects on forest structure and potential fire behavior. Northwest Sci. 77(2), 159-169.
- Hummel, S.S., Calkin, D.E., and Barbour, R.J.**, 2002. Landscape analysis with FVS and optimization techniques: efficient management planning for the Gotchen late successional reserve. In: Crookston, N.L., Havis, R.N. (Comp.), Second Forest Vegetation Simulator Conference. Proceedings RMRS-P-25. US Department of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, UT, pp 78-82.
- Reinhardt, E.D., and Crookston, N.L.** (Tech. Eds.), 2003. The Fire and Fuels Extension to the Forest Vegetation Simulator. General Technical Report RMRS-GTR-116. US Department of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, UT, 209 pp.
- USDI and USDA**, 2001. Managing the impacts of wildland fires on communities and the environment – the national fire plan. Available online at <http://www.fireplan.gov/>
- Willhite, E.A.** 1999. 1999 Biological Evaluation: Western Spruce Budworm Analysis Units. Mt. Adams Ranger District/Gifford Pinchot National Forest. Available online at: http://www.fs.fed.us/outernet/r6/nr/fid/pubsweb/budworm_be.pdf