TITLE: Determining extent and severity of Balsam Woolly Adelgid-caused mortality on eastside Washington and Oregon forests.

LOCATION: Eastern Washington, Central and Northeastern Oregon.

DURATION: 2 year project **FUNDING SOURCE:** Base

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PROJECT OBJECTIVES: 1. Determine the extent and severity of damage and mortality to subalpine fir from balsam woolly adelgid; 2. Assess the management options available to promote resistance and/or regeneration that will ensure the long-term viability of subalpine fir on the landscape.

JUSTIFICATION: Based on aerial and ground surveys, subalpine fir mortality in eastside forests has increased within the last 5 years. A special ground survey covering the state of Oregon from 1998-2000 detected balsam woolly adelgid in eastern Oregon where it had not been documented in 1970 (Overhulser 2004). Additionally, in 1983 it was documented in Idaho and has since killed millions of acres of subalpine fir there (Livingston et al. 2000). In 2005, balsam woolly adelgid was detected on about 340 acres in the Salmo-Priest Wilderness in northeast Washington, where it has the potential to affect habitat for mountain caribou. Because the impact on the host is sometimes subtle and the insects are only visible for a short time, FIA and CVS plots probably vastly underreport the incidence of balsam woolly adelgid. Plot remeasurements occurring between 1997-2004 in Region 6 documented very little or no adelgids in many forests while aerial surveys documented thousands of acres of increasing mortality in these same forests. While mortality in these areas is widely recognized, the impact on the landscape is not understood. There is very little information on stand dynamics and composition since the introduction of this invasive insect. This widespread mortality is changing lynx habitat, watershed dynamics, and fire severity in ways not understood.

DESCRIPTION:

a. Background: Balsam woolly adelgid is originally from Europe and was first observed in the west in California in 1928 and in Oregon near Salem in 1930. This adelgid is about 1mm in length, all individuals are female and thus capable of starting a new infestation alone, and all are flightless. They are believed to disperse via wind or by hitchhiking on birds, mammals, and transplanted trees. All true fir species are hosts with varying susceptibility depending on species, location, and condition of the host. Long-term impact plots in BWA-infested subalpine fir stands in Oregon have shown 40-79% tree mortality over 35-45 years (Mitchell and Buffam, 2001). However, only a few of these plots are as far east as the eastside of the Cascades.

We would like to document the severity of the impact in eastern Oregon and Washington where little besides survey work has been done. Our questions to be addressed include: Is the stand species composition changing where BWA occurs? Is the host age-class distribution changing?

Are certain age classes more susceptible to BWA? BWA on Frazier fir in North Carolina does not cause mortality in young trees, allowing trees to reach reproductive age before they die, thus resulting in a younger, but sustaining, forest (Rhea 2006). What is the effect of the SAF mortality on stem density? In many areas SAF serves as a pioneer species that promotes the regeneration of other species. If the presence of SAF is declining, is the existence of high elevation forest land declining?

b. Methods: Using aerial survey data of tree mortality and the previous Oregon and Washington surveys, we will revisit sites where BWA was both detected and not detected. We will also establish new monitoring sites not previously sampled. Through tree damage and mortality we will document dates of damage from BWA. We will sample a range of sites to cover the range of establishment dates. Plots will be modified stand exams to include detailed information on damage agents. Data will include host tree: species, diameter, tree status (live/dead), infestation level (branch flagging, topkill, % crown kill, tree mortality), tree class (e.g. dominant, open-grown, regen, …), years of infestation, other agents (Dryocoetes, ceratocystis…), and age; non-host tree data will include species, stem counts or diameter. We will establish plots in at least 2 areas within each of the 3 Service Center areas (i.e. Central Oregon, Blue Mountains, and Wenatchee Service Center). Two stands will be sampled in each area, yielding a total of 12 stands to be sampled. Eight plots per stand will be established and permanently marked to allow long term monitoring. Approximately 3 stands can be sampled per pay period.

c. Products: By sampling a range of sites that have varying histories of bwa presence, we will produce a snapshot through time of the effect of bwa in eastside forests. We will also produce recommendations for land managers wishing to promote the long-term viability of this species.

d. Schedule of Activities: Conduct sampling surveys in Sept-Oct 2007 and 2008 to standardize field data collection methods. June-Sept conduct surveys in 3 areas. Oct-Dec summarize results and consolidate from 3 sites. While we had planned to conduct these surveys in cooperation with Idaho FHP and Idaho Department of Lands, they decided they needed more data on BWA occurrence prior to conducting severity/damage surveys. If feasible, in 2008 we would cooperate with Idaho on additional surveys to fill in the picture of subalpine fir decline in the west, continuing to follow the protocol established in the Intermountain states (Tom Eager and co.)

e. Progress/Accomplishments: <Brief description of progress/accomplishments for multi-year projects.>

COSTS:

	Item	Requested FHM EM Funding	Other-Source Funding	Source
YEAR 2007				
Administration	Salary 2 GS05/07 for 6 pp@$2500/pp	$21,000	$10,000	FHP
	Overhead			
	Travel Per diem	$5600		
	Vehicle	$3000		
Procurements	Contracting			
	Equipment			
	Supplies (stakes)	$100		
Total requested for FY2007		29,700		
YEAR 2008				
Administration	Salary 2 GS05/07 for 6 pp@$2500/pp	$21,600	$10,000	FHP
	Overhead			
	Travel Per diem	$5600		
	Vehicle	$3000		
Procurements	Contracting			
	Equipment			
	Supplies (stakes)	$100		
Total requested for FY2007		29,700		

Livingston, R. L., J. E. Dewey, D. P. Beckman, L. E. Stipe. 2000. Distribution of balsam woolly adelgid in Idaho. Western Journal of Applied Forestry 15:227-231.

Mitchell, R. G. 2001. Patterns of long-term balsam woolly adelgid infestations and effects in Oregon and Washington. Western Journal of Applied Forestry 16:121-126.

Overhulser, D. L., I. R. Ragenovich, M. McWilliams, E. A. Willhite. 2004. Balsam woolly adelgid occurrence on true fir in Oregon. Pest Management Report, Oregon Department of Forestry. 7p.