

Western North American Defoliator Working Group

December 8-9, 2009

Portland, Oregon

Attendees

Darren Blackford, Sheryl Costello, Tom Eckberg, Rob Flowers, Ryan Hanavan, Bruce Hostetler, Virginia Jennings-Bolshakova, Sandy Kegley, Glenn Kohler, Jim Kruse, Laura Lazarus, Rhonda Mathison, Connie Mehmel, Stephen Nicholson, Lee Pederson, Iral Ragenovich, Angel Saavedra, Craig Schmitt, Kathy Sheehan, Cynthia Snyder, Lia Spiegel, Sky Stephens, Beth Willhite

Old Business

2008 Action Items (also see separate spreadsheet)

Completed items:

- WSB (western spruce budworm) in hemlock paper (Carol Randall)
- DFTM (Douglas-fir tussock moth) brochure (Pederson / Blackford)

Items to be dropped (but people are encouraged to participate):

- Hardwood Pests Field Guide (Greg Filip, R6-FHP = coordinator)
- DFTM Early Warning System Database (Sheehan)
- Gray Literature Database (Willhite, Blackford, Beverly Bulaon)
- Western Forest Insects revision (Ragenovich)
- WSB treatments & strategies catalog (Sheehan)

Items to be carried over to 2010 meeting:

- Send letter to FS FHP Directors re: need for aerial application training, need to revisit long-term defoliator plots, and need for gray literature database (Ragenovich)
- WSB trapping guidelines from Chris Niwa - seek to get published (Ragenovich)
- Collect adelgids in spruce from the Nez Perce for ID (Pederson)
- DFTM pheromone disruption publication (Ragenovich)
- WSB & thinning treatments – compilation of previous work, possible review paper (Sturdevant)
- WSB data analysis & publication (Hostetler, possible assistance by Kjerstin Skov)
- DFTM FIDL (Pederson)
- WSB strategies & research workshop – next WNADWG or WFIWC meeting (Sheehan)

Additional discussion – Aerial Application Training

Stephen suggested that states should consider sending letters of support to FHP Regional Directors. Iral pointed out that many new FHP Directors don't have much FHP experience, so a description of the extensive training and experience needed for successful aerial applications would probably be valuable. An "Aerial Applications 101" course covering all aspects of how to run a program (working with public, contracts, safety, calibration, carding of airports, using GPS) was generally supported, either as a series of smaller, regionally focused sessions (Stephen) or as larger sessions – perhaps 1 national or separate east and west sessions (Iral, Sheryl). We're not sure if this type of training happens annually for GM (gypsy moth) in the east, but in any case

many people with GM experience will soon retire (or have already). If any states send a letter of support, please send copies to other states.

New Business

New publications

DFTM brochure – authored by Lee Pederson and produced by the USFS, Northern and Intermountain Regions, in 2009. <http://www.fs.fed.us/r6/nr/fid/pubsweb/westdef/dftm-brochure-r14.pdf>

Western Forest Insect Work Conference (WFIWC) meetings

2010 – April 5-8 in Flagstaff, AZ: Ryan is handling registration; contact Joel McMillin re: workshop ideas

2011 -- NAFWIC meeting in May in Portland, OR

Regional and State Reports – Current Defoliator Conditions

Idaho -- Tom Eckberg (Idaho Dept. Lands)

DFTM and **WSB** are big issues in Idaho – will be discussed later during this meeting.

Gypsy Moth -- after moths were trapped last year in Hayden and Meridian, delimiting trapping was done this year, but no new moths were trapped.

Pine Needle Sheath Miner – causing damage in ~30-40 ac affected in a 100-ac plantation

FS Region 1 -- Lee Pederson (USFS)

DFTM – Virtually no defoliation has been detected since 2002, and populations in northern ID have been very low until 2009; in MT, no traps were set out last year.

WSB – Defoliation decreased from 2007 to 2008, and remains about the same in 2009; budworm activity has increased on the St. Joe NF – had not been reported in those areas prior to 2006

Balsam Woolly Adelgid – In 2008, infested acres were about 4 times higher than in 2007; preliminary 2009 maps show considerably lower acres infested.

Larch Casebearer – Defoliation remains very low.

Western Hemlock Looper – Saw many adults on the Clearwater and Nez Perce NFs, but no defoliation has been reported; the last outbreak occurred in 2001-2002 (in combination with DFTM)

Pine Sawflies – *Neodiprion autumnalis* larvae were found in a ponderosa pine seed orchard, causing defoliation on a few acres; these trees might have been stressed due to overwatering. These sawflies were controlled with sevin in 2009; Sandy will discuss this later.

Montana -- Sandy Kegley (USFS)

WSB is causing the most defoliation in MT -- you can see it everywhere; no treatments are being done, except for a few private landowners. Most FS attention is being devoted to western bark beetles. Some Douglas-fir beetle activity has been detected in areas with 90+% defoliation on the Beaverhead NF.

DFTM – No defoliation was detected in 2008 or 2009, and no trapping was done in 2009.

Pine Tussock Moth – Nearly 8,000 acres were defoliated in eastern MT (ponderosa pine) in 2008; this outbreak has continued in 2009.

Pine Needle Sheath Miner – Defoliation was found in a ponderosa pine plantation on the Bitterroot NF in 2009.

Gypsy Moth – No moths caught in 2008, but 3 moths were caught in 2009 (all European).

FS Region 2 -- Sheryl Costello (USFS)

All project funds – almost all funds except for salaries – are going to bark-beetle related salvage on NFs; NEPA has been done for 1 or 2 tree lengths away from all forest roads. IF the requested \$40 million comes through, then some of these funds will probably be returned to the projects.

DFTM – The populations around Bear Creek (SW of Denver) have collapsed – no defoliation was mapped in 2009. The number of moths trapped on the Pike NF continued to decline: 324 moths in 2007, 15 moths in 2008, 1 moth in 2009.

WSB – Populations have expanded in CO in 2009, and ~400,000 acres were defoliated (twice as much as in 2008). Budworm has caused mortality in some areas of CO, and the outbreak extends south into NM. In south-central WY, chronic budworm populations on the Medicine Bow NF collapsed following a DFB outbreak, while in northern WY defoliation increased to ~3,000 acres.

Aspen Defoliation – Large increase was detected in 2009 in southwest CO.

Marssonina blight was the primary agent, and may have been favored by the relatively wet summer. Other agents included Melampsora rust, large aspen tortrix, and western tent caterpillar. In southern CO, one drainage had large aspen tortrix, and defoliation by western tent caterpillar continued, but in fewer areas.

Ponderosa Pine Needle Miner – About 4,300 acres of ponderosa pines were defoliated on the Front Range in CO.

Pine Sawfly (*Neodiprion autumnalis*) defoliation continued in the Black Forest (CO) – defoliation was chronic but not heavy. Scattered sawfly activity was also reported in southwest SD and the NE panhandle.

Fall Webworm – Heavy defoliation continues in lower elevation riparian areas in CO.

Aspen Dieback continues to receive media attention in CO. The protocol for mapping this dieback is changing and under debate. Currently they don't exclude trees killed in previous years – “map 'til they drop”.

Colorado – Sky Stephens (Colorado State FS)

Gypsy Moth – 3 moths were found in different locations in 2009. The specimens have been sent off for genetic identification (Asian vs. European GM), and delimiting trapping was done in 2010. One moth was found in 2008, and none in follow-up delimiting trapping.

FS Region 3 -- Ryan Hanavan (USFS)

General Info --Terry Rogers is doing better and says “hi” to everyone. Ryan trained with Bobbe Fitzgibbons as an aerial surveyor this year in AZ. FHTET might conduct a survey about switching software contracts this year (current software = GeoLink). Generally 2009 was a mild year, but the severe drought persists.

Arizona

DFTM – No defoliation, but they have started picking up moths in traps.

Aspen Decline was coded for first time on ~41,000 acres.

Neodiprion fulviceps For the second year, this sawfly was found near Flagstaff.

The **unknown looper** that defoliated nearly 16,000 acres in 2008 declined to 639 acres in 2009.

Pandora Moth has been observed flying in areas south of the Grand Canyon rim.

New Mexico

WSB defoliation continues to be very high (over 550,000 acres in 2009).

Gold-Spotted Oak Borer is causing some oak mortality/dieback in western NM.

FS Region 4 -- Laura Lazarus (USFS)

WSB – Defoliation increased in 2009, especially in southern ID and UT; defoliation was widespread and often heavy. So far, FS line officers have not been interested in conducting suppression projects. Bark beetles have also been active

DFTM – No defoliation was detected in 2009, while the pheromone traps caught some moths but not many.

Sawfly/Needle Scale – Over 430,000 acres of pinyon pine were defoliated in NV in 2009.

Aspen Decline/Defoliation was mapped on nearly 30,000 acres in 2009.

Subalpine Fir Decline continued, although this mortality is overshadowed by MPB; Balsam Woolly Adelgid continues to be active; R4 is checking some permanent plots in Southern ID.

Aspen Decline – R4 just started recording this decline a few years ago; most of the 2009 decline was found in UT.

Gypsy Moth – Only 1 moth was found in R4 in 2009; this moth was trapped in a RV campground in eastern ID

Pine Butterflies – Adults have been seen flying around in some stands.

FS Region 4 -- Darren Blackford (USFS)

Asian Gypsy Moth – Steve Munson (R4), Vic Mastro (APHIS), and David Holden (Canadian FIS) went to the Republic of Korea in August 2009 to review the Lymantriidae monitoring program at several ports. They looked at trapping light characteristics, trapping placement within the ports, timing of female Asian GM flight, and the ship inspection process. A follow-up meeting was held in Houston, TX, in November 2009. Asian GM populations are low to endemic throughout Korea, but male moths were trapped at all monitored ports.

FS Region 5 -- Cindy Snyder (USFS)

California

Light Brown Apple Moth, *Epiphyas postvittana*

LBAM was first reported in early Feb. 2007 near Berkeley, CA. It is originally from Australia and is considered established in New Zealand, New Caledonia, Hawaii, and the British Isles. Its discovery in CA was a new North American record. Hosts include at least 200 plants in 20 genera and 50 families. The population of the light brown apple moth continued to increase in 2009 throughout the coastal area of central California primarily from Monterey to Sonoma Counties with outlying populations in Napa and Santa Barbara Counties. Eradication efforts using aerial spraying of pheromones for mating disruption were halted in 2008 due to public concerns and court orders. California Department of Food and Ag. is moving forward with an integrated pest management approach; an EIR is out for public comment. More information can be found at

http://www.cdffa.ca.gov/phpps/PDEP/lbam/lbam_main.html.

European Gypsy Moth, *Lymantria dispar*

In 2008, seven gypsy moth adults were trapped in the area of Ojai, Ventura Co. *Bacillus thuringiensis* was applied at multiple sites in 2009 to eradicate the Ojai infestation. 2009 trapping data is not yet available from CDFA.

Black Oak Leaf Miner, *Eriocraniella aurosparsella*

Blotch mining of California black oak leaves by this insect increased in intensity and affected a much larger area in 2009 near Blue Canyon, Tahoe National Forest (Placer County). This is the first time since this activity was first detected in 2005 that the affected area has significantly increased. Nearly every black oak was partially defoliated over approximately 7,000 acres of mixed conifer and hardwood forest along Highway 20 near Bear Valley along Interstate 80 from Baxter to Emigrant Gap. This is the fifth year of partial defoliation in some areas but neither tree mortality nor individual branch kill has been detected.

Douglas-Fir Tussock Moth, *Orgyia pseudotsugata*

Douglas-fir tussock moth reached outbreak numbers south of Big Bear Lake primarily along the eastern edge of forest road 2N10, San Bernardino National Forest (San Bernardino County). This is the first year defoliation of white fir was detected and high levels of defoliation may continue in 2010. The last known activity of Douglas-fir tussock moth in the San Bernardino Mountains occurred in the early 1970's. White fir is primarily being defoliated over about 200 acres, but high densities of caterpillars are also feeding on Jeffrey pine. Trees commonly had 10-25% defoliation with some defoliation on white fir reaching 70%. Infestations occurred on about 90% of white fir in these forest stands.

Western Tussock Moth, *Orgyia vetusta*

Defoliation of coast live oak from the western tussock moth occurred in Marion Bear County Park in northern San Diego (San Bernardino County). Defoliation covered less than 5 acres, impacting an estimated 12% of the stand. Defoliation ranged from minor to moderate levels, but has not lead to tree mortality.

White Fir Sawfly, *Neodiprion abietis*

White fir sawfly continues to defoliate white fir on the Lassen National Forest and private land, expanding another 1,000 acres from last year's infested area and moving southwest from Antelope Mountain towards McCoy Flat (Lassen County). Injury ranged from light to heavy defoliation of older needles with most injury affecting understory trees and lower crowns of mid- and overstory trees. A visit to the previously defoliated area of 2008 revealed no further insect feeding or subsequent tree mortality. White fir sawfly activity was also noted west of Lake Davis, Beckwourth District, Plumas National Forest (Plumas County,) and around residential properties at Donner Lake (Nevada County).

Pinyon Sawfly, *Neodiprion edulicolus*

Pinyon sawflies caused severe defoliation along State Highway 168 on the Inyo National Forest (Inyo County) in a group of five singleleaf pinyon. This was the fall-winter generation as larvae were large and active in late summer 2009.

Lodgepole Pine Needleminer, *Coleotechnites milleri*

Lodgepole pine needleminer in Yosemite National Park (Mariposa County) caused minimal defoliation in 2009 due to low populations levels. High numbers of predators were reared from sampled needles and likely contributed to the reduced populations. Injury levels were < 1 needle/bundle.

Pine mortality occurred near May Lake in 2008 associated with lodgepole pine needleminer defoliation; these areas also had low levels of needleminer-caused needle injury in 2009.

Fruittree Leaf Roller, *Archips argyrospila*

High levels of defoliation from the fruittree leaf roller occurred in areas (~60 acres) northeast of Crestline and adjacent to Highway 138, San Bernardino National Forest (San Bernardino County). Defoliation of California black oak ranged from low to severe. Defoliation has been persistent in the area for several years, but tree mortality has not been observed solely caused by this insect.

California Tortoise Shell, *Nymphalis californica*

Hundreds of acres of *Ceanothus* spp. defoliation were noted in Douglas-fir plantations on Hoopa Tribal Land (Humboldt County).

Hepialid Caterpillar

A caterpillar in the family Hepialidae girdled the root collars of Nordmann fir seedlings at a Christmas tree plantation in Camino (El Dorado County). Caterpillars in this family are known as root feeders on a variety of plants, but damage to trees is rare. An attempt to rear the caterpillars to adults, for identification, was unsuccessful.

Incense Cedar Scale, *Xylococcus macrocarpae*

Several seedling- and small sapling-sized incense cedars near Salmina (Lake County) were infested with incense cedar scale. Heavy infestations led to either direct mortality or ensuing attacks by *Phloeosinus* sp. Many larger saplings remain infested with the scale.

Ponderosa Pine Twig Scale, *Matsucoccus bisetosus*

There is a severe infestation of *Matsucoccus bisetosus* on ponderosa pine at the seed orchard of the Northern Sierra Tree Improvement Cooperative (a consortium of CalFire and forest industries in northern California) in Malin, OR. The principal symptom is roughened, resinous areas on tree branches. Branch tip flagging, a symptom often seen in natural stands, is rare in the orchard. Persistent scale outbreaks are unusual and can often be attributed to an activity that disrupts the natural enemy complex. The outbreak at Malin is most likely the result of pesticides applied to control seed and cone insects. The trees are well irrigated and appear to be tolerating the scales.

Hawaii

Erythrina gall wasp (EGW), *Quadrastichus erythrinae*

EGW continues to infest native and non-native *Erythrina* spp. It was first detected in April of 2005, as galls on leaves and stems on ornamental Indian coral trees at the University of Hawaii on Oahu. The current distribution of the Erythrina gall wasp also includes Taiwan, mainland China, India, American Samoa, Guam, and Florida. The impact of the gall wasp on native wiliwili populations is variable, with some populations still relatively healthy while others are moderately to highly infested. Wide scale mortality of wiliwili trees has not yet occurred but is imminent at some of the more highly impacted sites such on Maui and Oahu. Most *Erythrina variegata* (non-native) trees have been killed and removed.

The Hawaii Department of Agriculture and the University of Hawaii have identified candidates for biological control of the gall wasp during exploratory trips to Africa. A parasitoid wasp in the family Eurytomidae was released in

2008 and 2009 at several wiliwili populations throughout the state to control the gall wasp. Larvae have been retrieved from the field indicating the eurytomid wasp has established. Ongoing monitoring in collaboration with the Hawaii Department of Agriculture will determine impact of the released biocontrol on the health of the wiliwili trees. Two other agents found in Africa are currently being studied in quarantine facilities in Honolulu.

Myoporum thrips, *Klambothrips myopori*

The initial infestation of naio (*Myoporum sandwicense*) by *Myoporum thrips* (*Klambothrips myopori*) was reported to the Hawaii Dept. of Agriculture (HDOA) in March 2009 by a North Kona resort groundskeeper. In collaboration with DOFAW and the Big Island Invasive Species Committee, HDOA conducted initial delimiting surveys to assess the distribution, and determine whether *Myoporum thrips* should be the target of eradication efforts. The extent of the *Myoporum thrips* infestation is currently unknown on the Big Island, but populations continue to be detected on the west and north side of the island. Given the frequency of inter-island transport of goods and people, and the precedence of pest range expansions, the species will likely spread to other Hawaiian Islands. *Myoporum thrips* have been documented to cause high levels of mortality in ornamental *Myoporum* species used for landscaping residential and freeway margins in California. In Hawaii, there is no reason to expect a different outcome in terms of plant mortality, and the potential ecological impacts are much greater. *Myoporum sandwicense* (naio) is an integral component of native Hawaiian ecosystems.

Guam, Palau and Rota

Asian cycad scale, *Aulacaspis yasumatsui*, now occurs throughout Guam and continues to be a serious problem in Guam's native forests, particularly on small regeneration. First detected in 2003 on the ornamental king sago (*Cycas revoluta*) in Tumon Bay, it is a pest of both native and ornamental cycads. *Cycas micronesica* is a dominant mid-to-upper-canopy forest component in the island's native limestone forests and riparian ravine habitats. A suite of integrated pest management tools are being implemented to combat this pest. The scale has also been detected on Palau and Rota where the introduction of the biological control agent, *Rhyzobius lophanthae*, from Guam, has reduced scale populations to low levels.

Guam

Coconut rhinoceros beetle, *Oryctes rhinoceros*, was detected on Guam on September 12, 2007. CRB is native to Southern Asia and now occurs throughout much of Asia and the Western Pacific. It was accidentally introduced and is now established on the Pacific Islands of Palau, Fiji and Samoa. It is a serious pest of coconut palm *Cocos nucifera*, betelnut *Areca catechu*, and *Pandanus* species. It is also known to attack banana, taro, pineapple and sugar cane. Adults are the injurious stage of the insect. They are generally night-time fliers and when they alight on a host, they chew down into the folded, emerging fronds of coconut palms to feed on sap. V-shaped cuts in the fronds and holes through the midrib are visible when the leaves grow out and unfold. If the growing tip is injured, the palm may be killed or severe loss of leaf tissue may cause decreased nut set.

A Detector Dog Program is being initiated to detect CRB-infested palms. Canine handlers began field training with Guam Customs & Quarantine in August 2009.

Graduation of canines is scheduled for mid-November 2009. FHP is involved with this and it is a very exciting program!

Oregon – Rob Flowers (Oregon Dept. of Forestry)

Summary:

In 2009, there were 216,000 ac of defoliation detected by aerial survey in Oregon, an increase from the 195,000 ac mapped in 2008. Consistent with recent trends, the majority of insect defoliation this year was attributable to Western spruce budworm, larch casebearer, and balsam woolly adelgid. Lower levels of damage were associated with satin moth, sawflies, spruce aphid, and black pineleaf scale. Two seldom-observed damaging agents, the pine butterfly and “red belt,” a weather-related phenomenon, were newly detected this year. Preliminary results for trap captures of Douglas-fir tussock moth suggest an overall increase in northeast Oregon, while a total of 6 gypsy moths were captured statewide in 2009.

Major agents in 2009:

Western Spruce Budworm, *Choristoneura occidentalis*

Western spruce budworm defoliation was detected on approximately 41,000 ac in 2009, a significant increase from the 10,000 ac observed in 2008. However, this appears to be largely a product of more favorable survey timing this year. Increases may certainly have occurred in some areas, but overall damage levels were below the recent peak detection of 96,000 acres in 2007. Damage continues to be light-moderate in intensity and is primarily restricted to the Ochoco and Malheur NFs in northeast OR.

Balsam Woolly Adelgid, *Adelges piceae*

Damage by balsam woolly adelgid was detected on over 152,000 ac in 2009, an increase from 123,000 ac in 2008. Tree decline and mortality continues to be most apparent in stands of subalpine fir. Scattered damage is occurring in the Cascades from Mt. Hood NF south to the Rogue River NF, while more intense and widespread damage was apparent in northeast OR, over areas of the Wallowa-Whitman, Umatilla, and Malheur NFs as well as in Hell’s Canyon NRA.

Larch Casebearer, *Coleophora laricella*

Larch casebearer damage has been observed in northeast Oregon since 1999. In 2009, over 15,000 ac of light-moderate defoliation was detected, down from 55,000 ac in 2008, and far below the recent peak of 82,000 ac in 2007. It is unknown if recent fluctuations represent population declines or are the product of survey timing / damage signature development. Damage in 2009 was scattered in previously affected areas on the Mt. Hood NF as well as federal and private lands in northeast OR. Larch needle cast, an associated foliar disease, was also prevalent in the Elkhorn Mountains of the Wallowa-Whitman NF this year.

Minor agents in 2009:

Satin Moth, *Leucoma salicis*

Satin moth is a non-native defoliator of poplars that has periodic, localized outbreaks in Oregon. Defoliation was estimated at over 1,500 ac in 2009, a decline from the 3,000 ac detected in 2008. Damage is commonly observed in isolated aspen stands on BLM and private lands in southcentral OR as well as in areas of the Umatilla and Wallowa-Whitman NFs in northeast OR.

Previous ground surveys have confirmed the presence of satin moth in some areas, but additional funding is being sought to perform ground-based evaluations of damaged / declining areas of aspen in Region 6.

Sawflies, *Neodiprion* spp.

An estimated 125 ac of defoliation in eastern OR was attributed to sawflies in 2009, although ground-based surveys indicate the affected area is likely much greater. *Neodiprion* sawflies are common throughout OR, and have recently been observed damaging areas of mature, Western hemlock as well as ornamental pines and plantation Douglas-fir. In 2009, the majority of the damage occurred on pines in eastern OR. While defoliation appeared severe, recent outbreaks have quickly subsided with little to no tree mortality.

Black pine leaf scale, *Nuculaspis californica*

Defoliation due to black pineleaf scale was observed on 100 ac in 2009, but it is known to be affecting several thousand acres in / around fruit-growing areas of the Hood River Valley. Progressive decline and mortality of mature ponderosa pine, as well as Douglas-fir, a secondary host, continues to occur. Outbreaks are associated with disruption of scale parasitoids, and have previously been linked to residues from pesticide applications, road dust, and air pollution.

Spruce Aphid, *Elatobium abietum*

In 2009, spruce aphid accounted for 140 ac of damage to Sitka spruce along the Oregon coast. Scattered damage was observed in mature trees, similar to what has been detected in recent years, and was significantly less than the outbreak levels that were observed in 2005.

Other Moths

Visible defoliation from Douglas-fir tussock moth, Pandora moth, and oak looper, which were observed at low levels in 2008, were not seen during aerial surveys in Oregon this year.

New Detections in 2009:

Pine Butterfly, *Neophasia menapia*

Defoliation by pine butterfly was observed on approximately 4,000 ac in 2009. This represents the first reported outbreak in Oregon since 1982. The damage was scattered across multiple ownerships including the Malheur NF, BLM, and private lands, with ponderosa pine primarily affected. Previous outbreaks have occurred in ID on the Payette NF (1921-23) and Boise NF (1953-54) as well as the Bitterroot NF (1973-74) in MT. Defoliation appears to be severe in some areas, and some tree mortality may occur in combination with additional damage from sawflies and bark beetles. Additional funding is being sought to perform ground-based evaluations of this rarely observed occurrence.

“Red belt” / Winter Desiccation

“Red belt” also appears to be a somewhat rare, weather-related phenomenon in OR, but was observed on approximately 2,800 ac in 2009. The damage appeared as horizontal bands from 4,000-5,000 ft elevation on buttes, lower mountain slopes, and ridges in central and eastern OR. The damage is thought to have resulted from rapidly changing winter temperatures associated with air inversions. Ground-based evaluations indicated ponderosa pine and Douglas-fir were most affected, with severe needle desiccation common, but no observed damage to buds.

Pheromone Trapping:

Douglas-Fir Tussock Moth, *Orygia pseudotsugata*

Preliminary assessments suggest an increase in Douglas-fir tussock moth trap captures for OR in 2009. Thus far, greater average trap captures have been observed on the Umatilla and Wallowa-Whitman NFs. Ground-based evaluations on the Wallowa-Whitman NF, which have had the highest captures in recent years, as well as detectable egg masses, are ongoing.

Gypsy Moth, *Lymantria dispar*

Approximately 12,000 traps were placed in 2009, and these captured a total of 6 gypsy moths at three sites. All moths were determined to be the North American-European strain. Three moths were captured in the Portland area, associated with an RV park, while 3 additional moths were captured individually in smaller towns in the Willamette Valley. No additional moths have been found at the three most recent eradication sites in western OR: St. Helens (Asian gypsy moth strain), Shady Cove, or Eugene.

Washington – Glenn Kohler (Washington Dept. Natural Resources)

Summary of important defoliation events in Washington State:

Approximately 489,000 acres in Washington State were observed to be damaged by defoliating insects in the 2009 annual insect and disease aerial survey. 2009 defoliation was above the average of 386,000 acres with defoliation over the past 10 years in Washington. Ninety-eight percent of the recorded defoliation in Washington was caused by western spruce budworm (84%) and balsam woolly adelgid (14%). The cause of defoliation was unknown on 3,390 acres (1%).

The area of Douglas-fir tussock moth (DFTM) defoliation in northern Okanogan County has expanded from 300 acres in 2008 to more than 3,500 acres in 2009. A buildup of parasites and virus in the most heavily defoliated areas may slow the expansion of defoliation in those areas in 2010. Very light DFTM defoliation has been observed in the Methow Valley and the Early Warning System trap catches there indicate that DFTM populations have risen in that area.

A major western spruce budworm (WSBW) outbreak remains active on the eastern slopes of the Washington Cascade Mountains. New areas of defoliation have expanded in eastern Okanogan County and northern Ferry County in 2009. WSBW defoliated areas in western Yakima County have significantly decreased since a peak in the number of defoliated acres in 2006. More than 5,000 acres of balsam woolly adelgid (BWA) damage were observed in the Okanogan Highlands region of northeastern Washington. This is at least five times more area than that affected by BWA in this area over the past 10 years.

The actual amount of annual defoliation is likely underestimated by aerial survey mapping. One reason for this is that the damage from some defoliators is most evident outside the survey window. Many early-season damaged host plants may re-foliate prior to the survey flight. Examples include larch casebearer, tent caterpillars, needleminers, and sawflies.

Douglas-fir Tussock Moth (DFTM):

Defoliation by the Douglas-fir tussock moth (DFTM) increased to 3,565 acres in 2009 from 300 acres in 2008. The outbreak covers numerous discrete areas east and west of Oroville in northern Okanogan County near the British Columbia border. Affected forests are mostly low elevation, dry site, mixed stands of Douglas-fir, ponderosa pine, and western larch. The majority of defoliated acres are on BLM and private lands, although all ownerships are affected. Crown defoliation was as high as 100% in the epicenters of some outbreak areas. The heaviest defoliation has occurred in dense stands of understory and immature trees. Western larch and ponderosa pine have also been heavily defoliated in some areas. In general, open grown mature trees appear to be less affected by defoliation. Some areas of DFTM irruption in the Oroville area are overlapped with western spruce budworm activity. In the Methow Valley, very light defoliation has been observed and low densities (on 10-20% of cocoons) of fresh egg masses were present.

Analysis of egg masses collected in fall 2008 from the Oroville and Palmer Lake areas showed very low levels of virus (NPV) and egg parasitoids. In summer 2009, caterpillars with NPV symptoms and pupal parasitoids (Diptera and Ichneumonoid) were common in heavily defoliated areas. Symptoms of NPV included liquid filled cocoons and loosely spun cocoons containing dead caterpillars that never pupated. A buildup of parasites and virus in areas with the heaviest defoliation may slow the expansion of those defoliated in 2010. However, some areas with light defoliation north and south of Mt. Hull have high numbers of egg masses and no or low levels of natural control apparent. Egg masses collected in fall 2009 from the Oroville area and the Methow Valley will be analyzed for NPV and egg parasitoid levels.

Some of the DFTM infested areas in Okanogan County were used for a Forest Service study to evaluate the efficacy of an aerially applied biodegradable formulation of DFTM mating disruption pheromone. In late July 2009, the pheromone was applied to six 40-acre test plots in infested areas in the Methow Valley, on Palmer Mountain, and east of Oroville. Study results are pending.

Washington DNR placed 97 DFTM pheromone traps in 2009. Due to budget constraints, the DNR could only place 57% of the traps deployed in 2008. Traps were not placed in areas that are currently experiencing DFTM outbreak or where other agencies have DFTM trap coverage. Overall, DFTM trap catches have decreased in Washington since 2008. In 2009, there were five DFTM trap sites in Okanogan County with catches over 40 moths, down from eight in 2008. Trap catches were elevated in western Okanogan County and along the Methow Valley, indicating that DFTM populations are still rising in that area. DFTM traps in northern and central Okanogan County were down as expected due to high populations of DFTM females in the area that attract males away from traps. Two of the three high count traps along the Idaho border in Spokane County have trended upward. New defoliation and at least one egg mass were reported at the Tekoa Mountain location. The Idaho Department of Lands has reported elevated trap catches and sub-outbreak populations in areas south of Coeur d'Alene.

Western Spruce Budworm (WSBW):

The east slopes of the Washington Cascade Mountains continue to experience large areas of WSBW defoliation. Areas with WSBW defoliation recorded in the 2009 aerial survey have decreased to 412,640 acres, down from 450,643 acres in 2008, and remains below a recent peak of 555,748 acres defoliated in 2006. The average WSBW defoliation in Washington over the past ten years is 317,000 acres. Defoliation continues to be widespread along the eastern slopes of the North Cascades in western Kittitas County, Chelan County, and Okanogan County. WSBW pheromone trap counts in central and eastern Okanogan County and northern Ferry County have been elevated during 2007 to 2009. Correspondingly, the acres of WSBW defoliation recorded in eastern Okanogan County and northern Ferry County have increased in 2009. In addition, trap counts also remain high in Kittitas County where defoliation is likely to continue. Both trap counts and defoliated acres have decreased during 2007 to 2009 in western Yakima County. This area experienced heavy defoliation in 2005 and 2006. Washington DNR and a cooperator, American Forest Land Company, placed 132 WSBW pheromone traps in 2009. Due to budget constraints, DNR could only place 72% of the traps deployed in 2008. The DNR acquired new land in the Naneum Creek area north of Ellensburg, and was able to add eleven new pheromone traps sites in this area in 2009. Trap catches from the Naneum Creek area indicate heavy defoliation is likely in 2010.

Balsam Woolly Adelgid (BWA): In 2009, the aerial survey recorded 68,666 acres with BWA damage in Washington. This is an increase from approximately 45,000 acres in 2008 and more than the 59,000 acres affected by BWA in 2007. In 2009, approximately 5,500 acres were damaged by BWA in high elevations of the Okanogan Highlands in eastern Okanogan, Ferry, Stevens, Pend Oreille, and northern Spokane Counties. Damage of this extent has not been observed over the last ten years in the Okanogan Highlands. The most acreage damaged by BWA in this area was 850 acres in 2005. BWA damage was also recorded at high elevations of the Blue Mountains, the east slopes of the Olympic Mountains, and on both the west and east slopes of the Cascade Mountains. The majority of BWA damage in the Blue Mountains was on the Umatilla National Forest. The majority of damage in the Olympic Mountains occurred within the Olympic National Park boundary. BWA damage observed in the Washington aerial survey has been consistently high since 2001, averaging more than 43,000 acres per year for the past nine years.

Forest Tent Caterpillar (FTC): The 2009 aerial survey observed tent caterpillar in alder on 233 acres along stream bottoms in south Stevens County. Ground observers reported defoliation in red alder and other hardwoods along riparian areas throughout central Stevens County and north of Ellensburg in Kittitas County. Washington DNR entomologists identified FTC, *Malacosoma disstria*, as the cause of damage in some of these areas. Defoliation by FTC in both areas of central and northeast Washington was noticed in early July and damaged trees had refoliated by October.

Larch Casebearer: Larch casebearer damage was observed on 214 acres in 2009 in north Ferry County and near the Idaho border north and south of Newport. This is a significant decrease from the more than 70,000 acres defoliated in 2008.

Loopers (Lepidoptera: Geometridae): No looper defoliation was recorded in 2009. From 2006 to 2008, hemlock looper defoliation was observed on the north slopes of Mt. Baker.

Black Pineleaf Scale: The 2009 aerial survey recorded approximately 200 acres with black pineleaf scale defoliation in small scattered low elevation areas on the east slopes of the Cascade Mountains from Yakima County north to Okanogan County. The peak black pineleaf scale defoliation over the past ten years was approximately 6,600 acres in 2006 throughout north central and northeast Washington.

Satin moth: Satin moth defoliation of aspen was observed on 215 acres in eastern Okanogan County and Ferry County in 2009. Small areas of satin moth defoliation have been observed in the Okanogan Highlands area in previous surveys. The peak satin moth defoliation over the past ten years was 690 acres in this same area.

Needleminer in ponderosa pine: The area of ponderosa pine north of Ellensburg that was damaged by a needleminer, *Coleotechnites ponderosae* (Lepidoptera: Gelechiidae), in 2008 has recovered and there was no noticeable damage in that area in 2009. Some areas of needleminer damage to ponderosa pine were observed on the ground along Oak Creek west of Naches in Yakima County and in the areas around Wenas in Yakima County and southern Kittitas County. Needleminer damage in both areas was light in 2009. Damage from the needleminer is evident as a tan color in the older foliage with visible larval emergence holes. Needleminer damage has not been mapped by the aerial survey in 2008 and 2009 because elongation of current year needles over the summer masks damage during the aerial survey flight season.

Sawflies (Hymenoptera: Tenthredinidae): An unidentified species of sawfly caused minor defoliation of older foliage in a 20-year-old Douglas-fir plantation on approximately 10 acres of private land near Tiger Mountain in King County. An attempt to rear adults for identification was unsuccessful.

Mountain Ash Sawfly, *Pristophora geniculata*, (a non-native species) was confirmed from several locations in the Seattle area. The presence and any damage caused by the mountain ash sawfly will be monitored by Washington State Department of Agriculture and Washington State University Extension in 2010.

Striped Alder Sawfly, *Hemichroa crocea*, caused heavy defoliation on less than one acre of young alder reproduction near Centralia. The larvae were actively feeding in October.

Slug Sawfly: Washington DNR received a report of "slug" sawfly defoliation of Oregon white oak in southwest Washington. The identity of the sawfly has not been confirmed. Adult emergence traps will be placed in the area in 2010.

Gypsy Moth: In 2009, the Washington State Department of Agriculture placed 23,213 gypsy moth pheromone traps in Washington. Of these, 14,808 traps were for European gypsy moth (EGM) and 8,405 for Asian gypsy moth (AGM). Eighteen gypsy moths were collected from seven catch areas, all in western Washington. Of the seven catch areas, six areas were new detections for gypsy moth in 2009. All 18 moths collected were the North American variety of EGM from the established European population in the eastern United States. No AGM have been trapped in Washington since 1999. A total catch of 18 moths is not unusually high when more than twenty thousand traps are used. In the past twelve years, the highest number of moths collected was 92 in 2000. No eradication projects were conducted in 2009 and none are planned for 2010 at this time.

Region 10 -- Jim Kruse

Aerial Surveys

Aspen Leaf Miner – This leaf miner affected 310,600 in 2009, an increase from the ~200,000 acres detected in 2008 but still less than in 2007 (~500,000 acres). The last ALM outbreak was in the 1970s; that outbreak was ended by a large aspen tortrix outbreak. Some mortality has been observed along roads, mostly in areas where trees are already stressed by low rainfall.

Budmoth – About five species are present, including four on spruce and one on larch. The species on spruce affected about 13,200 acres in the spring when the shoots were in the candling stage.

Spearheaded Black Moth – Relatively high populations were detected on 14,310 acres in 2009

Willow Leafblotch Miner – Defoliation was detected on 136,336 acres, and was very visible in Fairbanks. Questions have been raised about possible effects on moose habitat.

Spruce budworm – No defoliation by either eastern or sitka spruce budworm was detected.

Ground Surveys

Sawflies – detected on 3,500 acres.

Non-native birch miners – Their range has increased, but their density has decreased. The decrease in density could be due to a newly introduced parasitoid – or perhaps native parasitoids have switched to these hosts.

Alder defoliators -- Some alder defoliation was observed on the Kenai Peninsula. Striped alder sawfly was also found, plus a new record for green alder sawfly. There is concern about the effect this defoliation near streams might have on salmon.

Noctuids – No defoliation was observed this year; usually ~40,000 acres are defoliated.

Gypsy Moth – None have been caught in traps since 2006. However, in September 2008 APHIS-CPB found Asian GM egg masses on a merchant ship from Japan. Also in September 2008, Rosy GM was found a ship from Vladivostock. No Rosy GM was found in the pheromone traps.

British Columbia -- presented by **Iral Ragenovich** for **Lorraine Maclauchlan**

Our CFS colleague **Imre Otvos** retired on November 6, 2009.

Western Spruce Budworm – In 2009, 766,125 hectares were defoliated in British Columbia, and 99% of this defoliation was in the Southern Interior Region. Defoliation declined slightly compared to recent years but still remains very high. Nearly 73,000 hectares were treated with Btk (Foray 48B) in 2009, and treatments on about 55,000 hectares are planned for 2010 -- **contact Lorraine if you want spray project experience!** Budworm is expanding in range and severity in these areas: Merritt-Lillooet, Okanogan, and Chilcotin. Populations have decreased significantly in the 100 Mile House and Kamloops areas – in part due to very large treatment programs. These treatments are being conducted to prevent tree mortality and thus fill the timber gap resulting from extensive pine mortality caused by mountain pine beetle.

Douglas-fir Tussock Moth – Most of the DFTM-caused defoliation was detected in Kamloops – 17,555 hectares were mapped in 2009, up from 2,600 hectares in 2008. About 4,300 hectares were treated with the nuclear polyhedrosis virus in 2009 – much more than was treated in 2008. About 60% of the treated area was Provincial Crown lands, and 38% was private lands. These treatments used up

BC's remaining supplies of NPV (both Virtuss and TM-BioControl). In areas with very high numbers of egg masses, defoliation and some tree mortality occurred despite NPV treatment. Additional treatments are planned for 2010, probably using *Btk*.

Western Hemlock Looper – Pheromone traps indicate that populations have been increasing and an outbreak is imminent. A discussion ensued about whether we know what different trap catch levels mean for hemlock looper (= not very much). Traditionally this insect has been thought to be an old-growth hemlock problem. Iral mentioned that Paul Flanagan had found this looper around Baker Lake (north of Seattle), and had done some pheromone trapping.

Gypsy Moth

No treatments in western states are planned for 2010. In Vancouver, BC, a treatment of about 2,000 hectares is planned near the airport – which is also near the skating arena for the 2010 Winter Olympics. They have not heard from very many local objectors.

General Discussions about Various Topics

Camera with GPS Links –

{Note: Sheryl presented examples of this technology during her R2 presentation. Information sent later by Rob and Sheryl is included here.}

From Rob:

I mentioned at the meeting that the ODF pilot did some research/testing on a very few camera systems that have GPS. He was tasked with finding something that would work well for general aerial photos, provide reasonably accurate coordinates, and be relatively inexpensive. His preferred camera was the Nikon D90 SLR.

<http://www.nikonusa.com/Find-Your-Nikon/Product/Digital-SLR/25446/D90.html>

This system can be outfitted with an external Nikon GPS unit that is tethered with a short cable (in the accessories tab at the link). This allows for real-time geo-tagging, with coordinates downloadable to Google Earth, etc. for display.

However, when tested against other GPS units that we have, the Nikon unit was the least accurate. Also, the way that it attached to the camera was problematic with the set-up that we use. So, although very difficult to find, Trevor located adapter that allows you to attach any GPS unit to the camera, which is how he did the testing. He settled on a Garmin 60CSx, which together with the D90 would run about \$1,200-\$1,500.

From Sheryl (info from Brian Howell, R2 Aerial Survey Program Manager):

The GPS device use in R2 is called the Geopic II. It is compatible with certain Nikon and Fuji digital SLR's- check to see if your camera is compatible. We use a Nikon D300 and have been satisfied with results. The Geopic is roughly 2"x1.5"x3/4" and it can mount either to the strap of the camera or it will slide in to the external flash mounting bracket. It runs off of the camera's batteries but can be set to sleep when not in use to save batteries. It can take a while to get a satellite fix so if I know I will be taking pictures I'll leave the GPS on rather than having to circle in the airplane waiting to get a satellite lock. It has a variety of settings- you can set it to only geotag a picture if it has a current lock (which is

useful for most outdoor applications) or it can tag pictures with the last position it took (useful for getting a lock outside a building then going in to take a number of pictures indoors where you will not get satellite reception). You need software to be able to see the coordinates- I use IMatch which allows you to click on a link which will show the photo location in Google maps. You can also store photos on an online site and link to Google Maps/Earth and create links to your pictures by location. It costs around \$200 and is available from B&H photo:

http://www.bhphotovideo.com/c/product/564380-REG/Custom_Idea_GEOPICII2467_GeoPic_II_Direct.html

Other products exist that are compatible with other cameras. If you go to the above link and search around you can find those

Nursery Inspection Programs – Jim asked about the status of nursery inspection programs. Sandy reported that at the Couer d’Alene (ID) nursery, they have found pine tip moth; they also trap for cranberry girdler. Jim noted that European pine shoot moth, forest tent caterpillar, and western tent caterpillar are found fairly often. Glenn and Rob reported that leaf sampling is done for sudden oak death. Iral described how container-grown spruce (with a certificate!) had been the source of a gypsy moth infestation in Eagle Creek in 2004.

General Questions/Information about Invasives – The CAPS program, APHIS, and ARS may fund some inspections/sampling for invasive species. In response to a question about how ED/RR trapping locations are determined, Iral described how those sites are selected by the USFS and State Dept.s of Agriculture as part of the CAPS program. Jim noted that the invasive weeds program is very strong in AK – they also have quite a bit of leeway to look at other invasives, too.

Good Topics for Next Year’s Meeting:

Quarantines, port inspections, trapping strategy, inspections
EDRR, CAPS (East WA pine survey by WSDA)

Note: here’s a link to a document about sampling techniques for introduced species that feed on pines –

<http://www.fs.fed.us/r6/nr/fid/pubsweb/2008-caps-exotic-pine-pests-survey.pdf>

What happens if something is found?

Iral: Bob Rabaglia will be reviewing EDRR this winter – modifications may result

Jim K – Has put out his own traps on the side

Laura – Would the WO-FHP be interested in a defoliator EDRR?

Social Media / Websites:

Jim: Expanded use of twitter and other social media was encouraged during the recent R10 FHP review

Ryan: a blog for the 2010 WFIWC meeting is about to be implemented

FYI, here’s the link to the WNADWG website:

<http://www.fs.fed.us/r6/nr/fid/pubsweb/westdef.shtml>

Abbott’s Formula – This formula adjusts % mortality attributed to a treatment to account for background mortality observed in the control. The original citation is: Abbott, W.S. (1925). A method of computing the effectiveness of an insecticide. J. Econ. Entomol.; **18**: 265-267. Here’s a website showing how to apply Abbott’s formula and several other related formulae: <http://www.ehabsoft.com/ldpline/onlinecontrol.htm>

Douglas-fir Tussock Moth in the West

Low Dose Virus trials for DFTM – Iral Ragenovich

Background: Imre Otvos tested the stored virus in 1998-2001, and found the virulence had declined. Therefore we had less virus available (as measured by acre-doses) than we'd thought. In addition, some virus has been used by R6, R3, Coeur d'Alene Nursery. Imre had tested low-doses before, and had some success

Treatments: 4 treatments were applied (3 blocks each): $\frac{1}{4}$ of the registered rate, $\frac{1}{2}$ of the registered rate, the registered rate, and no treatment. These applications were tagged on to operational DFTM treatments in BC, and were done in cooperation with Lorraine Maclauchlan. Treatments were applied on June 4 2009. Pre-spray samples (15 sample trees per block) were collected on June 1-4, and post-spray samples were taken ~5 weeks later (July 6-9). Some blocks burned up later – after the post-spray sampling. Imre Otvos tested larval samples from pre- and post-samples for virus. Some plots had budworm present.

Results: Reduced rate ($\frac{1}{4}$ and $\frac{1}{2}$) mortality was higher than registered rate, but Imre found lower mortality in reduced rate applications. They still need to adjust for DFTM density, and larval instar. Defoliation was heavy, even in treated plots. Natural virus was present in all plots. The US DFTM strains are generally more susceptible to virus than BC strains – so we might see higher mortality if used in the US. We're not sure if these areas will be monitored in 2010 – the populations will probably collapse because of virus.

Background Information about DFTM Virus Production

USFS: Sometime after the 1974 DDT project aimed at DFTM, the USFS started producing virus at the PNW-Corvallis Lab. DFTM larvae were reared, and then infected with virus; careful rearing procedures were necessary to prevent infection of the base colony. Dead infected larvae were ground up/purified, and then the final product ("TM-Biocontrol-1) was stored in a freezer at the Corvallis lab. This virus production facility was closed in 1984; the FS tried to get a commercial company to produce the DFTM virus, but there was no interest due to the very small market. From 1998-2001, Imre Otvos (Canadian FS) tested the virulence of each production lot; there was some decrease in potency for all lots. The pesticide registration label for TM-Biocontrol-1 is linked to the Goose Lake DFTM colony because the original development and testing was done with that colony. Imre Otvos (Canada FS) had maintained that Goose Lake colony until his recent retirement; the colony is now maintained by the USFS at the Hamden, CT research facility.

Canada has also produced DFTM virus. Whitemarked tussock moth (a closely related species) was used to produce the virus for a product is called Vertuss. Vertuss is no longer available, though – the remaining supply was used up in recent projects.

DFTM Mating Disruption – Iral Ragenovich, Glenn Kohler, Lorraine Maclauchlan

Treatments: This project was funded by a Special Technology Development Program grant (USFS) and the Spray Efficacy Research Group-International, and was done cooperatively by the USFS-R6, WDNR, and USFS-FHTET. Three sites in north-central WA were treated, with 2 treatments and 2 controls (~30 acres each) at each site. Helicopters were used to apply a biodegradable formulation of the DFTM pheromone. The pheromone was applied dry; they had originally planned to use a bucket so sticker could be included, but that didn't work out. Pre-sampling

was conducted on June 29-July 1, and the target instars were L3 & L4. High-dose traps were put in each treatment plot, and they monitored female pupae and egg masses. Elution cards were also set out and collected periodically to determine the pheromone elution rate.

Results: Due to very high parasitism among pupae plus some virus, they weren't able to collect many pupae in either treated or control areas. The treatment area was generally heavily defoliated, even on pine and larch(!). They'd thought they had a low DFTM population, but it turned out to be very high. Very few parasites or virus were present in the egg masses that Glenn sent to Imre. They still need to look at pupal data; many of the tagged pupae were gone or torn up, and Iral had noticed many mountain chickadees around. The elution data just came in yesterday. It was very difficult to find suitable locations: there were either too few insects (couldn't find enough to sample) or too many (other mortality sources affected the DFTM populations).

Questions from the group: How did you decide upon 10g – that's a low rate? Iral: A 2001 test in ID compared 2 rates (5g and 10g) with sticker; many plots were lost (sprayed, harvested, virus), but traps had lots of moths caught in control areas, but very few moths in traps in treated areas at either dose. Also, for gypsy moth, generally 6g is used, or 12g for very high populations (info from Donna Leonard). Is the biodegradable formulation registered? Iral: Hercon wants to register the biodegradable formulation, at least for gypsy moth, but it probably hasn't been registered yet.

DFTM in Idaho – Tom Eckberg

It's coming! ID has at least 10 times more moths in 2009 compared to 2008; most traps had moths. Populations are increasing in the usual spots, including many industrial lands. They added some new sites this year, including near WA's Tekoa Mountain, which seem to be a bellwether location. Defoliation has been seen on sentinel trees near Rathdrum on grand fir, and also at the Coeur d'Alene nursery. Defoliation has not yet been visible from the air, but they have seen defoliation in tops of trees observed from the ground.

Larval sampling has found increasing numbers for past 3 years; they also found egg masses at 4 of 26 sites sampled. The last outbreaks were in 1986 and 2000. In 2001, about 76,000 acres were treated with *Btk* and dimilin, and in 2002 about 30,000 acres were treated with dimilin.

Planned 2010 Treatments

The only known planned treatment for 2010 would be in northcentral Washington by the USFS. Connie estimated that up to 60,000 acres might be treated there. In response to a question about the current costs for aerial application, Connie said that for the USFS 2001 project, the total project cost was ~\$99 per acre. Tom reported that the ID 2001 project cost about \$33 per acre, and Glenn said that DNR's cost when using Bt was ~\$50 per acre for treatment and material only. States interested in possible FS funds should check with their local FHP staff.

Wednesday, December 9, 2009

Where to hold next our meeting?

Sheryl offered to host the 2010 meeting in Denver or Ft. Collins, and Lee offered to host the meeting in Coeur d'Alene. After some angst about which offer to accept, the group decide to flip a coin – and the Coeur d'Alene site was chosen. Our target dates are the weeks of either November 29th or December 6th – either Tu & W or W & Th.

Other Defoliators

Pine Sawfly & Pine Butterfly -- Lia Spiegel

These two defoliators were found together on ~4,000 acres on the Malheur National Forest and nearby BLM lands. The sawfly feeds a little earlier (many found in July) than pine butterfly. Defoliation was seen for a couple of miles along a road, mostly on the older understory needles. Pine butterfly adults were seen in early August; adults could be seen along a 15-mile stretch of road, though defoliation was visible for shorter portion of that road. Rob Progar (FS-PNW Research) provided some video clips of many adults flying among some trees. These insects were found on pines at edge of its range, where the forest type is transitioning into juniper. Defoliation is difficult to see during aerial surveys unless the angle is just right.

Discussion -- Beth: past outbreaks have been associated with old growth. Connie: sees them every year, generally don't see much defoliation. Bruce: saw a lot of pine butterflies in early-mid 1980s south of John Day, OR – no defoliation, though. Laura: Ralph Thier put together a literature survey; he found outbreaks occurred ~every 10 years somewhere in southern ID and caused heavy defoliation, often followed by increased bark beetle activity. Rob: the WFIWC archives has some info about past outbreaks.

Pandora Moth – Ryan Hanavan

Ryan has been working at Pandora Moth in northern AZ – R3 might get a FHM Evaluation Monitoring grant for this project. The last outbreak was in early 1980s, involving about 4,000 acres near Jacob Lake. R3 received calls this year from the Kaibab NF (both north rim and south rim). Rich Hoffsteter (NAU) is interested in pandora moth pheromones for use in traps; later he might look at the virus. Ryan plans to look at historical pandora moth maps and fire history in a study of the influence of previous burns on the timing and location of outbreaks. ADS generally didn't pick up pandora moth, so he's looking at satellite images instead.

Adults were present in 2009 for these 2-year, synchronized populations. The FS is just monitoring now; they would need to consult with Native American groups if treatments are planned. Iral mentioned that Orthene was applied in the early 1980s (check with Dayle Bennett for more information); they tried both fall and spring treatments on populations near Jacob Lake. Regarding public health concerns about caterpillars, Sky mentioned a study by Mike Wagner (NAU) on public perceptions about management. Bruce said that standard ADS is generally too late to detect pandora moth – R6 does special early surveys when pandora moth is present.

Sawflies

Neodiprion fulviceps

Ryan reported an outbreak of this sawfly on the border of the Kaibab and Coconino NFs – north of Kendrick Mountain – in the transition zone between ponderosa pine and juniper. This outbreak covered about 4,000 acres, and was fairly heavy (larvae were running out of food). The defoliation was difficult to see

in ADS. Rich Hofstetter (NAU) has some students working on this sawfly. R3 has established some permanent plots to look at mortality and possible subsequent bark beetle activity.

***Neodiprion* species on Douglas-fir/hemlock**

Rob reported defoliation on Douglas-fir by a *Neodiprion* species. Douglas-fir from unknown seed sources had more damage than was found on trees from confirmed local seed sources. These sawflies caused defoliation but not tree mortality. A big storm that occurred when most larvae were third and fourth instars caused much mortality among the sawflies. Rob also reported substantial defoliation by *N. tsugae* on hemlock on the west slope of the Cascades in 2008 only.

Kathy mentioned that long ago she worked with two *Neodiprion* species feeding on white fir in Modoc County (northeastern CA). D.R. Smith identified the common species (brown larvae and pupae, cocoons found in soil) as *N. near deleoni* and the relatively rare species (green larvae and pupae, cocoons attached to needles) as *N. abietis* complex. She was able to rear *N. abietis* complex on Douglas-fir, grand fir, and hemlock.

***Neodiprion autumnalis* on pine**

Sandy reported that huge numbers of sawflies were found at a dry area at Salmon River Seed Orchard. The local manager had thought these were European pine sawfly, but Dave Smith identified them as *N. autumnalis*. These sawflies were treated with carbaryl.

***Neodiprion edulicolis* – Pinyon Sawfly**

Darren reported that pinyon sawfly defoliated about 75,000 acres in central Nevada in the early summer of 2009. He also mentioned the H.H. Ross (1955) paper in *Forest Science* that provides much of the published taxonomic guidance for this genus. Cindy found some defoliation by this sawfly in southern CA (San Bernadino NF).

Green Alder Sawfly

Jim reported a new find in the U.S. (though previously discovered in eastern Canada in 2000). This sawfly was discovered in AK in 2004 in click beetle traps, and identified by Dave Smith. Heavy defoliation of alders *Alnus tenuifolia* was detected in 2005 at Eagle River; a separate study found that defoliated alders were not fixing nitrogen. Cindy found it on Palmer Hay Flats in 2007. In 2008 this sawfly was rediscovered on the Kenai Peninsula. Some adults were found in EDRR traps -- they emerge relatively early (2-3 weeks before alder woolly sawflies), and the adults seem to be attracted to yellow sticky cards. APHIS PPQ has now classified this species as “reportable, actionable” (just last week, after much pushing by Jim), which is just 1 step below the level requiring quarantines. Concerns include effects on salmon habitat (defoliation causes stream temperatures to increase); also, defoliated alders are outcompeted by cherry, which may release toxins into streams. This sawfly can pupate in wood as well as duff – possibly moved by firewood? The pupation sites don't have to be alder. An Evaluation Monitoring proposal would look at the possible connection between this sawfly and alder canker.

This sawfly is native to Europe & North Africa). We don't know how it arrived in North America – perhaps on shipping through the NW Passage (125 ships per year come directly from Europe through Arctic passage at Anchorage; may have first arrived at Anchorage). Other ports that should be on the lookout include Seattle and Prince Rupert. Not much is known about this species – it is not on most warning lists, and only 5-6 papers from Europe cover this species. Several species are hosts in Europe, but it was only found on *A. rugosa* in Newfoundland. This sawfly may be able to switch over to other *Alnus* species in North America.

Green Alder Sawfly was found in stands along the Little Suisitna River in July 2009. Lots of alder are present, and it is a very important early successional species because it fixes nitrogen. This area was ground-checked, and the sawfly was confirmed. Defoliated trees generally don't re-leaf in same year. Defoliation can continue for several years of defoliation (some mortality may occur), and a canker may also be involved. The FS has some interest in looking at a natural control (contact Dick Reardon), but needs to find a local scientist to work on it; Steve suggested checking with UBC and/or UNBC.

Other Sawflies and General Discussion

Glenn reported finding **striped alder sawfly** in WA this year. Jim mentioned that in AK the populations go up and down, but usually you can find some. Rob said he is also doing surveys for *Phytophthora alni* -- but doesn't think that was causing this defoliation.

Iral asked if anyone was using yellow sticky cards for sawflies. Ryan noted that those cards work well for leaf beetles. Jim said that Rob Progar uses traps over the ground to catch emerging adults – probably an easier trapping method than sticky yellow cards.

Tom reported defoliation by sawflies on ~150 acres of hybrid poplars near Hayden, ID, in the spring of Spring 2009. Different poplar clones had very different sawfly population levels. Defoliation happened in late May / early June, then the trees generally re-leafed a month later. They had trouble rearing larvae -- foliage dried out really fast. Treatments might be applied next year. Rob said they found no problems in poplar plantations in eastern OR near Boardman.

Larch Casebearer

Lia reported that we had thought that larch casebearer typically defoliates trees in the spring, and then the trees re-leaf in the summer; however, throughout the Blue Mountains, she has seen much later defoliation (in September, even), with no subsequent re-leafing. Heavy defoliation has been observed, mortality may occur soon. Some needle diseases are also present, but she's fairly certain they are not causing this damage.

Larch casebearer activity was also reported by:

Tom – Casebearer populations have consistently been present in ID.

Sandy – Two waves of defoliation often occur. Large larvae cause defoliation in the early spring, then in the fall the small larvae of the next generation can cause additional defoliation. They find heavy defoliation sometimes (such as on golf courses), but mostly the defoliation is sporadic. Several years ago, she and Paul Flanagan reared parasites, and found *Agathis* plus many native species (not all were identified).

Bruce – On the east slopes of Mt. Hood (OR) there is an area on the National Forest that has had defoliation, visible from the ground, every year for the last decade or so.

Rob – He also has seen several years of defoliation on private lands in OR.

Pine Needle Sheath Miner

Tom reported damage on ~100 acres in 2009. This miner was mostly feeding on the previous year's growth. The new "candles" seem to be unaffected, and he is not sure how big of a problem this miner will be next year.

Other Items

Defoliator Database

Beth presented some background information about this project: In 2002, Rob Progar, Beverly Bualon, and Beth used EndNotes to consolidate information about the effects of western spruce budworm on non-timber resources. In 2004, Darren added many citations from his dissertation research. In 2006, the group contacted Marla Downing (FHP-FHTET) for help; Marla suggested contacting the bark beetle technical working group – they were using a proto-type that Marla had developed. Beth then went to bark beetle group, who agreed to joint project. At a WFIWC workshop in 2007, participants agreed to focus on "gray literature" – unpublished, informal reports. The western FS Research Stations have since started a bark beetle working group, and they are very interested in our gray literature.

We decided to do a pilot project, because we needed to answer questions about how much it would cost, how much time would be needed, etc. We also worked with the FS Library -- their staff was very excited about making our gray literature a special collection. The pilot project would cover one FHP field office, and would just meet bare minimum cataloging requirements (nothing fancy or extravagant). In 2008 a \$10,000 proposal was submitted to WO-FHP with Darren as lead; however, during the summer fire borrowing interfered. This proposal was then resubmitted in the fall of 2008 – but by then, support from FHTET began to wane, in part because they were not sure how this database would mesh with the new Kansas City data center. Separately we also had some input to FHTET's Information Strategic Plan, but we have not heard anything yet resulting from those efforts. In the meantime, FHP-R5 received funding through FHM for a geo-based literature system. Laura noted that last summer Joy Roberts hired a student to scan papers from their office (used EndNotes, included keywords).

Beth has put in a proposal for R6 (Westside Service Center) in response to a recent call for new FHM Analysis and Reporting proposals; their proposal requests \$20,000 for a pilot project to develop processes, procedures, standards, and protocols for a prototype forest insect and disease gray literature database repository based on the gray literature at one field office location. Bruce noted that if FHM doesn't fund this proposal, then perhaps each FHP Field Office in the West could contribute a small amount (~\$1,000) to get to the \$20,000. Beth hopes that other regions will also apply for similar pilot projects.

What would this database cover? FS Research: all of their publications are (or will soon be) available, so the database would include links to those publications. It would include trip reports and numbered reports often written by Field Offices. Small journals

would probably be included, especially if their papers are not otherwise available. Our emphasis would be on publications that are not available online. We'd need to be mindful of copyright concerns. The database should be searchable by host, scientific name, and common name; geo-referencing to state or maybe county would be a secondary objective.

Forest Insect and Disease Leaflets (FIDLs)

Kathy presented an update on FIDLs. This publication series has 173 FIDLs. Seven FIDLs were revised in FY09, including one that covers a western defoliator: FIDL#139, Large Aspen Tortrix, by Bill Ciesla and Jim Kruse. Revisions to 11 FIDLs are underway – including one western defoliator (FIDL#86 Douglas-fir Tussock Moth). Six new FIDLs have been proposed, including winter moth – an introduced species found in OR and WA. Bill Ciesla has also proposed to revise FIDL#95 – Boxelder Bug – and is looking for potential coauthors (and support from FS FHP). Ryan Hanavan expressed interest in coauthoring the boxelder bug FIDL with Bill Ciesla. Kathy will add a list of “missing versions” to the FIDLs website (<http://www.fs.fed.us/r6/nr/fid/wo-fidls/index.shtml>).

Revised Western Forest Insects

Lral reported that the revision to WFI is proceeding steadily. Much work remains to be done, and she is looking for volunteers. See which sections have already been revised (or at least, claimed!) on the WFW website: <http://www.fs.fed.us/r6/nr/fid/wfi/index.shtml> - your help with any of the remaining sections would be greatly appreciated!

Budworm Activity in the West

Managing WSB: Treatments

Kathy reported minimal recent progress in expanding the documentation of treatments aimed at western spruce budworm. Detailed information about 93 suppression projects and 6 silvicultural treatments aimed at WSB is available at: <http://www.fs.fed.us/r6/nr/fid/budworm/info.shtml>, and additional information is added as time permits; she welcomes new contributions. A proposed workshop to discuss managing WSB will be proposed for the 2011 WFIWC meeting.

Stem Injections

Tom reported on stem injections with emamectin benzoate. In 2006, he evaluated 5 pairs of treated and control grand firs. These trees were evaluated in 2007 and 2008, and the treated trees still looked very good after 2 years. A new trial was started in 2008 using 60 pairs of trees (20 each for grand fir, Douglas-fir, and subalpine fir); this trial will be monitored for 3 years.

Eastern Spruce Budworm in AK

Jim described his work with several budworms in Alaska, which may have implications for effects of climate change on these species. He set out 4 pheromone baits (actually 3, but one had 2 concentrations, since the western spruce budworm pheromone is generally the same as the eastern spruce budworm, but at a lower concentration) along a north-south transect in AK, and looked at the timing of moth flight as well as the budworm species composition. Traps set out south of the Alaska Range (mostly *orae* +western complex) were very different from the northern plots (mostly *fumiferana*).

Permanent Plots

Laura reported that she has information from several old monitoring plots that were established in the 1980s. Some have been harvested or burned, but they may try to remeasure the intact plots. Ryan reported that R3 has permanent plots that were established by Bobbe Fitzgibbon. They will go back and remeasure these plots in 2010, and perhaps continue with 10-year remeasurements.

Pheromone Trapping

Connie has set out pheromone traps for western spruce budworm for 4-5 years using Chris Niwa's protocol. So far, she has not found a consistent relation between trap catches and subsequent defoliation by budworm. Both budworm and DFTM are active in the area, though. Lia reported that trap catches did track defoliation (visual estimates of current year's defoliation) pretty well in the Blue Mountains. Beth suggested that pheromone traps might be more effective in predicting defoliation when populations are increasing rather than established, ongoing outbreaks.

Aerial Surveys

Glenn asked if anyone has tried to correlate trap catches with forest-wide defoliation estimates from aerial surveys.

Ryan described a ~1,000 acre area that he had recently visited. This area has been defoliated by budworm for ~10 years, but the defoliation still has not detected during aerial surveys. This area has some ponderosa pine and also spruce aphid, which might be obscuring the budworm defoliation.

Beth noted that Julie Johnson and Keith Sprengel from R6-FHP have completed a mortality mapper tool that summarizes tree mortality over time for a geographic area – we may want to seek development of a similar tool for defoliation.

Effects on Northern Spotted Owl Habitat

Beth described a Forest Health Monitoring project that examined the effects of budworm defoliation on northern spotted owls (NSO) in southwest Washington. Generally, habitat that's good for NSO is also good for western spruce budworm. Region 6 has moved from managing circles around NSOs to managing landscapes for NSOs. This landscape approach offers the option of providing NSO habitat in different areas within the landscape over time rather than trying to keep the same habitat in place for very long time periods. They are also using more prescribed burning.

Additional Topics

B.t. Products and Management Strategies – Stephen Nicholson (Valent BioSciences)

{Need "fit for publication" version from Stephen!}

Sagebrush Defoliator -- Virginia Jennings

Aroga websteri (Gelechiidae) defoliates sagebrush. This project was started near the end of the most recent outbreak, which occurred throughout Great Basin (ID, CA, OR, NV, UT). This outbreak was tied to drought conditions and stressed plants. Larvae

feed gregariously and web leaves together – the leaves then turn yellowish. Eggs are laid in the bark. Sagebrush mortality often results after 1-2 years of heavy defoliation.

The study area covers ~1,700 acres in a park, and has been 10-15% defoliated. Project objectives are: (1) Monitor and quantify *A. websteri* activity, (2) Assess parasitoid-host interactions, (3) Evaluate linkage with current weather patterns, and (4) Evaluate the history of defoliation and climate patterns. She is also working on developing a degree-day model for larval development

This defoliator's populations were very different from 2008 to 2009 – some sites had higher populations, some sites had lower populations, and populations remained the same in other site. Generally there has not been much defoliation in last few years. Parasitism rates have been high, and may be affected by elevation. Both larval and pupal parasitoids are active. Parasitism rates might also be connected to forb species richness – as measured by a Flower Power Index.

--- End of Notes ---

(note-taker: Kathy Sheehan, R6-FHP)

Updated 10/4/10 based on comments from Bruce Hostetler & Lia Spiegel