

# 2011 Western North American Defoliator Working Group Washington State Report

Compiled by Glenn Kohler, Washington Department of Natural Resources

## Summary of important defoliation events in Washington State:

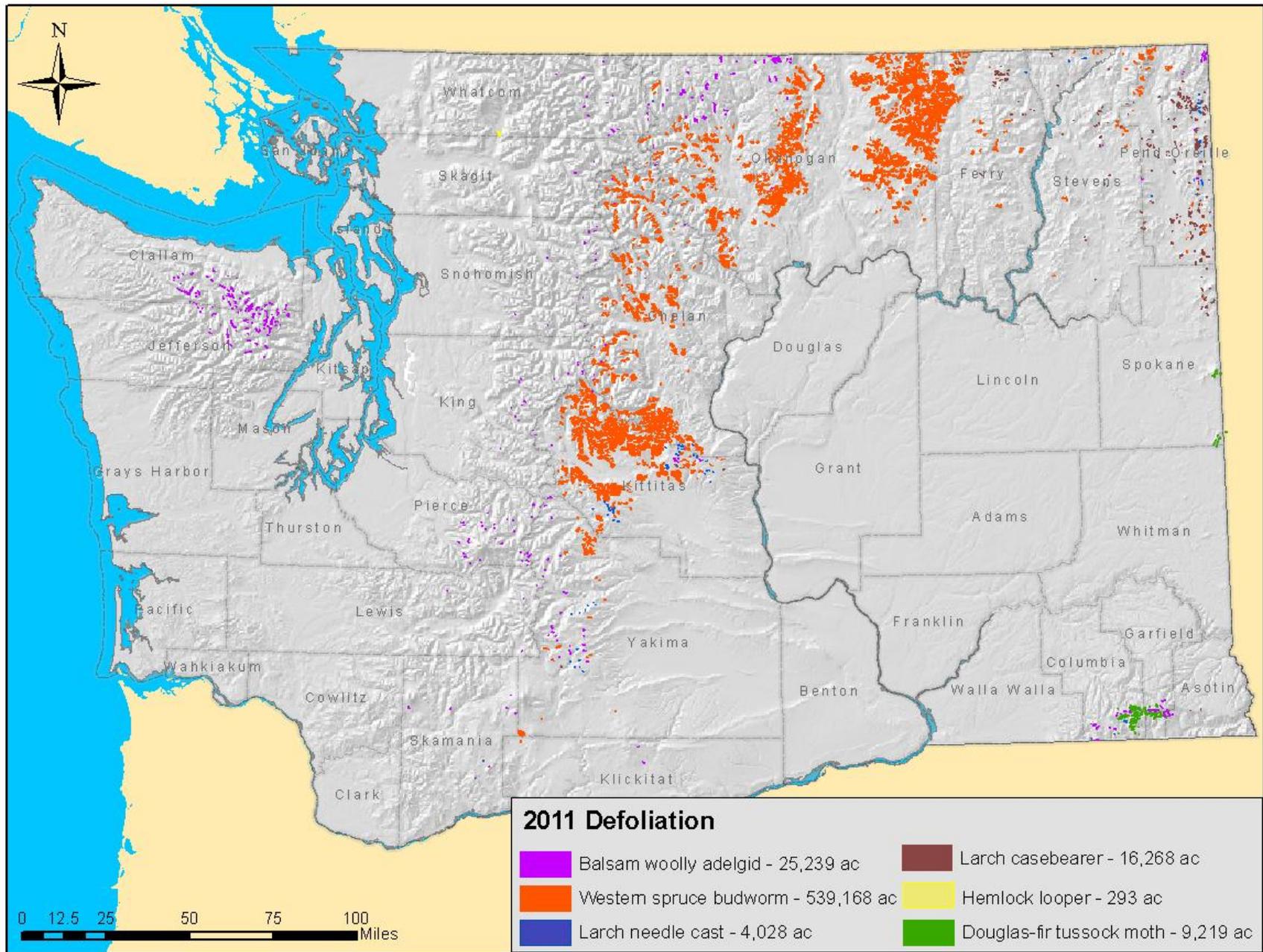
Approximately 596,000 acres in Washington State were observed to be damaged by defoliating insects and diseases in the 2011 annual insect and disease aerial survey (Fig.1 and Table 1). 2011 defoliation was well above the average of 427,000 acres with defoliation over the past 10 years in Washington. Four agents accounted for 99% percent of total acres with defoliation in Washington: 90% western spruce budworm (539,168 acres), 4% balsam woolly adelgid (25,239 acres), 3% larch casebearer (16,268 acres) and 2% Douglas-fir tussock moth (9,220 acres). Much of the defoliator conditions data reported here were collected during the cooperative annual insect and disease detection aerial survey (ADS) conducted by the USDA Forest Service (USFS) and Washington Department of Natural Resources (WDNR).

The east slopes of the Washington Cascade Mountains and mountains of northeastern Washington continue to experience an outbreak of **western spruce budworm (WSBW)**. The area affected is expanding in northeastern Washington and severity of defoliation is increasing in parts of the Cascades (Fig. 2). Areas with WSBW defoliation recorded in the 2011 aerial survey have increased to 539,168 acres, the highest amount since 2006.

In 2011 the area of **Douglas-fir tussock moth (DFTM)** defoliation in Spokane County increased to 1,425 acres, up from 570 acres in 2010. Adjacent DFTM defoliated areas in north Idaho expanded to 68,000 acres in 2011, up from 9,000 in 2010. 2011 was likely the third year of this outbreak and ground surveys indicate this outbreak is collapsing in Spokane County. 2011 was also the first year with widespread DFTM defoliation totaling approximately 7,800 acres in the Blue Mountains of Washington, primarily in wilderness areas of the Umatilla National Forest.

A new outbreak of **hemlock loopers** is developing around Baker Lake and Darrington in the North Cascades. Caterpillar activity, defoliated understory trees and heavy adult flight caught the attention of recreationalists who reported the damage. Approximately 300 acres of defoliation in old growth hemlock forests near Baker Lake was recorded in the 2011 aerial survey. The damaged area is expected to expand in 2012.

2011 defoliation from **larch casebearer (LC)** totaled approximately 16,268 acres in Washington, primarily in Ferry, Stevens and Pend Oreille counties. This is a sharp increase from no LC damage recorded in 2010. Widespread defoliation by larch needle cast disease (LNC) in the same area in 2010 may have obscured signature of an irrupting LC population.



**Figure 1.** 2011 defoliation activity in Washington State based on aerial survey data. *Map: Aleksandar Dozic, Washington DNR.*

**Table 1.** Washington acres with defoliation from 2011 aerial survey.

<b>Defoliating agent</b>	<b>Primary host(s)</b>	<b>Acres affected</b>
western spruce budworm	Douglas-fir, true firs, spruce	539,168
balsam woolly adelgid	true firs	25,239
larch casebearer	western larch	16,268
Douglas-fir tussock moth	Douglas-fir, true firs	9,220
larch needle cast	western larch	4,029
conifer sawfly	hemlock	1,027
pine needle cast	lodgepole and ponderosa pine	451
hemlock loopers	western hemlock	293
oak pit scales <sup>a</sup>	Oregon white oak	240
forest tent caterpillar	alders	181
foliar disease in poplars	cottonwood and other poplars	99
conifer sawfly	ponderosa pine	60
pine butterfly	ponderosa pine	60
satin moth	aspen	59

<sup>a</sup> mapped in aerial survey as ‘hardwood decline in oak’ (HDO).

### **Western spruce budworm (*Choristoneura occidentalis* Freeman):**

The east slopes of the Washington Cascade Mountains and mountains of northeastern Washington continue to experience an outbreak of western spruce budworm (WSBW). The area affected is expanding in northeastern Washington and severity of defoliation is increasing in parts of the Cascades (Fig. 2). Areas with WSBW defoliation recorded in the 2011 aerial survey have increased to 539,000 acres, up from 373,500 acres in 2010 and 412,000 acres in 2009. This year’s defoliated area is larger than any year since the 556,000 acres in 2006. The average WSBW defoliation in Washington over the past ten years is 343,000 acres.

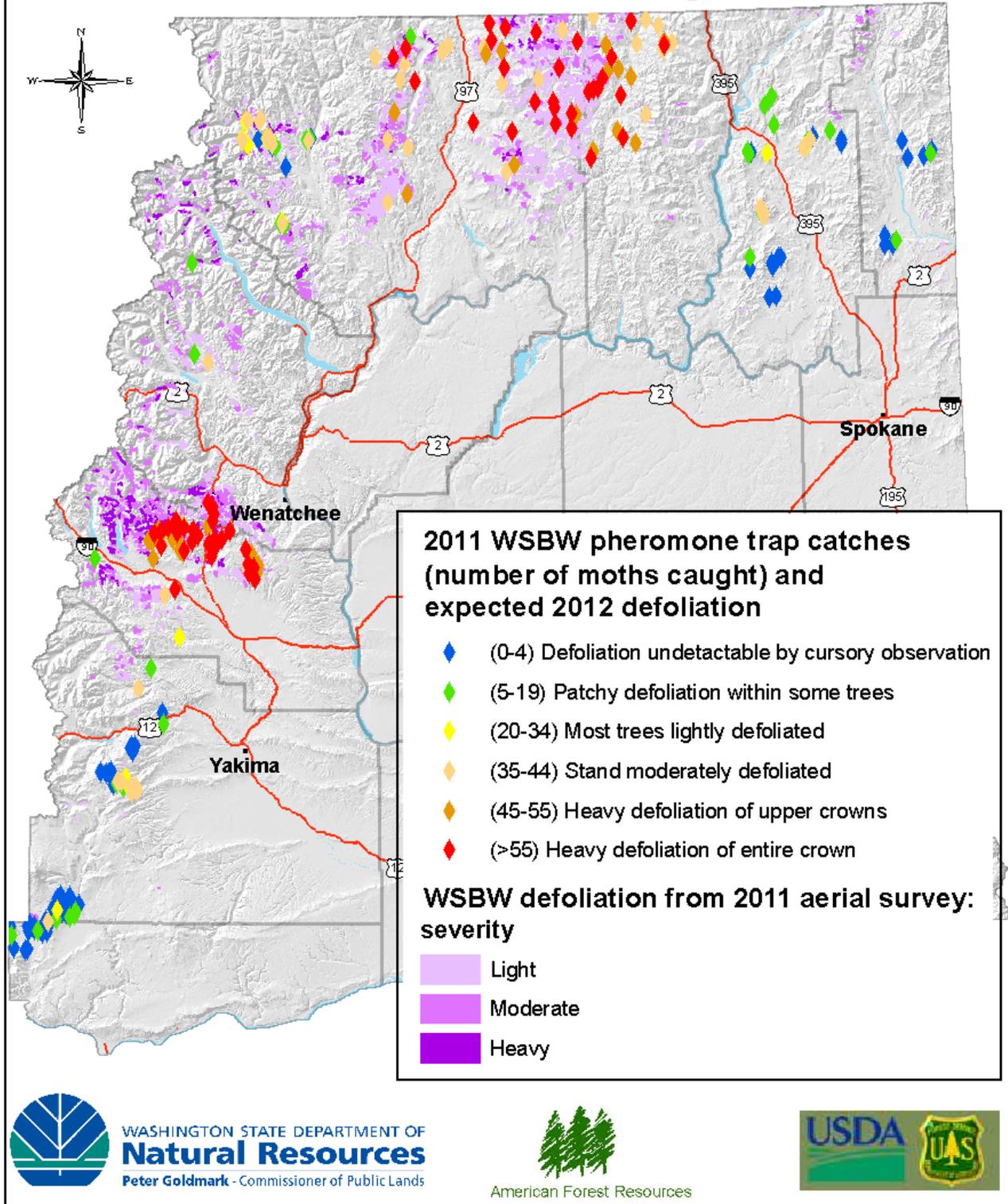
**Central and North Cascades:** The area of forests defoliated on the eastern slopes of Cascades has not expanded much since 2010. However, the ‘scorched’ crown signature and defoliation damage was much more intense in 2011. Once again, Kittitas County had especially heavy WSBW defoliation. Pheromone trap catches in the Teanaway watershed, Blewett Pass, and Naneum State Forest predict heavy defoliation in 2012 (Fig. 2). Direct mortality from defoliation (especially in smaller trees) and top-kill are becoming more common in the central Cascades outbreak.

**Northeastern Washington:** Defoliated areas in northeastern Washington (Pend Oreille, Stevens, Ferry, and eastern Okanogan counties) expanded significantly to approximately 193,000 acres in 2011 from 38,000 acres in 2010. Pheromone trap catches indicate that Okanogan and Ferry counties are likely to experience heavy defoliation in 2012. Defoliation in Stevens and Pend Oreille counties is expected to be light to moderate (Fig. 2).

**South Cascades:** Small pockets of defoliation have expanded and new areas have been mapped in the Ahtanum State Forest, Yakama Indian Reservation and the south slopes of Mt. Adams. Pheromone trap catches in these areas indicate some light to moderate defoliation is expected in 2012 (Fig. 2).

**2011 WSBW pheromone trap monitoring:** Washington DNR and a cooperator, American Forest Land Company, placed WSBW pheromone monitoring traps at 209 locations in 2011(Fig. 2). This includes 28 newly established trap sites in Okanogan, Kittitas, Chelan and Yakima Counties. The US Forest Service deployed additional traps in western Okanogan County. WSBW pheromone trap counts and acreage with WSBW defoliation in central and eastern Okanogan County and northern Ferry County have been increasing since 2007, with the majority of trap catches high enough that we expect heavy defoliation in 2012. Several locations in Stevens County have increased trap catches in 2011, indicating light to moderate defoliation in 2012. Trap counts in Kittitas County remain very high and heavy defoliation is likely to continue in 2012. Both trap counts and defoliated acres in western Yakima County have increased in 2011, with light to moderate defoliation predicted for 2012. This area experienced heavy defoliation in 2005 and 2006.

# Western Spruce Budworm Pheromone Trap Results in Eastern Washington 2011

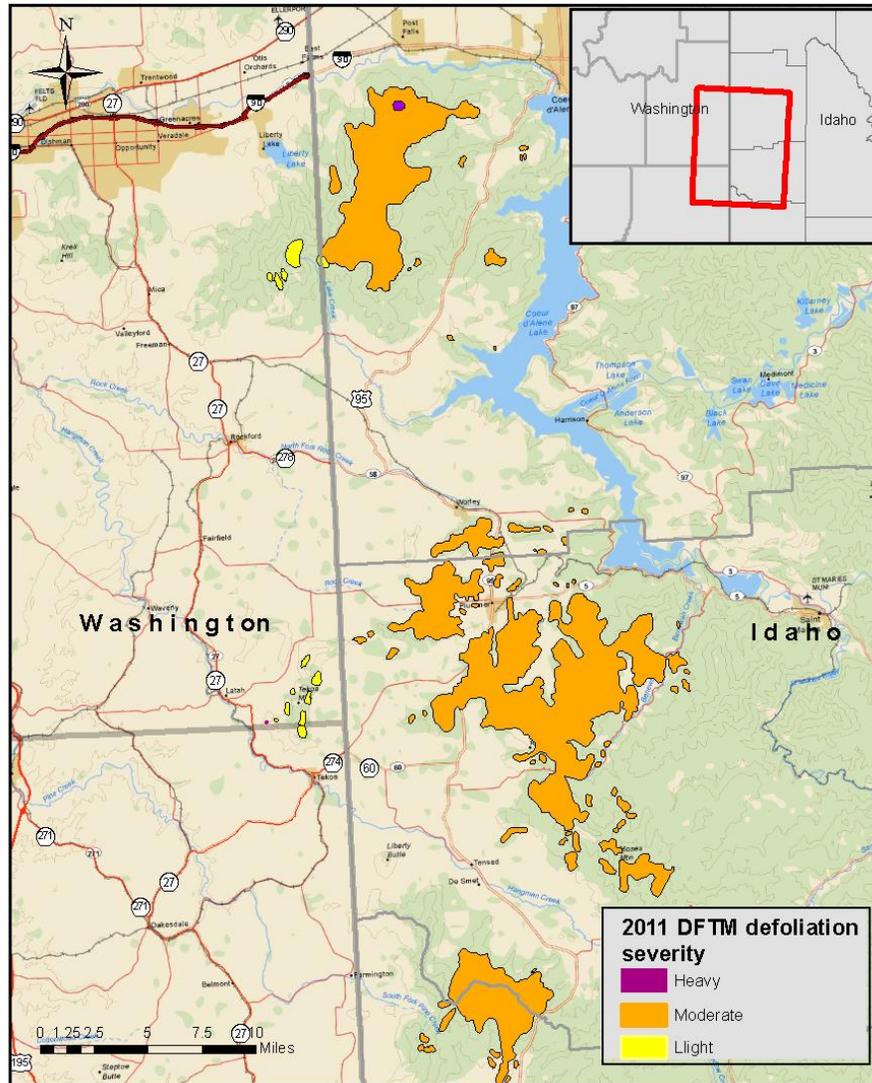


**Figure 2.** 2011 western spruce budworm pheromone trap captures and defoliation in eastern Washington based on aerial survey data. *Map: Aleksandar Dozic, Washington DNR.*

**Douglas-fir tussock moth (*Orgyia pseudotsugata* McDunnough):**

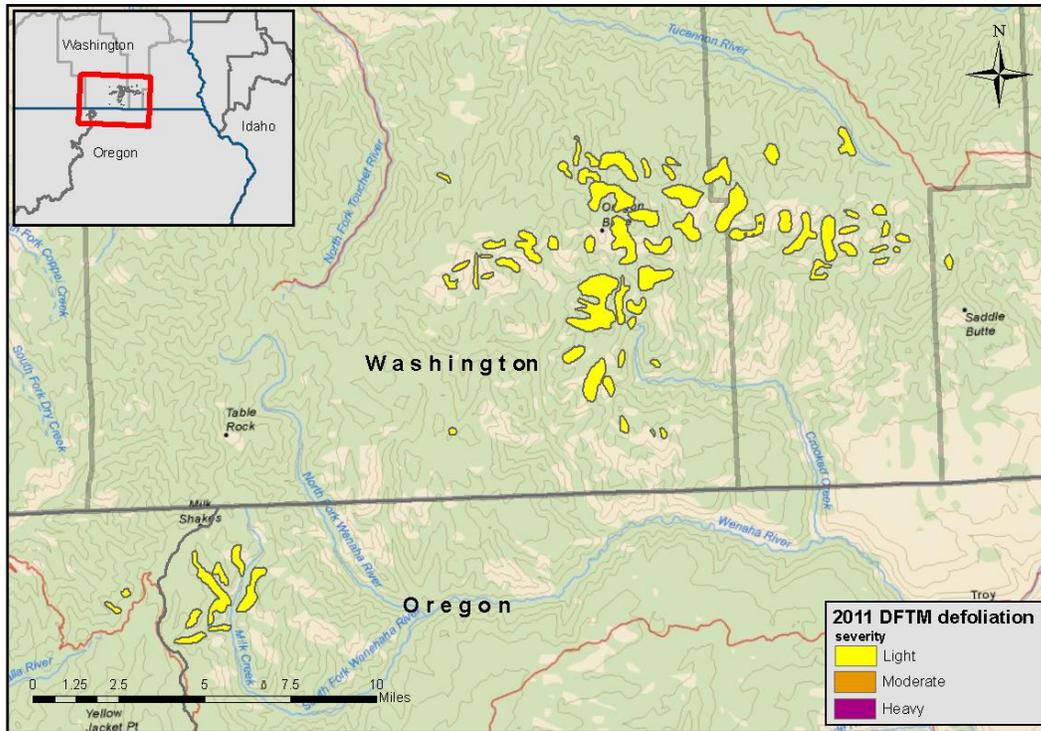
**Spokane County and north Idaho:** Pheromone monitoring traps in eastern Spokane County indicated increasing DFTM populations in 2008 which have remained high through 2011. In the summer of 2011, the Idaho State Department of Lands (IDL) aerial survey mapped approximately 68,000 acres with defoliation in Kootenai, Benewah and Latah Counties in Idaho; a significant increase from the 8,500 acres mapped in 2010. The USFS and WDNR cooperative aerial survey recorded just over 1,600 acres with defoliation in eastern Spokane County; an increase from 570 acres in 2010 (Fig. 3). In Washington, damage has primarily affected grand

fir and Douglas-fir on Mica Peak, Tekoa Mountain and Gelbert Mountain. Defoliation has been moderate, with more heavy defoliation in the upper third of tree crowns. Low numbers of new egg masses and evidence of virus-killed caterpillars suggest the outbreak in Spokane County is collapsing and there isn't likely to be much more defoliation in 2012. In spring 2012, an analysis of egg masses collected throughout the affected areas in both states will be used to identify locations where there may be enough virus to cause a collapse of the caterpillar population.



**Figure 3.** 2011 Douglas-fir tussock moth activity in Spokane County (WA) and Kootenai, Benewah and Latah Counties (ID). Map: Aleksandar Dozic, Washington DNR.

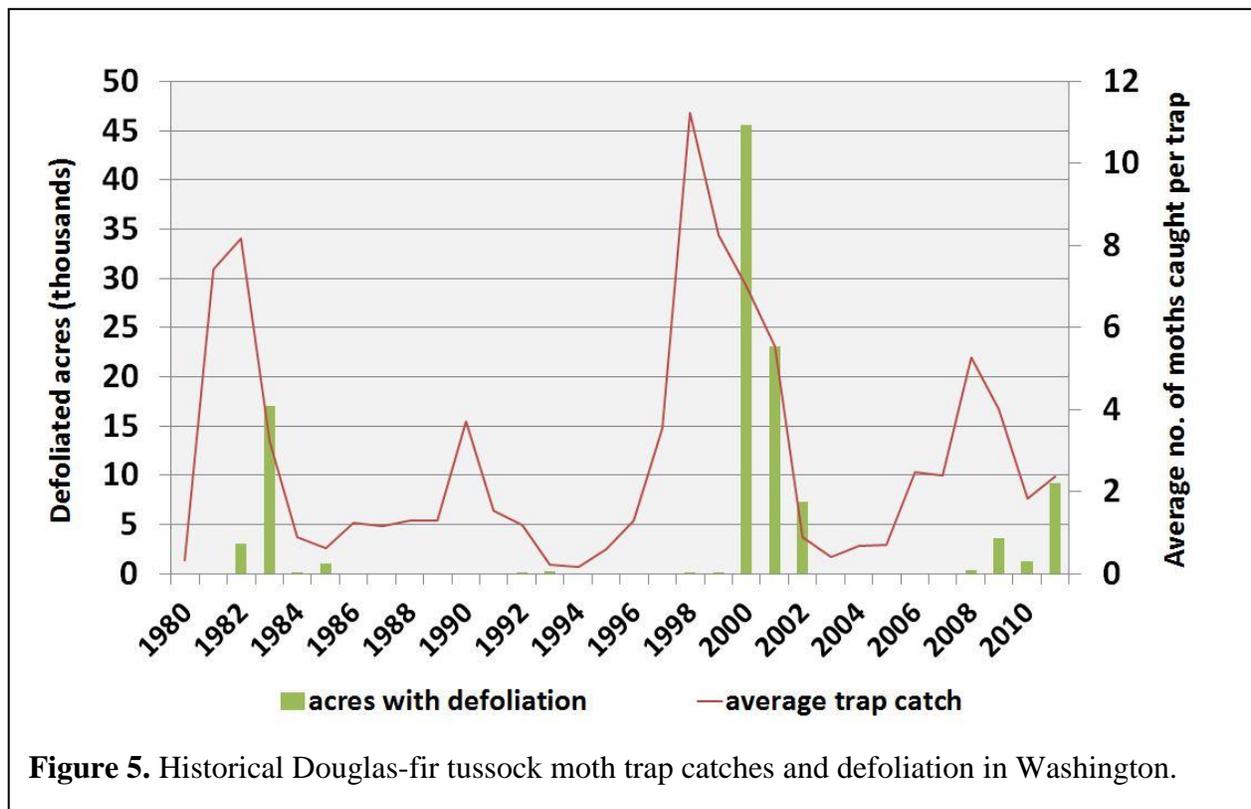
**Blue Mountains:** In 2011, approximately 7,800 acres of new DFTM defoliation was mapped in the Umatilla National Forest in the Blue Mountains of Washington and an additional 1,200 acres in northeast Oregon (Fig. 4). USFS entomologists noted smaller areas of defoliation in 2010 that were too light to be recorded in aerial survey. Defoliation primarily affected grand fir, subalpine fir and to a lesser extent Douglas-fir and spruce in the wilderness area in Columbia and Garfield Counties. Damage is typically light, with the top third of the crown most heavily defoliated. Defoliation may expand in area and intensity in 2012.



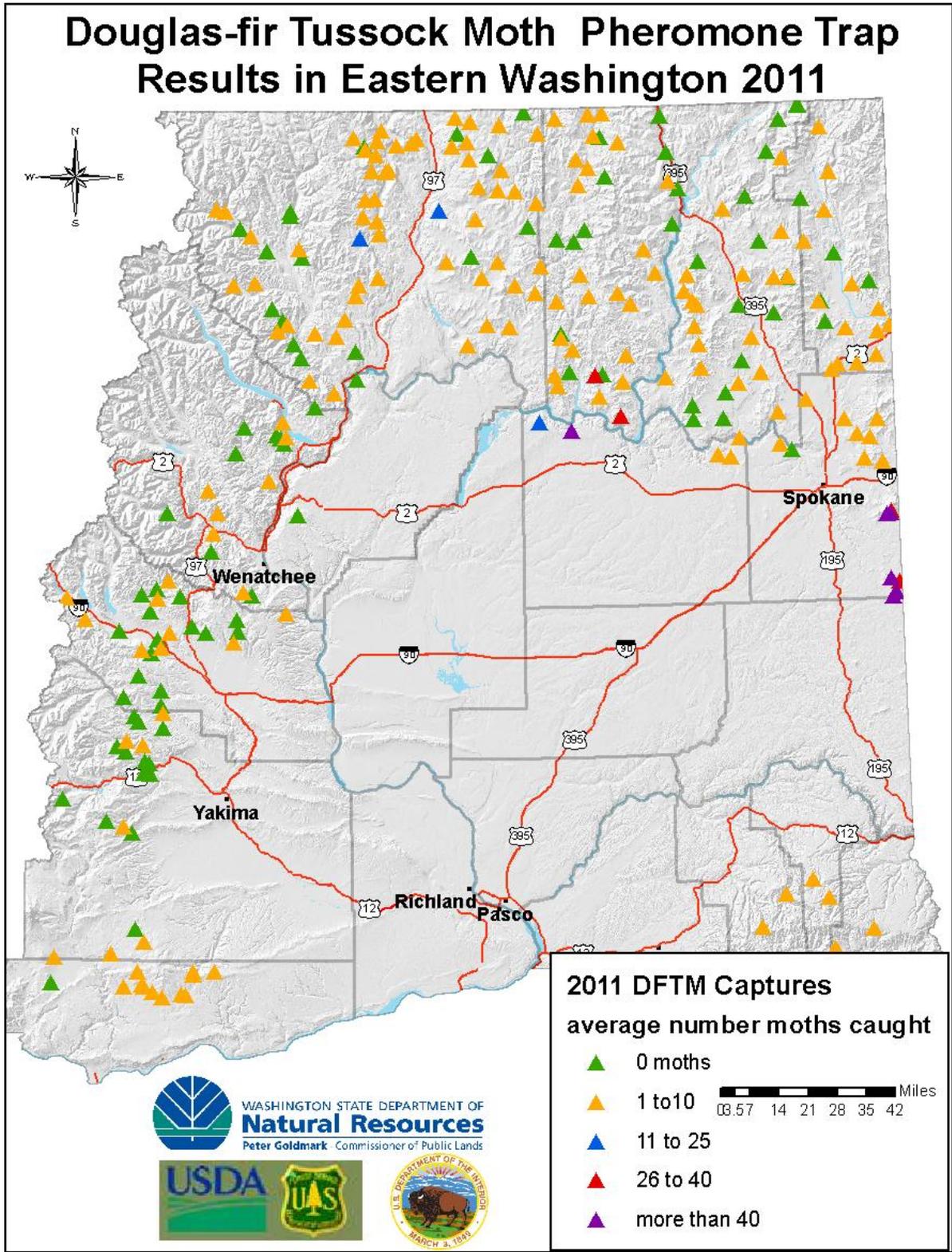
**Figure 4.** 2011 Douglas-fir tussock moth activity in Columbia and Garfield Counties (WA) and northeast Oregon. Map: Aleksandar Dozic, Washington DNR.

**Okanogan County:** No DFTM defoliation was recorded in Okanogan County in 2011. The 2008-2010 outbreak in Okanogan County peaked in 2009, when more than 3,500 acres had defoliation, primarily east and west of Oroville near the British Columbia border. In 2010, the affected area decreased to approximately 650 acres including small areas of new defoliation in the Methow Valley. In summer 2010, a DFTM suppression project was conducted using a naturally occurring virus (TM Biocontrol) on 13,000 acres of Forest Service land in the Methow Valley area. Also, 965 acres of private land in the upper Methow Valley were aerially sprayed with the bacterial insecticide Btk, *Bacillus thuringiensis* var. *kurstaki* (Foray 48B).

**2011 DFTM pheromone trap monitoring:** Washington State has a network of 260 “Early Warning System” pheromone-baited trap locations on federal, state and private land. Washington DNR collected DFTM traps from 160 plots in 2011, including 7 new permanent plot locations in Okanogan County. The state-wide average trap catch increased slightly in 2011, but remains below the pre-outbreak peak in 2008 (Fig. 5). In Spokane County, several trap locations had very high trap catches in 2011 (Fig. 6). Given signs of population collapse in Spokane County, these high trap catches are not reliable predictors of more defoliation in 2012. DFTM pheromone traps are designed to be used as a warning system early in an outbreak. During the heavy defoliation stage of an outbreak, trap catch numbers typically fall and may even rise as the population collapses. Neither of these trap trends are accurate proxies for actual caterpillar populations. Trap locations in the Blue Mountains on the Washington side of the Umatilla National Forest gave no indication of the impending 2011 outbreak. Average catch remained below 8 males per trap for five years leading up to the outbreak. Trap catches were higher on the Oregon side. Throughout Okanogan County, DFTM trap catches returned to normal levels in 2010 and remain low in 2011.



**Figure 5.** Historical Douglas-fir tussock moth trap catches and defoliation in Washington.



**Figure 6.** 2011 Douglas-fir tussock moth pheromone trap captures from all agencies (BIA, Forest Service, and WDNR) in Washington State. *Map: Aleksandar Dozic, Washington DNR.*

### **Balsam woolly adelgid (*Adelges piceae* Ratzeburg) NON-NATIVE:**

Although it continues to be widespread in high elevation forests throughout Washington, damage from balsam woolly adelgid (BWA) totaled 25,239 acres in 2011, similar to the 30,000 acres affected in 2010. This is still well below a recent peak of 60,000 acres in 2009 and the 10-year average of 38,000 acres. BWA damage, primarily to subalpine fir and Pacific silver fir, was recorded at high elevations of the Blue Mountains, the Olympic Mountains, and on both the west and east slopes of the Cascade Mountains, and scattered areas of northeastern Washington (Fig. 1). There were 3,800 acres with some host mortality attributed directly to BWA damage. Approximately 8,000 acres in these same high elevation areas were mapped with some western balsam bark beetle caused mortality in subalpine fir. BWA infestation can be a predisposing factor to western balsam bark beetle attack.

### **Larch casebearer (*Coleophora laricella* Hübner) NON-NATIVE:**

Larch casebearer is an exotic insect that feeds on the foliage of western larch. In 2011, primarily light to moderate defoliation from larch casebearer (LC) totaled 16,268 acres in Washington, primarily in Ferry, Stevens and Pend Oreille counties (Fig. 1). This is a sharp increase from no LC damage recorded in 2010. Widespread defoliation by larch needle cast disease (LNC) in the same area in 2010 may have obscured signature of an irrupting LC population. The last outbreak of widespread larch damage was in 2008 when 39,000 acres were defoliated by LC and 31,000 acres with LNC damage were mapped. Because larch re-foliates annually, it takes several years of damage to cause serious injury to larch.

Researchers at Oregon State University are conducting a survey for parasitoid wasps that were released in the 1960s as biological control agents of LC. One objective is to determine if populations of the introduced wasps, primarily European species, *Agathis pumila* (Ratz.) and *Chrysocharis laricinellae* (Ratz.), are still established in Washington.

### **Oak pit scales (*Asterolecanium* spp.):**

Oak pit scales (OPS) are sucking insects that cause branch tip dieback, delayed leaf expansion in spring, and clumping of foliage in oaks. In spring 2011, landowners spanning the Columbia River Gorge, from Lyle to Stevenson and Washougal, Washington reported damage and some mortality in Oregon white oaks. WDNR and Washington State University (WSU) Extension entomologists found OPS to be the primary cause of oak damage in Skamania and Klickitat Counties. Damage has now been recorded as far north as Tenino and Roy in the South Puget Sound area. Using ground data as a 'heads up,' aerial survey crews mapped approximately 240 acres of OPS damage and some mortality, coded as hardwood decline in oak (HDO), primarily in Klickitat County.

Oak pit scales are among several species of scale insects in the *Asterolecanium* genus (family Asterolecaniidae) that feed on numerous species of oaks. They are well known in California where valley oak, *Quercus lobata*, is most frequently infested. Less is known about

OPS effects on Oregon white oak, *Quercus garryana*, because damage has been less common where that host grows in Oregon, Washington and British Columbia.

It is uncertain what factors have led to the recent increase in OPS-caused damage in Washington. It is possible wet springs in 2010 and 2011 have led to an increase in OPS because sucking insects often become more abundant when host trees have increased access to water. Drought conditions in preceding years may have stressed some trees, predisposing them to more severe damage and mortality. The majority of oak mortality associated with OPS has occurred in Klickitat County, where past drought conditions have been more prevalent. In the relatively moist South Puget Sound area, infested oak stands have little or no mortality associated with OPS.

**Hemlock loopers (*Lambdina fiscellaria lugubrosa* (Hulst) and *Nepytia phantasmaria* (Strecker)):**

In late summer 2011, WDNR and USFS received reports from people observing high numbers of inch-worm type caterpillars, droppings and defoliation damage in the vicinities of Baker Lake, Whatcom County and Darrington, Snohomish County. USFS entomologists confirmed presence of both “western hemlock looper” *Lambdina fiscellaria lugubrosa* (Hulst) and “phantom hemlock looper” *Nepytia phantasmaria* (Strecker), but the population is primarily western hemlock looper. With this information, aerial survey was able to accurately map approximately 300 acres with hemlock looper (HL) defoliation.

The heaviest defoliation has occurred in and around Horseshoe Cove Campground on the west shore of Baker Lake. Areas along the Mountain Loop Highway about 4 miles south of Darrington are also affected. Defoliation was patchy and appeared more severe in understory trees. Mature overstory trees appeared lightly defoliated, although there are some areas with heavier damage. Flying adult moths were numerous at Baker Lake and at the Darrington Ranger Station. USFS entomologists noted symptoms of a naturally occurring virus that kills HL larvae at both Baker Lake and Darrington sites. The virus can take a year or more to spread through the looper population enough to slow defoliation, so more defoliation over a wider area is expected in 2012.

The Mt. Baker area has been the site of past outbreaks of HL. Outbreaks are sporadic and Washington hasn't had one for several years. The last outbreak in western Washington was from 2001-2003. Areas affected were hemlock forests near Baker Lake, the City of Everett Watershed surrounding Lake Chaplain, and near Arlington. A very large HL outbreak affected Pacific County in the 1960s.

**Pine butterfly (*Neophasia menapia* (C. and R. Felder)):**

Light defoliation of ponderosa pine caused by both pine butterfly (PB) and diprionid sawflies was recorded on 60 acres about 15 miles northwest of Wenatchee. Presence of PB and sawflies was confirmed by USFS entomologists. This is the first time PB has been recorded in Washington aerial survey since 1987.

**Cottonwood foliar diseases (*Septoria* spp. and *Venturia* spp.):**

Very visible leaf damage and defoliation in black cottonwoods along Interstate 90 west of Cle Elum and along the White River Valley north of Lake Wenatchee was reported by numerous people in 2011. USFS pathologists identified the cause of damage as foliar disease caused by *Septoria* spp. and/or *Venturia* spp. Using these reports as a ‘heads up,’ aerial survey crews mapped approximately 100 acres of foliar disease in poplars along Interstate 90 and in Wahkiakum County. Some concerned landowners were advised not to salvage what they thought were dead trees.

**Larch needle cast (*Meria laricis* Vuillemin):**

Defoliation from larch needle cast disease (LNC), caused by *Meria laricis*, was recorded on 4,028 acres in eastern Washington in 2011, primarily in Kittitas and Pend Oreille counties (Fig. 1). LNC was more widespread in 2010, affecting approximately 22,000 acres. Continued incidence of LNC is likely associated with a second year of unusually wet spring and summer weather in 2011. The signature for this disease is yellow to orange foliage in the lower crown, but can be confused with whole crown defoliation caused by larch casebearer. Approximately 16,000 acres with larch casebearer defoliation in some of the same areas may have obscured LNC signature.

**Western tent caterpillar (*Malacosoma californicum* (Packard)):**

Red alder defoliated by western tent caterpillar (WTC) was recorded on 181 acres in the northern area of the Mount Saint Helens National Volcanic Monument. The severity of defoliation was moderate. WTC caterpillar damage to aspen was also reported from the ground in northern Ferry County and San Juan Island. It is likely WTC damage will increase in 2012 in some areas of the state. WTC caterpillar outbreaks are cyclical and rarely last more than a few years.

**Satin moth (*Leucoma salicis* Linnaeus) NON-NATIVE:**

A Eurasian native defoliator of poplars, satin moth (SM) periodically develops outbreak populations and defoliates aspen stands in eastern Washington. Region 6 aerial survey has historically used SM as a code for damaged aspen stands. Aspen stands with new mortality that did not appear defoliated were coded as hardwood decline (HD). In 2010 and 2011, the Oregon Department of Forestry (ODF) and WDNR cooperated to monitor aspen condition at 71 locations. Less than 10% of these monitoring plots had evidence of satin moth or defoliation. A combination of factors, primarily animal damage and conifer competition, were contributing to slow, successional decline and mortality. A new aerial survey code, ‘hardwood decline, aspen’ (HDA) was adopted by Region 6 to more accurately record aspen mortality and differentiate it from defoliation by SM when it does occur. In 2011, 59 acres with SM defoliation and 653 acres with HDA were recorded in Washington. Approximately 700 acres with SM defoliation was mapped in 3 of the past 10 years, but the number is typically below 100 acres each year. Aerial

photos of monitoring plots and the next SM outbreak will provide opportunities to refine ADS signatures used to distinguish HDA and SM.

### **Sawflies (Hymenoptera):**

**Green alder sawfly (*Monsoma pulveratum* Retzius) NON-NATIVE:** 2011 was the second year of monitoring for the non-native green alder sawfly (GAS) in Washington using yellow sticky traps. GAS was first detected in Vancouver, Washington in 2010, however museum specimens date its introduction to at least 1995. In 2010 monitoring, GAS was detected in 11 Washington counties. Four agencies (Washington State Department of Agriculture, Washington State University Extension, USFS and WDNr) cooperated to significantly expand the 2011 trap coverage to 130 sites in Washington. There are now 18 counties with GAS detections, including Kittitas, Ferry and Stevens in eastern Washington. GAS has also been recorded in Alaska, British Columbia, Idaho, and Oregon.

GAS defoliation of alder appears as numerous round ‘shotholes’ through the leaf, leaving most of the leaf intact. At monitoring sites where GAS larvae have been collected, defoliation damage has been moderate. Damage in Washington has been nothing like the heavy damage to thin-leaf alder (*Alnus tenuifolia*) in Alaska. In fact, two years of aerial survey using GAS positive sites as a ‘heads-up’ have not resulted in any alder defoliation being mapped from the air.

**Conifer defoliating sawflies (Family Diprionidae):** Conifer sawfly defoliated western hemlocks and Pacific silver firs were reported near Baker Lake by a USFS entomologist. While on a special flight to map hemlock looper damage, ADS recorded 1,027 acres of sawfly defoliated hemlock on forested slopes east of Baker Lake. Ground reports of conifer sawfly populations and minor defoliation include Pacific silver firs at Stampede Pass (near Snoqualmie Pass), ponderosa pines in south Spokane County and western larch in south Pend Oreille County. Light defoliation of ponderosa pine caused by both diprionid sawflies and pine butterfly was recorded on 60 acres about 15 miles northwest of Wenatchee. WSDA is planning to survey for diprionid sawflies in 2012. Of special interest are the distributions of two non-native species, the European spruce sawfly (*Gilpinia hercyniae* (Hartig)) and the European pine sawfly (*Neodiprion sertifer* (Geoffroy)).

**“Slug” sawflies (*Caliroa* spp.):** Oregon white oak in southwest Washington that was defoliated by “slug” sawflies in 2009 were monitored closely in 2010. Larvae were observed and collected as they consumed foliage. No adults were captured emerging from soil into traps in the spring. Adult *Caliroa* (the genus of “slug” sawflies) on yellow sticky traps placed at this location were identified by WSDA as *Caliroa distincta* Smith and *Caliroa labrata* MacGillivray. *Caliroa distincta* has a Pacific Northwest distribution, but wasn’t described until 1971; its hosts and biology are unknown. *Caliroa labrata* is distributed from Washington to Alberta; larvae are known to feed on willows (*Salix* species).

### **Gypsy moth (*Lymantria dispar* Linnaeus) NON-NATIVE:**

In 2011, the Washington State Department of Agriculture (WSDA) placed 17,198 gypsy moth pheromone traps in Washington. 13,619 of these were for European gypsy moth (EGM) detection and delimiting and 3,579 were for Asian gypsy moth (AGM) detection. Sixteen (16) gypsy moths were collected from six (6) catch areas, all in western Washington. Ten (10) of the 16 EGM catches were near the Puyallup eradication project site, where twenty-nine (29) acres were ground sprayed using Btk in 2011. Of the six catch areas, three (3) areas were new detections for gypsy moth in 2011. All 16 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 16 moths is not unusually high when more than 17,000 traps are used. In the past twelve years, the highest number of moths collected was 92 in 2000. WSDA proposed two eradication projects for spring 2012 in Pierce County. One will be near Eatonville where multiple egg masses and pupal cases were found. The other project is a follow-up to the 2011 treatment in Puyallup.