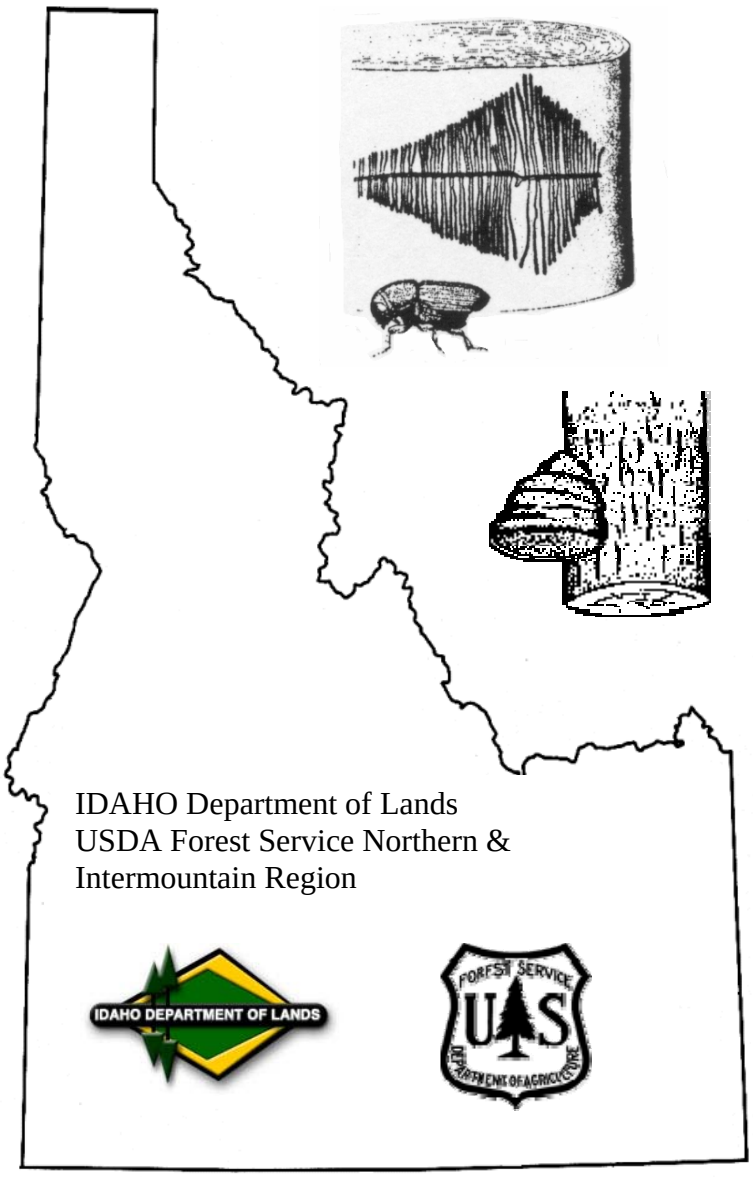
IDAHO

FOREST INSECT AND DISEASE CONDITIONS REPORT 2004



IDAHO Department of Lands
USDA Forest Service Northern &
Intermountain Region

IDAHO FOREST
INSECT & DISEASE CONDITIONS
2004

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Idaho Department of Lands
USDA Forest Service, Northern and Intermountain Regions
IDL Report No. 04-3

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INTRODUCTION

This report summarizes major insect and disease activity on forested lands of all ownerships within the State of Idaho for 2004. Much of the information for this report was derived from aerial and ground surveys and associated detection and evaluation activities by insect and disease specialists within the USDA Forest Service and the Idaho Department of Lands. Acres and numbers of trees reported in text, graphs, and tables are only estimates. Likewise, maps outlining areas of major insect infestations only provide general locations of defoliation and mortality.

Bark beetle and defoliating insect activity is featured in this report because it commonly affects a number of trees in a discrete area and is readily captured in aerial detection surveys (ADS). Trees killed by bark beetles were attacked the year before they were mapped in an aerial detection survey. All described locations, insect-caused mortality, and acres affected are derived from ADS observations, which occur in flight planning "reporting areas." In this document, reporting areas with the most significant amount of insect-caused mortality will be described. National Forest designations include all adjacent state and private ownerships as well as federal lands. Effects of most significant forest diseases are not readily assessed from the air. Therefore, only general information and observations on diseases are reported.

Insects and diseases affect the health of forests in many ways. A broader, more comprehensive discussion of these effects and their significance is contained in USDA R1 Forest Health Protection Report No 99-4 "Health of Idaho's Forests, A Summary of Conditions, Issues and Implications."

CONDITIONS IN BRIEF

Forest Insects

Pine mortality attributed to **mountain pine beetle** increased on all ownerships throughout Idaho in 2004, with 1,945,997 dead pines detected, up from 1,765,854 detected in 2003. Again, the largest outbreaks occurred on the Sawtooth National Recreation Area (SNRA), and the Nez Perce and Salmon-Challis National Forests (NF). Tree mortality attributed to **pine engraver beetle** was less than half of last year's count, where 4,203 where observed compared to 8,973 in 2003. **Western pine beetle** slightly increased throughout Idaho this year, with 19,942 killed trees, up from 18,903 beetle-killed trees in 2003. **Spruce beetle**-caused mortality, although minor, declined in 2004, with 1,255 trees killed compared to 1,789 in 2003. The most notable mortality groups were located on the Caribou-Targhee NF with 1,131 dead spruce trees. **Douglas-fir beetle** killed 210,588 trees in 2004, a considerable increase from 159,352 trees killed in 2003. The largest outbreaks occurred on the Salmon-Challis, Sawtooth, and Caribou-Targhee NF's, resulting in the death of 100,012, 28,572, and 28,434 trees respectively. **Fir engraver**-caused mortality substantially increased throughout the state from the previous year, as 233,921 trees were killed in 2004 compared to 121,760 in 2003. The largest outbreaks were again located on the Kaniksu and Nez Perce NF's, and the Nez Perce Indian Reservation. Tree mortality attributed to **western balsam bark beetle/subalpine fir complex** was nearly one-half

less than last year's count. A total of 62,888 trees were killed in 2004, compared to 191,253 in 2003. The largest outbreaks were located on the Salmon-Challis, Sawtooth, and Kaniksu NF's, respectively. No visible defoliation was recorded for Douglas-fir tussock moth in 2004, in contrast to numbers that reached nearly 142,000 in 2001 at the peak of that outbreak. State-wide defoliation from **western spruce budworm** decreased significantly, accounting for 61,699 acres compared to 178,675 acres in 2003. Apparently the infestation that affected the Boise, Caribou-Targhee, and Salmon-Challis NF's has abated. The Kaniksu NF sustained the most defoliation, which more than doubled the surveyed damage from the previous year. Subalpine fir mortality due mainly to the **balsam woolly adelgid** was mapped on 50,150 acres, more than twice the amount recorded in 2003. Most damage was mapped on the St. Joe and Clearwater NF's, and adjacent state, private, and BLM lands. There was no visible defoliation caused by **larch casebearer** in 2004.

Forest Diseases
Impacts caused by forest pathogens are not accurately captured by aerial survey methods. Other assessment methods primarily utilizing ground survey are most effective at describing the effects of many pathogens.

FOREST INSECTS

BARK BEETLES

MOUNTAIN PINE BEETLE

Mountain pine beetle (MPB) continues to be the most frequently encountered and damaging bark beetle in the state. This beetle attacks and kills all locally occurring pine species. MPB-caused pine mortality increased from last year's estimate, with 1,945,997 trees killed on 554,485 acres (Table 1) across all land ownerships. This is in contrast to 2003, when an estimated 1,765,854 trees were killed on nearly 344,448 acres.

MPB-caused mortality has surged in certain parts of Idaho due to continued environmental conditions favorable for beetle infestations. Once again, a major portion of this year's mortality occurred in southern Idaho on the **Salmon-Challis** and **Sawtooth NF's** and the **SNRA**, and largely consists of lodgepole pine (Table 2). In northern Idaho, on the **Nez Perce NF**, the MPB infestation persists in lodgepole pine, impacting landscapes throughout the reporting area. An increase of over 20,000 killed lodgepole pine trees was recorded for this year. The **Clearwater**, **Coeur d'Alene**, and **Kaniksu NF's** have again charted substantial increases in MPB activity in lodgepole pine this year. Hundreds of thousands of acres of lodgepole pine are becoming increasingly susceptible as continued warmer and drier weather conditions favor beetle survival. These conditions have enabled beetle populations to increase significantly during recent years. Impacts from these infestations include the loss of scenic visual corridors, loss of cover and screening for wildlife, and increases in stream temperatures that may affect the spawning of endangered salmon species.

Year	MPB Killed Trees	Acres Infested	Year	MPB Killed Trees	Acres Infested
2004	1,945,997	554,738	1998	84,942	81,649
2003	1,765,854	344,448	1997	62,914	54,667
2002	2,534,856	339,322	1996	41,073	33,098
2001	1,270,402	165,858	1995	16,862	17,850
2000	485,957	123,225	**Total**	**8,336,462**	**1,798,673**
1999	127,605	83,818			

Table 1. Aerial detection survey (ADS) results for MPB in the state of Idaho from 1995-2004. Results reported include estimated number of dead pine trees (all species) and acres infested mapped by ADS year.

MPB-caused whitebark pine mortality continued to increase in 2004, to nearly 164,000 trees killed on 65,158 acres. The largest outbreak was located on the **Salmon-Challis NF** with 70,610 trees killed on 29,831 acres, and a substantial increase occurring on the **Sawtooth NF**, as well. In northern Idaho, most damage was seen on the **Kaniksu NF,** which has shown a slight decrease in numbers compared to 2003. Beetle-caused mortality in ponderosa pine stands is still not extreme but is of concern in some areas. Ponderosa pine mortality declined this year by approximately two-thirds, bringing mortality down to 5,435 trees, compared to 15,096 in 2003. Overall MPB-caused white pine mortality in Idaho dropped considerably again this year on the **Coeur d'Alene** and **Kaniksu NF's**, however, an increase was recorded on the **St. Joe NF**.

Northern Idaho: The MPB infestation on the **Nez Perce NF** continues to affect high numbers of lodgepole pine across landscapes administered by the Forest Service's Elk City Ranger District. This event is likely to continue as long as warm and dry conditions persist along with susceptible host availability. Beetle-killed lodgepole pine on the **Kaniksu NF** has increased substantially, is still found predominantly in areas between Long Canyon and Myrtle Creeks northwest of Bonners Ferry, and along drainages of Boulder Creek and areas surrounding Two Tail and Katka Peaks southeast of Bonners Ferry. On this forest, whitebark pine continues to sustain heavy losses at high elevations between Long Canyon Creek and Myrtle Creek drainages. These rare pine stands are declining primarily from aggressive MPB attacks, combined with white pine blister rust infections, fire suppression, shade tolerant species invasion and consequent overstocking, and over-maturation of whitebark stands. Whitebark pine ecosystems are highly valued for watershed stability, recreation, and wildlife purposes. The heavy whitebark pine seeds are also an important food source for numerous birds and small mammals, as well as food for the threatened and endangered grizzly bear. Populations of MPB continue to build in lodgepole along the Bitterroot Range of the **Coeur d'Alene NF,** although the **St. Joe NF** showed a decrease this year.

Southern Idaho: Although tree mortality has declined in 2004, high populations of MPB continue to infest lodgepole pine, causing mortality throughout drainages of the **Sawtooth NF** and the **SNRA**. Large portions of **Federal, State**, and **private** lands displayed high lodgepole pine losses starting from Stanley, down to Galena. On the **Salmon-Challis NF**, landscapes west of Challis to Bull Trout Lake contained high lodgepole mortality, as well as areas across the Lemhi, Boulder, and Pioneer Mountain Ranges. Whitebark pine mortality in reporting areas of southern Idaho showed increases on the **Boise**, **Salmon-Challis**, and **Sawtooth, NF's,** while

decreases occurred on the **Payette** and **Caribou-Targhee NF's**. On the **Boise NF**, pockets of whitebark pine infestation were scattered throughout the landscape. The Lemhi and Pioneer Mountain Ranges on the **Salmon-Challis NF** were still the primary areas of MPB activity in whitebark pine, while the Smokey Mountain Range and the south end of the Sawtooth Mountain Range east of Ketcham remain the centers of activity in whitebark pine on the **Sawtooth NF.**

Table 2. Mountain Pine Beetle Aerial Detection Survey (ADS) results for the state of Idaho 2003-2004. Acres infested, Dead Trees, and MBF Volume for white pine, ponderosa pine, lodgepole pine, and whitebark pine.

		MPB (white pine) Estimated Mortality			**MPB** (ponderosa pine) Estimated Mortality			**MPB** (lodgepole pine) Estimated Mortality			**MPB** (whitebark pine) Estimated Mortality		
AREA	Year	Acres Infested	Red Trees	MBF Volume	Acres Infested	Red Trees	MBF Volume	Acres Infested	Red Trees	MBF Volume	Acres Infested	Red Trees	MBF Volume
Bitterroot	2003	0	0	0.0	524	321	25.7	0	0	0.0	78	54	0.0
	2004	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
Boise	2003	0	0	0.0	0	0	0.0	2,032	4,257	68.1	835	956	19.2
	2004	0	0	0.0	0	0	0.0	5,723	12,305	196.9	2,024	5,617	112.3
Clearwater	2003	720	571	228.4	10	12	1.0	3,236	4,765	428.9	2	11	1.2
	2004	718	267	106.4	822	416	33.3	5,823	11,481	994.1	2	1	.1
Coeur d'Alene	2003	1,583	2,305	922.0	0	0	0.0	1,453	6,960	626.4	0	0	0.0
	2004	453	812	211.6	0	0	0.0	3,581	16,063	1,158.8	13	110	12.1
Kaniksu	2003	5,149	2,876	1,150.4	3,121	2,229	178.3	19,007	29,875	2,688.8	12,712	38,672	4,253.9
	2004	597	241	68.0	461	430	33.5	27,660	90,028	7,937.8	8,132	32,722	3,598.8
Kootenai	2003	4	6	2.4	6	12	1.0	76	61	5.5	0	0	0.0
	2004	7	12	5.0	0	0	0.0	0	0	0.0	0	0	0.0
Nez Perce	2003	0	0	0.0	4,204	8,080	646.4	104,771	440,139	39,612.5	437	448	49.3
	2004	17	0	8.4	1,503	3,029	131.8	159,206	463,677	39,532.7	17	21	2.3
Payette	2003	0	0	0.0	0	0	0.0	1,492	7,487	119.8	1,519	2,368	47.4
	2004	0	0	0.0	0	0	0.0	2,613	4,604	73.7	908	1,340	26.8
Salmon-Challis	2003	0	0	0.0	0	0	0.0	50,997	226,448	3,623.2	3,592	10,441	208.8
	2004	0	0	0.0	0	0	0.0	123,577	529,626	8,474.0	29,831	70,610	1,412.2
Sawtooth	2003	0	0	0.0	0	0	0.0	77,302	843,479	13,495.7	5,613	18,162	363.2
	2004	0	0	0.0	0	0	0.0	128,662	584,241	9,347.9	19,576	42,227	844.5
St. Joe	2003	52	75	30.0	1,658	670	53.6	18,849	25,662	2,309.6	0	0	0.0
	2004	548	722	36.0	119	122	7.4	7,868	17,997	1,572.1	9	20	1.5
Caribou-Targhee	2003	0	0	0.0	36	55	1.1	521	568	11.4	4,960	29,805	596.1
	2004	0	0	0.0	0	0	0.0	7,803	17,825	356.5	3,417	8,547	170.9
Indian Res.	2003	0	0	0.0	0	0	0.0	10	40	1.0	0	0	0.0
	2004	0	0	0.0	25	18	0.0	3,427	5,408	86.5	0	0	0.0
BLM	2003	57	68	1.1	475	639	12.8	4,756	11,464	229.3	324	1,167	23.3
	2004	37	55	0.9	29	86	4.3	2,916	11,076	177.2	963	2,365	47.3
Other Lands	2003	291	400	84.0	2,651	3,078	147.7	9,298	40,990	2,172.5	81	178	11.2
	2004	536	732	153.7	639	1,352	67.6	4,321	9,413	150.6	180	397	7.9
Idaho Totals	2003	7,856	6,301	2,418.3	12,679	15,096	1,067.6	293,800	1,642,195	65,372.7	30,153	102,262	5,573.6
	2004	2,913	2,841	590.0	3,573	5,435	277.9	483,180	1,773,744	69,973.3	65,072	163,977	6,236.7

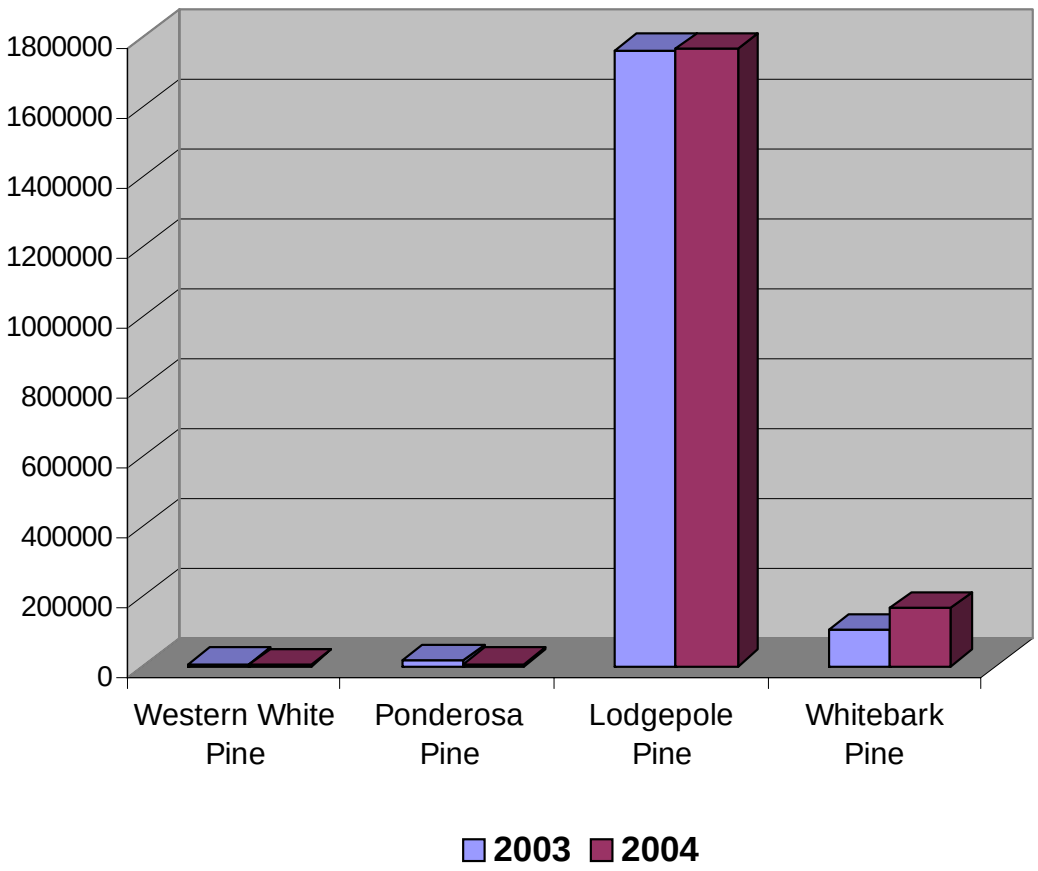

Figure 1. Mountain Pine Beetle Mortality by Host Species as Determined by Aerial Surveys in Idaho, 2003-2004.

PINE ENGRAVER

Pine engraver beetle mortality in 2004 was reduced to less than half of the 2003 estimate, with Ponderosa pine sustaining most of the damage. Numbers decreased from 8,973 killed trees on 3,839 acres in 2003 (Table 3, Figure 2), to 4,203 killed trees on 1,198 acres for this year. Much of this mortality was dispersed across **State**, **private**, and **tribal** lands around communities like Morton, Twin Lakes, White Bird, and Keuterville.

WESTERN PINE BEETLE

Ponderosa pine mortality attributed to western pine beetle (WPB) slightly declined from 2003 recorded levels. In 2004, beetle-caused mortality totaled 19,942 trees (Table 3, Fig. 2) across an estimated 15,817 acres. There still remains the potential for WPB populations to increase due to continued warm and dry conditions and residual susceptible hosts remaining from the 2000 fires.

Northern Idaho: **State** and **private** lands within the reporting areas sustained a majority of the WPB infestations. Areas reporting higher incidences include north and east of Moscow along drainages of the Palouse Range, and northeast of Potlatch along the Gold and Lemman Creek drainages. An outbreak of over 100 trees was detected just northeast of Spirit Lake. The **Kaniksu NF** currently has an infestation of over 2000 trees in the vicinity of Brush Lake and areas of over 100 infested trees north of the town of Copeland. On the **Clearwater NF**, areas of scattered mortality were observed with higher beetle populations located northeast of Boundary Point, just east of the town of Harvard. The **NPIR** showed areas of dispersed mortality, with the highest incidence of beetle-killed trees occurring around Cottonwood Butte, west of the town of Cottonwood.

Southern Idaho: On the **Payette NF**, pockets of WPB mortality were found throughout areas north and east of Payette Lake, drainages southeast of the Lost Valley Reservoir, and in areas south of Pinehurst. Beetle-killed trees were found scattered across watersheds of the western half of the **Boise NF** which also includes **State** and **private** lands**,** but with more noticable activity occurring between the Luck Peak and Arrowrock Reservoirs, and along the South Fork of the Payette River.

SPRUCE BEETLE

Spruce beetle populations decreased in 2004. Nearly 1,300 trees were killed on 1,176-recorded acres compared to 1,789 trees killed on just over 778 acres last year (Table 3, Fig. 2).

Northern Idaho: Mortality was negligible across all landscapes and ownerships.

Southern Idaho: The **Caribou-Targhee NF** sustained the most spruce mortality, with scattered outbreaks occurring in areas such as the Caribou and Little Elk Mountains located southwest of Palisades Reservoir.

Table 3. 2004 Idaho Statewide Aerial Detection Survey (ADS) Summary for Fir Engraver Beetle, Western Pine Beetle, and Spruce Beetle (Acres Infested, Red Trees and MBF Volume Lost) by ADS reporting area.

		Pine Engraver Beetle Estimated Mortality (PP&LPP)			**Western Pine Beetle** Estimated Mortality			**Spruce Beetle** Estimated Mortality		
AREA	Year	Acres Infested	Red Trees	MBF Volume	Acres Infested	Red Trees	MBF Volume	Acres Infested	Red Trees	MBF Volume
Bitterroot	2003 2004	0 0	0 0	0.0 0.0	0 0	0 0	0.0 0.0	0 0	0 0	0.0 0.0
Boise	2003 2004	20 36	60 102	1.0 1.6	1,570 2,039	1,572 1,859	31.4 37.2	25 10	30 13	2.7 1.2
Clearwater	2003 2004	15 0	20 0	0.4 0.0	907 418	957 636	382.8 254.4	18 32	12 20	6.0 1.8
Coeur d'Alene	2003 2004	29 0	173 0	4.3 0.0	211 194	222 155	88.8 62.0	4 0	12 0	4.8 0.0
Kaniksu	2003 2004	28 0	71 0	1.6 0.0	70 3,089	94 3,530	37.6 1,412.0	544 0	1,379 0	551.6 0.0
Kootenai	2003 2004	0 0	0 0	0.0 0.0	0 0	0 0	0.0 0.0	0 0	0 0	0.0 0.0
Nez Perce	2003 2004	468 0	1158 0	26.6 0.0	230 110	345 86	138.0 34.4	42 4	70 6	28.0 .5
Payette	2003 2004	0 0	0 0	0.0 0.0	1,295 2,191	1,884 2,148	37.7 43.0	10 0	15 0	4.8 0.0
Salmon- Challis	2003 2004	2,064 0	5,094 0	81.5 0.0	0 635	0 499	0.0 10.0	43 15	100 15	1.4 1.4
Sawtooth	2003 2004	0 0	0 0	0.0 0.0	70 55	141 22	2.8 .4	80 15	160 45	14.4 4.1
St. Joe	2003 2004	0 0	0 0	0.0 0.0	10 8	12 18	4.8 7.2	0 17	0 5	0.0 1.0
Caribou-Targhee	2003 2004	0 0	0 0	0.0 0.0	0 5	0 3	0.0 0.1	0 1,062	0 1,131	0.0 101.8
Indian Res.	2003 2004	470 5	1,162 51	26.7 1.0	423 420	534 579	213.6 231.6	0 0	0 0	0.0 0.0
BLM	2003 2004	0 80	0 141	0.0 2.3	548 420	788 436	15.8 8.7	0 0	0 0	0.0 0.0
Other Lands	2003 2004	745 1,077	1,235 3,909	28.4 70.4	11,348 6,233	12,354 9,971	2,594.3 1,860.7	12 21	11 20	2.8 5.0
Idaho Totals	2003 2004	3,839 1,198	8,973 4,203	170.5 75.3	16,682 15,817	18,903 19,942	3,547.6 3,961.7	778 1,176	1,789 1,255	616.5 116.8

Idaho Pine & Spruce Mortality

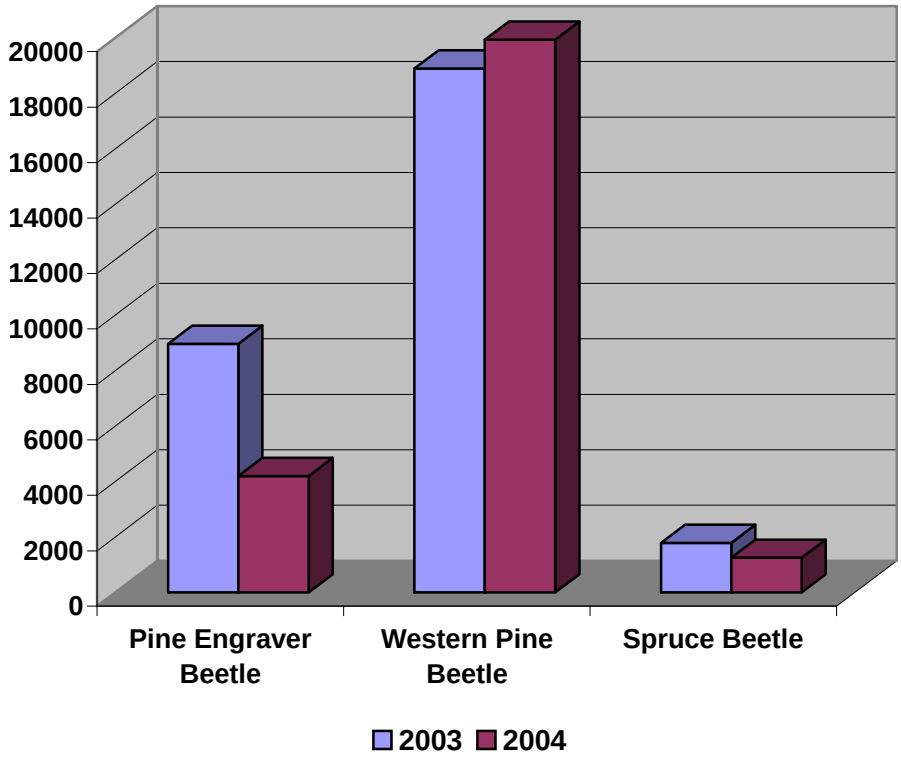

Figure 2. Pine and Spruce Mortality by Bark Beetle Species as Determined by aerial Surveys in Idaho 2003-2004.

DOUGLAS-FIR BEETLE

Douglas-fir Beetle (DFB) mortality significantly increased in 2004, with 206,450 killed trees on 111,657 acres, compared to 159,352 killed trees on 49,157 acres in 2003 (Table 4, Figure 3). Douglas-fir beetle populations are still considerably high on forests that had significant acreage affected by fire in 2000.

Northern Idaho: Dispersed pockets of DFB-caused mortality were found across **State** and **private,** and **BLM lands**, more notably to the east and south of Elk River and in drainages along the upper 1/3 of the North Fork of the Clearwater River. Douglas-fir beetle on the **Clearwater NF** more than tripled from 2003 estimates. Many small mortality groups were widely distributed across landscapes, with more notable concentrations occurring in the vicinity of Wendover Ridge, just west of the Powell Ranger District, and in areas between Meadow Creek and the North Fork of the Palouse River drainages northeast of the town of Harvard. The **Coeur d'Alene NF** also logged an increase in DFB mortality, more than doubling the previous year's estimates. Areas include: Fulkerson and Pony Peaks just south of Murray, scattered polygons north of Murray, the West Fork of the Eagle Creek drainage, and in the vicinity of Grizzly Ridge northwest of Pritchard.

Southern Idaho: **State, private,** and **BLM** lands all had increases in DFB mortality. The **Salmon-Challis** and **Sawtooth NF's** both more than doubled mortality estimates from 2003. Over 100,000 trees were killed on the **Salmon-Challis NF** this year. A massive DFB infestation is occurring across all landscapes on the northern portion of the forest, including islands within the boundaries of the 2000 fires. On the **Sawtooth**, DFB mortality groups continued to be found throughout drainages west of Ketchum to the Smokey Mountains.

FIR ENGRAVER

Fir engraver beetle (FEB)-caused total mortality nearly doubled this year. An estimated 233,921 trees were killed statewide on 279,011 acres compared to 121,760 trees killed statewide on 152,058 acres (Table 4, Figure 3) in 2003. Fir engraver beetle populations and damage to trees will likely remain high until typical moisture patterns return to the state. Northern Idaho also has a high amount of root disease in many grand fir settings that increases grand fir's susceptibility to FEB attack. Outbreaks of FEB are usually associated with drought.

Northern Idaho: Dispersed pockets of mortality were mapped across the **Kaniksu NF**, with higher concentrations found on the west side of Priest Lake and up to the Canadian border. The **Nez Perce NF** exhibited high beetle-caused mortality in numerous drainages from Elk City to the western edge of the Forest. Populations of FEB increased dramatically on the **Coeur d'Alene** and **Clearwater NF's,** with high mortality occurring in drainages throughout the Coeur d'Alene Mountain Range, and in areas southwest of Bovill, respectively. **State, private,** and **BLM** lands were particularly affected by FEB in areas to the east of Priest Lake, landscapes between Sandpoint and Bonners Ferry, and lands in the vicinity of Whitebird, Grangeville, and Weippe. Beetle-killed trees on the **NPIR** were found in all drainages flowing into Soldiers Meadow Reservoir, and in drainages east of Cottonwood.

Southern Idaho: Beetle-caused mortality on the **Boise** and **Payette NF's** was found predominantly in drainages along the Payette and Weiser River systems, and in areas of the West Mountain Range**. State, private**, and **BLM** lands were found to have scattered mortality across landscapes, with concentrated infestations occurring in areas between Big Creek and Gold Fork Rivers, just east of the Cascade Reservoir.

WESTERN BALSAM BARK BEETLE/SUBALPINE FIR COMPLEX

Western balsam bark beetle/sub-alpine fir complex (WBBB/SAF) was the identified cause for 236,186 trees killed on 139,873 acres, with 191,253 trees killed on 99,434 acres statewide in 2003 ADS (Table 4, Figure 3). Much of the subalpine fir mortality occurring in these environments results from varying combinations of root diseases, bark beetles, and possibly other factors such as climate change. Western balsam bark beetle (WBBB) is thought to be the most significant mortality factor. A woodstaining, pathogenic fungus carried by WBBB appears to cause mortality even when the beetles only lightly attack trees. Decline and die-off of subalpine fir started in the late 1980's. Peak mortality periods occurred during the mid-1990's when over a million trees were affected. Although there are a number of pathogens affecting subalpine fir mortality, the primary insect involved is the WBBB, although the exotic Balsam Woolly Adelgid may also play a role in some areas. Ground examinations suggest a number of factors that contribute to the complex, including: twig beetles, secondary bark beetles, wood borers, fir engraver beetles, root diseases, cankers, and rusts. Drought, heat stress, and winter drying, compounded by overstocked and overmature stand conditions also contribute to subalpine fir mortality.

Northern Idaho: Mortality was again mapped across the western portion of the **Kaniksu NF**, particularly in areas northwest of Upper Priest Lake from the south end of Hughes Ridge to the Canadian border, and on **State** and **Federal** lands east of Priest Lake to Bonners Ferry. On the **Clearwater NF,** scattered groups of mortality were recorded across landscapes of the eastern portion of the Forest, with higher incidences in drainages between Little Moose and Goose Ridges on the North Fork RD. The **Nez Perce NF** once again displayed beetle damage across drainages of the Gospel Hump Wilderness, east of Riggins.

Southern Idaho: The **Salmon-Challis NF** showed the highest incidence of subalpine fir complex damage across areas of the Lemhi Mountain Range south of Salmon. Within the **SNRA**, red trees were recorded across landscapes of the Salmon, Boulder and Smokey Mountain Ranges. On the **Caribou-Targhee NF**, more prominent activity was recorded in the Elkhorn Mountains and the Cottonwood Creek drainage near Downey, to northern portions of the Caribou Range. Considerable mortality was mapped on **State** and **private** lands across drainages of the Blackfoot Mountains, and along the drainage of the Little Toponce Creek on the Fort Hall Indian Reservation.

Table 4. Aerial Detection Survey (ADS) results by reporting area for the Douglas-fir beetle, Fir Engraver, Western Balsam Bark Beetle, and Subalpine fir complex for the state of Idaho, ADS years 2003 and 2004.

		Douglas-fir Beetle Estimated Mortality			**Fir Engraver** Estimated Mortality			**Western Balsam Bark Beetle** Estimated Mortality			**Subalpine fir Complex** Estimated Mortality		
AREA	Year	Acres Infested	Red Trees	MBF Volume	Acres Infested	Red Trees	MBF Volume	Acres Infested	Red Trees	MBF Volume	Acres Infested	Red Trees	MBF Volume
Bitterroot	2003	66	35	12.3	0	0	0.0	0	0	0.0			
	2004	32	60	21.0	0	0	0.0	0	0	0.0			
Boise	2003	2,027	4,497	134.9	776	1,325	39.8				741	1,563	31.3
	2004	3,922	4,353	130.6	10,189	10,362	310.9				3,855	5,890	117.8
Clearwater	2003	1,170	2,578	902.3	417	843	168.6	2,970	4,518	497.0			
	2004	3,896	10,464	3,662.4	5,966	6,109	1,221.8	5,858	11,803	1,298.3			
Coeur d'Alene	2003	615	1,356	474.6	547	1,513	302.6	854	2,542	279.6			
	2004	1,136	5,079	1,777.7	27,998	27,160	5,432.0	1,442	1,070	117.7			
Kaniksu	2003	5,415	7,742	2,709.7	27,232	26,694	5,338.8	49,788	87,728	9,650.0			
	2004	1,536	2,963	1,037.1	21,749	28,033	5,606.6	21,897	38,031	4,183.4			
Kootenai	2003	100	88	30.8	0	0	0.0	4	12	0.0			
	2004	66	233	81.6	5	10	2.0	20	44	4.8			
Nez Perce	2003	3,544	10,608	3,712.8	6,925	14,462	2,892.4	5,406	8,037	844.1			
	2004	603	2,246	786.1	16,632	22,982	4,596.4	4,767	6,360	699.6			
Payette	2003	5,926	11,670	350.1	3,188	4,949	148.5				2,109	3,507	70.1
	2004	8,433	12,352	370.6	8,400	11,227	336.8				3,312	6,788	135.8
Salmon-Challis	2003	1,600	40,640	565.6	0	0	0.0				12,314	30,022	600.4
	2004	58,245	100,012	3,000.4	0	0	0.0				26,191	64,593	1,291.9
Sawtooth	2003	3,191	10,778	623.4	0	0	0.0				6,536	26,800	536.0
	2004	8,599	28,572	857.2	0	0	0.0				18,304	49,432	986.4
St. Joe	2003	787	3,004	1,051.4	3,233	2,177	762.0	5,925	5,159	567.5			
	2004	358	2,139	748.7	3,110	3,877	775.4	856	1,645	181.0			
Caribou-Targhee	2003	21,247	59,299	1,779.0	1,055	2,717	81.5				7,792	14,304	222.6
	2004	17,763	28,434	853.0	0	0	0.0				19,825	34,723	694.5
Indian Res.	2003	59	127	44.5	589	535	107.0	0	0	0.0	463	777	85.5
	2004	69	276	96.6	2,118	1,303	260.6	0	0	0.0	418	806	16.1
BLM	2003	654	1,276	38.3	2,385	2,419	72.6	80	110	2.2	456	774	15.5
	2004	2,476	4,006	120.2	3,281	3,104	93.1	184	209	4.2	931	1,799	36.0
Other Lands	2003	2,756	5,654	1,074.3	105,711	64,126	7,695.1	2,260	2,297	252.7	1,736	3,103	62.1
	2004	4,523	9,399	1,785.8	206,295	131,296	15,755.5	1,949	3,726	242.2	30,064	9.267	185.3
Idaho Totals	2003	49,157	159,352	13,857.5	152,058	121,760	17,608.9	67,287	110,403	12,093.1	32,147	80,850	1,623.5
	2004	111,657	210,588	15,329.0	279,011	233,921	34,391.1	36,973	62,888	6731.2	102,900	173,298	3463.8

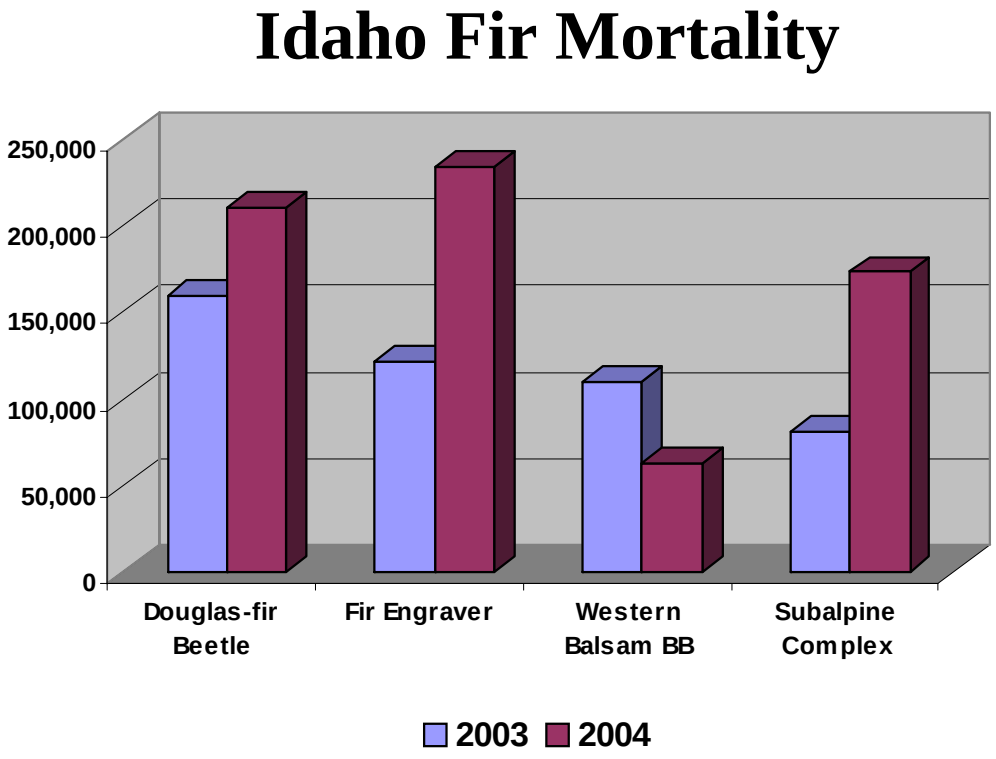

Figure 3. Fir Mortality by Bark Beetle Species as determined by Aerial Surveys in Idaho 2003 – 2004.

DEFOLIATORS

LARCH CASEBEARER

Neither aerial nor ground surveys detected any larch casebearer-caused defoliation in northern Idaho in 2004. The population that caused defoliation from 1997-2001 has continued to decline to current undetectable levels. Rates of parasitism during the outbreak were monitored each year, but population levels of parasites were not high enough to exclusively account for the population decline. Other causes for the decline of larch casebearer populations were not determined. Affected areas from the 1997-2001 defoliation event will be occasionally monitored for a resurgence of larch casebearer populations; but detectable defoliation in 2005 is unlikely.

WESTERN SPRUCE BUDWORM

In northern Idaho, a complex of 5 budworm (*Choristoneura*) species including western spruce budworm (*Choristoneura occidentalis* Freeman) was responsible for 51,161 acres of defoliation in 2004, up from 18,500 defoliated acres in 2003. Most defoliation occurred on the **Kaniksu NF** across landscapes west and north of Priest and Upper Priest Lakes and along drainages of Lightning Creek**,** with budworm feeding heavily on hemlock. This is a rare occurrence, as budworm-caused hemlock defoliation has not been recorded since 1922.

A substantial drop in budworm defoliation was recorded in southern Idaho. A total of 10,538 acres were defoliated on **Federal** lands, compared to 160,175 in 2003. Between 2-3 thousand acres were mapped on the **Boise**, **Caribou-Targhee**, **Payette**, and **Sawtooth NF's** each. **State** and **private** lands accounted for 1,118 acres.

HEMLOCK LOOPER

The western hemlock looper infestation that caused thousands of acres of defoliation in 2001 and 2002 (38,000 and 53,440 acres respectively) on the **Clearwater** and **Nez Perce NF's** in northern Idaho appears to have abated. These outbreaks typically last 3 years. Parasites, predators, and disease are the primary causes of their demise. In 2004, there was no hemlock looper-caused defoliation detected by ADS.

DOUGLAS-FIR TUSSOCK MOTH

Moderate Douglas-fir tussock moth (DFTM) defoliation was found in a few scattered areas across the Albion Mountain Division of the Manidoka Ranger District, **Sawtooth NF**. This year's Pheromone trap catches in northern Idaho decreased from an average of .2 moths/trap in 2003 to 0.02 moths/trap for 2004. This followed an outbreak of DFTM in Idaho that peaked in 2000, and resulted in several spray projects conducted by the IDL in 2001 and 2002 on mixed land ownerships within the **Clearwater NF**.

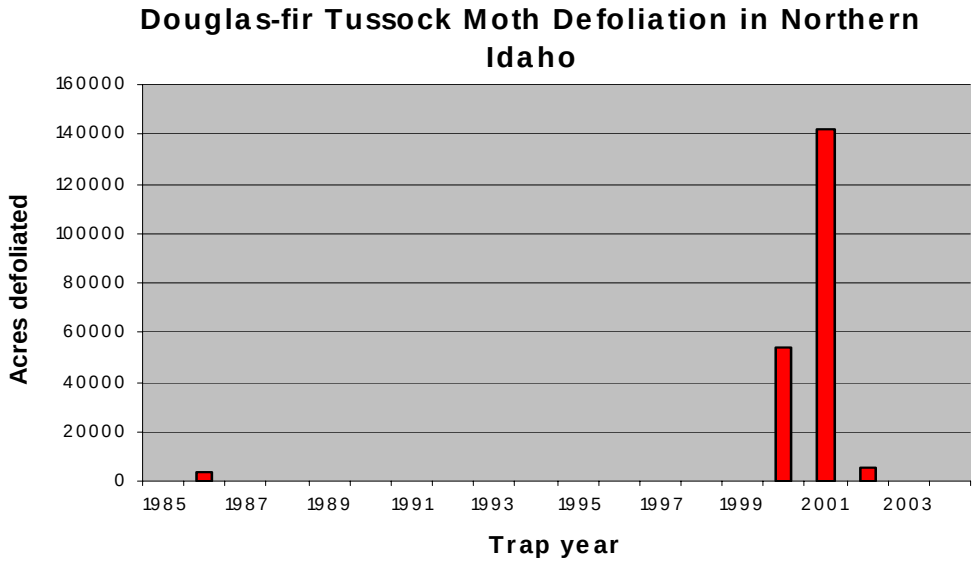

Figure 4. Defoliated acres by Douglas-fir tussock moth as determined by ADS in northern Idaho 1985-2004.

Table **5. Douglas-fir tussock moth Early Warning System Pheromone Trap Results:** Means of average moth catch per 5 pheromone trap/sample plots in Idaho, 2004-1994

AREA	Number of 2004 sample plots	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994
STATE AND PRIVATE												
Coeur d'Alene	5	*	*	0.0	0.0	0.0	0.6	0.3	0.08	0.0	0.0	0.0
Coeur d'Alene	5	*	*	0.0	0.0	0.0	0.5	0.08	0.0	0.0	0.0	0.0
Plummer-Moscow	13	0.0	0.3	33.9	73.5	75.2	36.6	20.4	4.1	0.4	0.3	0.02
Plummer-Moscow	18	0.0	0.6	43.9	82.9	63.3	24.0	14.0	1.2	0. 1	0.04	0.0
Plummer-Moscow	13	0.02	0.1	31.4	87.2	55.9	19.0	2.6	0.1	0.0	0.0	0.0
Plummer-Moscow	1	0.0	0.2	1.0	0.2	93.0	36.4	29.8	1.4	0.2	0.2	0.0
Plummer-Moscow	2	0.0	0.4	37.9	79.1	89.4	44.1	54.8	2.7	0.2	0.1	0.0
Plummer-Moscow	3	0.0	1.3	62.1	80.1	96.1	55.6	29.7	2.2	0.3	0. 1	0.0
Plummer-Moscow	15	0.04	0.2	30.8	72.7	82.4	69.7	30.1	7.8	1.4	0.04	0.0
Plummer-Moscow	1	0.0	0.0	8.8	75.4	*	37.6	20.2	0.4	0.0	0.0	
Plummer-Moscow	3	0.0	0.5	47.7	38.9	97.1	67.1	52.1	3.1			
Plummer-Moscow	2	0.0	0.1	15.5	39.1	86.8	53.0					
Plummer-Moscow	27	0.0	0.01	27.4	68.7							
Plummer-Moscow	24	0.0	0.01	22.1	66.3							
Craig Mountain	7	0.0	0.0	0.1	6.4	0.0	0.6	0.5	0.0	0.0	0.0	0.0
NEZ PERCE NF												
Moose Ck RD	4	0.0	0.30	0.8	2.0	1.0	2.4	1.7	0.0	0.0	0.0	0.0
Salmon River RD	5	0.0	0.0	0.1	2.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0
CLEARWATER NF												
Lochsa RD	2	0.0	0.0	0.4	5.9	*	0.0	0.4	0.0	0.0	0.0	0.0
North Fork RD	3	0.0	1.3	0.3	15.1	0.8	1.9	2.6	0.0	0.0	0.0	0.0
Pierce RD	6	0.0	0.0	3.6	16.9	1.0	0.4	0.3	0.0	0.0	0.0	0.0
Palouse RD	6	0.2	6.7	32.9								
BOISE NF												
Mountain	6	*	*	5.9	17.4	15.4	3.8	0.1			0.0	0.1
Home RD	8	*	*	1.0	3.4	0.8	0.2	0.0	0.5	2.1	0.0	0.0
Idaho City RD	5	*	*	0.0	0.4	0.2	0.2	0.0	0.0	0.0	0.0	0.0
Cascade RD	9	*	*	0.1	0.7	0.4	0.0	0.1	0.0	0.0	0.0	0.0
Lowman RD	10	*	*	0.5	5.1	6.9	6.8	3.0	0.0	0.0	0.0	0.0
Emmett RD									0.3	0.02		
PAYETTE NF												
Council RD	11	*	*	1.2	6.4	15.8	13.1	5.8	1.4	0.05	0.1	0.0
Weiser RD	12	*	*	3.3	11.9	19.0	29.9	26.9	3.6	0.6	0.1	0.1
New Meadows RD	11	*	*	0.2	5.5	9.8	9.3	5.3	0.6	0.02	0.0	0.0
McCall RD	5	*	*	0.1	2.0	2.7	1.7	0.6	0.0	0.0	0.0	0.0
SAWTOOTH NF												
Burley RD	2	*	*	3.6	20.2							
Fairfield RD	5	*	*	1.1	9.3	9.0	1.7	0.5	0.1	0.1	0.0	0.3
OTHER												
Owyhee	3	*	*	6.1	57.5	84.6	40.2	32.1	30.6	24.0	13.1	2.0
Mountains	1	*	*	50.2	38.2	29.6	12.8	*	0.4	0.0	0.0	0.0
Sharps Canyon												

***** Traps not deployed

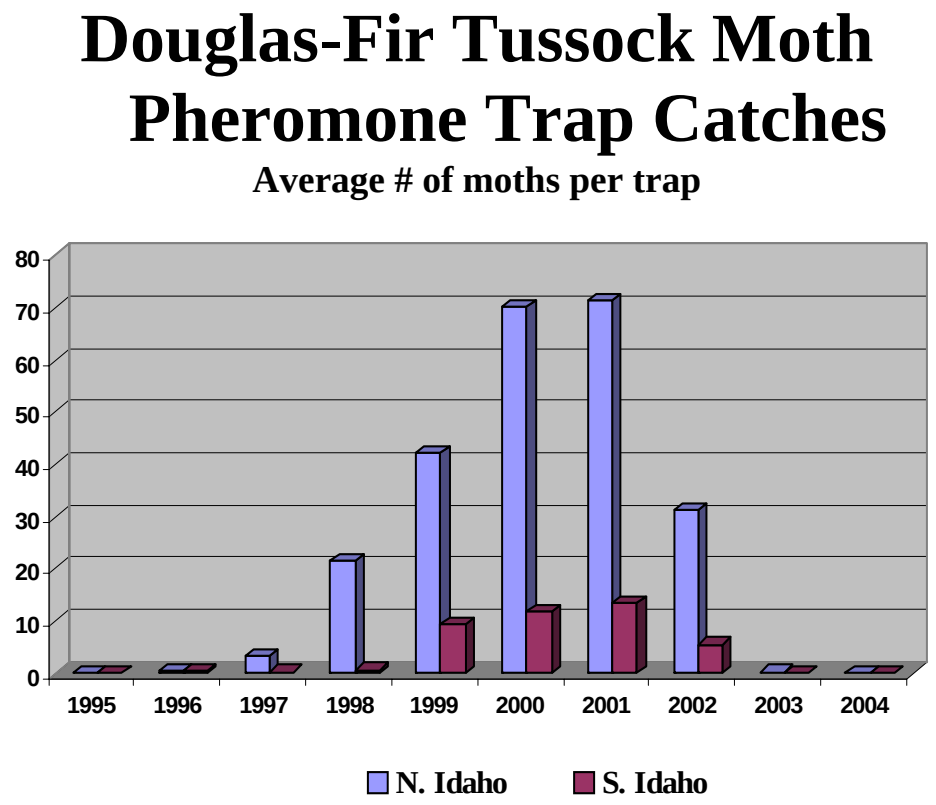

Figure 5. USFS and IDL Douglas-fir Tussock Moth, Early Warning System trap results (avg. # of moths per trap) 1995–2004.

GYPSY MOTH

The Idaho gypsy moth detection survey program systematically samples all populated areas of the State in order to detect introductions of gypsy moths. Many USDA Forest Service campgrounds are sampled, as well as rest stops, tourist attraction sites, and other locations where people congregate. High-risk areas, those cities with the highest populations and the highest potential for newly arriving families are trapped each year. Other areas are trapped every other year or every third year. The survey will continue to expand as cities grow and more people move into the rural areas of the state. All trapping results are incorporated into the National Agricultural Pest Information System (NAPIS) database.

Detection and trapping

In 2004 the cooperating agencies in the Idaho gypsy moth detection program placed 5,875 detection traps throughout the state. Pheromone-baited traps were placed on a grid basis at a density of four traps per square mile. Traps were placed throughout the state in cities and towns and the surrounding urban areas and rural communities in accordance with a predetermined rotation schedule. Cities and communities where 20 or more move-ins occur are trapped irrespective of their place in the schedule. A move-in is defined as an individual or family moving to Idaho from a state that is generally infested with gypsy moths. This information is derived from vehicle registration information supplied by the Idaho Department of Transportation. Most infestations are initiated when an egg mass or other life stage of the gypsy

moth arrives on an outdoor household article brought by someone moving into the area. Between May 2003 and April 2004, there were 8,922 "move-ins" to the state, representing a 13% decrease from the prior year. Campgrounds, tourist attractions, and other high-risk locations were also trapped.

During the course of this year's annual detection trapping for the North American (or European) gypsy moth, the IDL found a single male Asian gypsy moth in north Idaho, near Hauser Lake in Kootenai County. This is significant, in that compared to the North American gypsy moth, the Asian gypsy moth feeds on a wider range of hosts, including many of our native conifers. Also, the female Asian gypsy moth can fly, which allows for much wider and faster distribution of a population. These factors give this insect a high capability of causing significant economic and ecological damage if it were allowed to establish and develop populations. Asian gypsy moths appear to have been introduced in the past from egg masses deposited on ships leaving ports in Eastern Russia. They were first found in the United States at ports around Seattle and Tacoma, WA, Portland, OR, Los Angeles, CA, and Sunny Point, NC. All of these introductions have been eradicated and intensified monitoring has been implemented. The Asian gypsy moth captured in northern Idaho is the farthest inland that any has been found. Speculation is that it was attached to a container being transported by the railroad, which passes close by the catch site.

In October and November, an extensive search was conducted for egg masses or other life stages in and around the trapping area, but no further evidence was found. A science panel convened by the Animal and Plant Health Inspection Service (APHIS) in November recommended spraying 640 acres surrounding the capture site with the biocontrol agent *Bacillus thuringiensis* (Bt) in 2005 to eradicate AGM. In addition, a delimitation trapping survey for the flying adult male will be implemented. It will entail placing 25 traps per square mile throughout a 5-mile radius around the catch site, where typically 4 traps per square mile are placed.

Delimitation trapping

No delimitation trapping was conducted in Idaho in 2004

Mass trapping

No mass trapping occurred in Idaho in 2004.

State advisory committee

An advisory committee, composed of representatives from the Idaho Department of Lands, The Idaho Department of Agriculture, The U. S. Forest Service Regions 1 and 4, and APHIS, reviews activities and provides guidelines for the gypsy moth program in Idaho.

Gypsy Moth Catch Site
2004

Figure 6. State of Idaho 2004 Asian Gypsy Moth Catch Site, Hauser Lake.

OTHER INSECTS

Balsam Wooly Adelgid
Balsam wooly adelgid (BWA), a non-native invasive from Europe, was first detected in Idaho in 1983 near Coeur d'Alene. This near-microscopic insect is capable of killing fir trees in ornamental, forest, and Christmas-tree plantation settings. The host range includes native grand fir and subalpine firs along with white firs planted in landscape settings. Since establishment, the insect's traditional host range in Idaho had been restricted to a roughly 250-mile band in northern Idaho between the Salmon and St. Joe Rivers. However, in 2001 the sap-sucking insect was found killing four subalpine firs in residential settings in Cascade and McCall, Idaho.

Aerial survey data estimates 50,150 acres infested by the balsam woolly adelgid on all land ownerships in northern Idaho in 2004, up from 24,500 in 2003. Areas with the heaviest infestations occurred on the **St. Joe** and **Clearwater NF's**, and adjacent **private** lands. Subalpine fir of all ages and size classes are killed. Extensive gouting and bole infestations occur on grand fir, but to date no grand fir over 5 inches in diameter has been documented as being killed solely by the adelgid. Regeneration mortality of both subalpine and grand fir is high, resulting in forest type conversions in some areas. Continued surveys to delimit the distribution of the balsam wooly adelgid and damage assessment surveys are planned in the near future.

CONE AND SEED INSECTS

Western conifer seed bug, Coneworm, Cone beetle
Cone and seed insects can cause considerable damage to the seeds of western conifers, significantly reducing seed crops. Though insects are found feeding on a variety of tree species in wild stands, they are especially of concern in blister rust-resistant western white pine seed orchards. The insects that cause the most damage in western white pine are western conifer seed bug, *Leptoglossus occidentalis*, cone beetle, *Conophthorus ponderosae*, and coneworm, *Dioryctria abietivorella*. One or more of these insects are often abundant enough in northern Idaho white pine seed orchards to warrant an insecticidal spray treatment to protect cones. To assist in timing of insecticide treatments, cone beetles are monitored with pheromone traps. Sanitation of infested cones is routinely performed in the orchards. However, their proximity to wild stands makes immigration of pests a continual problem.

At the Grouse Creek tree improvement area in northern Idaho, coneworms were again found infesting a young larch seed orchard that had just started to produce cones. Also in the improvement area, cone beetles have been a big problem during the last couple years in the white pine orchard. An insecticidal treatment was planned in 2004, but was not initiated due to timing and procedural problems.

Tree improvement areas in Montana are now nearing cone-producing age. Monitoring will occur as cones are produced.

FOREST DISEASES

STEM AND BRANCH DISEASES

Comandra blister rust
This disease occurs infrequently on lodgepole and ponderosa pine throughout Idaho. Localized areas of heavy infection resulting in branch, top and entire tree mortality of sapling-size ponderosa pine occurs in offsite plantations in southern Idaho.

Dutch elm disease
In Idaho this disease has become common in many communities along the Snake River in southern Idaho, after initial discovery in Boise in 1975 where the disease is still active. Twelve trees were diagnosed with the disease and removed in 2003, reducing the population of street-tree elms to around 1,100 from a high of 6,000, 30-years prior. Unfortunately Dutch Elm Disease is slowly working its way into northern Idaho communities. It was discovered in Moscow in 1990, but an aggressive treatment program has limited losses to only a few trees per year for the past several years. It has also been discovered in several Inland Empire communities nearby--Genesee, in Idaho; Palouse and Pullman, in Washington.

Pinyon blister rust
This disease occurs on pinyon pine in the Raft River Mountains on the **Sawtooth NF** in central Idaho. Disease levels are generally sporadic and tree mortality is low.

Stalactiform blister rust
This rust disease occurs on lodgepole pine in localized areas throughout southern Idaho. Severe infection has occurred in localized areas on the **Boise, Payette, Sawtooth** and **Targhee NF's**.

Western gall rust
This disease occurs throughout the range of lodgepole and ponderosa pine in Idaho. Disease levels vary from year to year and some sites are more prone to damage from this disease than others. Genetic resistance varies widely and resistant individuals can often be found in locations with high infection levels. Generally the disease is not an important cause of mortality, although branch and stem breakage can be of concern, especially within recreation areas. Gall rust is an important consideration in tree improvement plantations where infection can significantly affect performance of young trees. It has also been found damaging ornamental pines including Scots, Austrian and mugho.

White pine blister rust
White pine blister rust was introduced into western North America around 1910, and subsequently spread to western white pine, whitebark pine, and limber pine in Idaho and other western forests. This disease, along with bark beetles, fire suppression, and harvesting reduced white pine dominated stands to less than 5% of the 5 million acres where it once was the dominant species. Residual mature white pines continue to be lost due to a combination of blister rust and mountain pine beetle, and blister rust may also kill a high proportion of naturally regenerated seedlings. This has resulted in major changes in historical transitions in forest types over broad areas. Western white pine has historically been the dominant species in moist habitat

types of northern Idaho, but has been replaced by species such as grand fir, Douglas-fir, and hemlock. These tree species are more susceptible to native disturbances such as bark beetles and root diseases. Efforts to restore white pine are concentrating on planting stock with improved natural resistance. Improved stock has been planted since the mid 1970's and current monitoring efforts are focused on gaining a better understanding of variation in infection levels observed in improved stock performance over time. In addition, lower branch pruning of younger trees is being conducted on a large scale in certain areas to improve survival rates.

White pine blister rust is also causing extensive mortality in high-elevation five-needle pines. Recent surveys in northern Idaho and western Montana high-elevation forests have found infection rates in whitebark pine regeneration of up to 90%. Infection levels in mature whitebark are also high, but are extremely difficult to determine accurately. There is a growing concern that severe losses of large diameter whitebark pine due to increasing mountain pine beetle populations coupled with regeneration losses due to blister rust may have significant impacts on the hydrologic functions and wildlife in these fragile ecosystems.

CANKER DISEASES

Atropellis canker
This disease is usually found on the boles of pole-sized lodgepole pine where it primarily causes stem defects and topkill; tree mortality is infrequent. It is also occasionally found killing small branches of western white pine and whitebark pine. The disease is uncommon, but can be found sporadically across the entire state.

Cytospora canker of true firs
This disease has been found throughout the state on all *Abies* spp. Infected trees display branch flagging, top killing, and infrequent mortality. The disease is associated with environmental stresses such as drought, frost, and freezing damage. Severely infected subalpine fir may be killed by the western balsam bark beetle.

Sphaeropsis blight
This disease is very common on ponderosa pine in many areas of Idaho, but has never been documented in the southwestern part of the state. Damage occurs primarily as a branch or main stem dieback with dead branch tips especially common on exposed portions of tree crowns. Affected trees are often found in riparian areas, although damage can occur on the edges of any ponderosa pine stand. Apparently, disease severity is cyclic and associated with years of prolonged cool, wet weather. This disease does not normally cause tree mortality (except in nursery seedlings), but results in trees with dieback symptoms that may be especially unsightly in recreational and residential areas.

STEM DECAYS

Aspen trunk rot
Decay caused by this fungus occurs most frequently in aspen stands greater than 80-years old in southern Idaho.

Rust red stringy rot (Indian Paint fungus)
This fungus is an important cause of heartwood decay of hemlock and *Abies* spp. It causes more than 90% of the decay occurring in these species and is especially damaging in trees older than 60 years. The most extensive damage is usually found in stands with multiple entries. It occurs most frequently in northern Idaho stands growing in cool, wet conditions, while the most damage in southern Idaho occurs in mature and overmature stands of *Abies* spp. in much drier climates.

Red ring rot (White pocket rot)
This fungus causes white pocket decay of heartwood in western larch and all pine species. It occurs less frequently on spruce, Douglas-fir and *Abies* spp. Damage levels vary considerably throughout Idaho. Mature trees with advanced decay are often used by cavity nesting birds and mammals.

ROOT DISEASES

Douglas-fir and Abies spp. are the primary hosts of root diseases. These species have increased dramatically during the past several decades due to the loss of western white pine, western larch and ponderosa pine from blister rust, fire control, harvesting, and forest practices such as thinning that favor shade tolerant species. As a result, root diseases have become the most important diseases in northern Idaho. The most important root pathogens are Phellinus weirii (cause of laminated root disease) and *Armillaria ostoyae* (cause of Armillaria root disease). Many root pathogens are intimately associated with insects (particularly bark beetles) either as vectors or agents that attack and often kill infected trees. Therefore, mortality levels may vary from year to year in response to bark beetle activity.

Annosus root disease
Annosus root disease is separated into two types based on the hosts attacked. The “p-type” attacks pines and is common in ponderosa pine stands in western Montana. Infected trees are frequently found near stumps, which serve as inoculum sources. Importance, distribution, and impact of this root disease vary widely throughout Idaho. Most damage is concentrated in lower elevations where ponderosa pine is the dominant tree species and past harvesting of large trees has been common. Presence of annosus root disease in ponderosa pine stands greatly decreases the potential for managing ponderosa pine. These sites are usually too dry to effectively grow alternative tree species, so preventing the introduction and subsequent increase of annosus root disease is crucial for managing ponderosa pine. The “s-type” of annosus root disease is widespread at low levels on Douglas-fir and true firs in mixed conifer stands throughout western Montana and northern Idaho. It is frequently found in association with other root diseases.

Armillaria root disease
In northern Idaho this pathogen is the most broadly distributed of the root pathogens and the most important disease agent, overall. It frequently occurs in conjunction with annosus root disease, laminated root rot, or brown cubical root and butt rot. Conifers of all species can be killed by *Armillaria* when they are young, but only Douglas-fir, subalpine fir and grand fir remain highly susceptible throughout their lives. Consequently, the damage is much greater in the latter species where severe disease often turns formerly forested sites into shrub fields for many decades.

Black stain root disease
Black stain root disease is found infrequently in Idaho. The pathogen may cause pinyon pine mortality (associated with insect attacks) in southern Idaho and occurs on off-site ponderosa pine in some stands in northern Idaho. Root-feeding insects vector the fungus, and infected trees are usually attacked and killed by bark beetles.

Brown butt rott
Phaeolus schweinitzii causes brown-cubical decay of roots and butts of Douglas-fir and pine species (particularly ponderosa pine). This fungus is a common root inhabitant of Douglas-fir trees of all ages, but causes root decay mostly in mature trees. Trees on poor sites (shallow soils with poor water-holding capacity) are especially prone to damage by this fungus. Infected trees are rarely directly killed by this fungus, but may be predisposed to windthrow, other root diseases, and bark beetle attacks.

Laminated root disease
This root pathogen is a major cause of mortality of Douglas-fir and *Abies* spp. in northern Idaho. Losses in some areas are extensive, although distribution of the pathogen within forests varies widely. Some level of disease-associated mortality occurs each year with greater mortality occurring during years of drought stress or high bark beetle populations.
This disease is most severe on sites that historically may have supported mostly western white pine and western larch. These tree species have been replaced by highly susceptible Douglas-fir, grand fir, and subalpine fir with consequent increases in this pathogen. It causes damage to trees of all ages, primarily in distinct groups or pockets. This pathogen is often found in conjunction with armillaria and/or annosus root diseases. Like *Armillaria*, it often converts formerly forested sites to long-term shrub fields.

Tomentosus root disease
This disease occurs on Douglas-fir, subalpine fir, Engelmann spruce and lodgepole pine. The pathogen usually causes root and butt decay, often in association with other root-infecting fungi. Infected pole-sized or larger trees may have increased susceptibility to bark beetle attack and windthrow. The pathogen is most common in mature to overmature stands in southern Idaho, but occurs at low levels throughout the state.

White mottled rot
This root pathogen of aspen is increasing throughout southern Idaho. The disease is observed on windthrown trees on the Caribou and Sawtooth NF's.

DWARF MISTLETOES

Dwarf mistletoes are parasitic seed plants in the genus *Arceuthobium.* They occur on most conifer species in Idaho, especially Douglas-fir, western larch, ponderosa and lodgepole pine. Western larch overstory trees throughout many stands in northern Idaho are extensively infected with dwarf mistletoe. Douglas-fir and ponderosa pine are infected only in particular stands in northern Idaho. Lodgepole pine dwarf mistletoe is widely distributed throughout the type. Suppression projects have continued to remove infected overstory trees. However, dwarf mistletoes remain very widespread and are probably are the most damaging disease in southern Idaho.

Lodgepole pine dwarf mistletoe is especially damaging in southern Idaho, and infests approximately 2 million acres (28 percent) of the lodgepole pine type. In Region 1 it causes about 18 million cubic feet of growth reduction annually. Douglas-fir dwarf mistletoe infests about 600,000-acres (13 percent) of Douglas-fir forests, reducing growth by approximately 13 million cubic feet annually. Western larch dwarf mistletoe occurs on about 800,000--acres (38 percent) of western larch stands, and reduces annual growth by over 15 million cubic feet. Ponderosa pine dwarf mistletoe is prevalent throughout its host range in southern Idaho and is locally heavy in ponderosa pine stands around Coeur d'Alene and along the Spokane River drainage in northern Idaho. Limber pine and whitebark pine are heavily infected in localized areas in Montana, with infection being most prevalent east of the Continental Divide. In southern Idaho, limber pine dwarf mistletoe infects much of the host type within Craters of the Moon National Monument.

FOLIAGE DISEASES

All conifer species are susceptible to foliage diseases but damage varies from year to year. Foliage diseases are usually favored by high moisture conditions, so damage is typically most severe in dense stands and in the lower portions of crowns. Infections generally occur during moist periods in the summer or fall, but damage may not be observed until needles are killed the following spring. Since most foliage diseases only attack one age class of needles, they very rarely cause tree mortality. However, several years of infection may result in reduced growth. The effects of foliage disease are most apparent and significant in Christmas tree and tree improvement plantations where healthy foliage is required. In these cases, direct suppression with fungicides is often warranted.

Elytroderma needle cast
This foliage disease actually grows into small branches where it can perpetuate the disease year after year. Localized areas of heavy infection from Elytroderma are still seen in Montana, especially during years with high summer moisture.

Lodgepole pine needle cast
Lophodermella concolor causes cyclic damage on lodgepole pine throughout Idaho. In southern Idaho, the disease appears following periods of drought. In northern Idaho, extensive damage is evident in the early spring in some stands. Damage varies from year to year and it is difficult to predict future disease levels based on observations of spring weather conditions. High levels of infection make trees appear extensively damaged and may be confused with bark beetle mortality. However, the disease usually has no prolonged effects on infected trees although growth may be temporarily reduced. An exception is in tree improvement plantations where growth reduction can seriously affect tree performance.

Rhabdocline needle cast
This disease is most apparent on sapling- to pole-sized Douglas-fir throughout Idaho following seasons of high moisture. It may cause extensive defoliation on dense young stands of Douglas-fir in the northern part of the state. Christmas tree production has been greatly reduced or eliminated in certain parts of northern Idaho because of this disease.

Swiss needle cast
This is another foliage disease of Douglas-fir that occurs throughout northern Idaho. In recent years, infection levels have increased, probably because of increasing fungal inoculum and favorable spring weather. Affected trees may have chlorotic thinning crowns as foliage is slowly killed and needle retention is reduced.

Larch needle disease
Larch needlecast is caused by *Meria laricis* and needleblight is caused by *Hypodermella laricis*. Both diseases occur throughout the state and are generally cyclical, occurring at high levels during years of prolonged cool, moist weather in the spring and early summer.

Fir broom rust
This disease is widespread on *Abies spp*. throughout Idaho. Although the disease is usually of little consequence, high disease levels (greater than 50-brooms/tree) occur in some stands south of the Snake River in southern Idaho.

Spruce broom rust
This disease is scattered throughout spruce stands in Idaho. It appears most commonly in spruce stands in southeastern Idaho.

Cedar apple rust (Gymnosporangium rusts)
In eastern Idaho, this disease periodically causes a leaf spot on residential apple trees and on *Amelanchier* spp. throughout the range of serviceberry in southeastern Idaho.

Miscellaneous foliage diseases
Marssonina blight and Shepard's Crook occurred at moderate levels of infection on aspen during 2004 in southern Idaho. Affected trees had brown-colored foliage from mid-July until leaf drop in the fall.

NURSERY DISEASES

Fusarium root disease
Fusarium spp. routinely causes important diseases of bare root and container-grown stock in Idaho forest nurseries in 2003. Extensive outbreaks of damping-off and root diseases of older seedlings did not occur during 2004, but endemic levels of damage were evident at most nurseries. In particular, damage occurred on container-grown sagebrush, bitterbrush, western larch, Douglas-fir and ponderosa pine seedlings at a southern Idaho Nursery. The major *Fusarium* sp. associated with diseased seedlings was *F. proliferatum*.

Cylindrocarpon root disease
Damage to container-grown seedlings of five-needle pines from *Cylindrocarpon destructans* was at normal levels during 2004. Growers have successfully managed this disease by implementation of appropriate watering schedules and using well-drained growing media.

Gray mold
Botrytis cinerea was mostly found at endemic levels on container-grown seedlings during 2004. One exception was above-normal disease levels on container-grown bitterbrush seedlings in a southern Idaho nursery. Existing pesticides and cultural practices to control this important pathogen were generally effective.

OTHER DISEASES

There were no new and unusual nursery diseases that were apparent during 2004. Tip dieback caused by *Sirococcus conigenus*, *Sphaeropsis sapinea*, and *Phoma* spp. occurred at average levels. *Meria laricis* on bare root western larch occurred at low levels. Root diseases caused by *Pythium* spp. or other soilborne pathogens were also detected at average levels. Most of these pathogens are easily detected during most years and their level of intensity is often related to ambient weather conditions, especially intensity and duration of rainfall. During years of unusually wet spring and summer weather, diseases are generally more severe.

NURSERY DISEASE PROJECTS

Work to evaluate potential alternatives to chemical pre-plant soil fumigation has been completed at most bareroot nurseries in the western United States. Dazomet and chloropicrin are often as effective as the standard mixture of methyl bromide/chloropicrin in controlling soilborne pathogens and weeds at most nurseries. Bare fallowing with periodic cultivation can also be effective, particularly if soilborne pathogen populations are kept low by excluding organic matter amendments and cover cropping. Use of methyl bromide can still be authorized if particular nurseries seek exclusions based on lack of appropriate and effective alternatives.

Tests to evaluate the biocontrol agent *Trichoderma harzianum* were completed at several container nurseries in the western United States. The goal was to use a commercially-available formulation of this agent [Biotrek®] to control *Fusarium* diseases of container stock. Low ambient disease levels clouded results of these tests and further biological control tests with other commercially-available formulations are planned.

Fusarium oxysporum is the most important and damaging pathogen in many forest nurseries in western North America. Efforts were initiated [in cooperation with the Rocky Mountain Research Station] to genetically define populations of this species from an Idaho forest nursery to determine genetic diversity and phylogeny. Populations of *F. oxysporum* were successfully separated into highly virulent and non-pathogenic isolates using amplified fragment length polymorphism [AFLP] and DNA sequencing techniques. The next step of the work will involve developing molecular probes that may be used to detect pathogenic populations in the field.

Work was initiated to protocols for screening families of *Acacia koa* for resistance to the wilt/dieback pathogen *Fusarium oxysporum* in Hawaii (In cooperation with the Hawaii Agriculture Research Center and Forest Health Protection – Region 5). Initial efforts were to confirm etiology of this important disease on a high-value native Hawaiian tree. Although *F. oxysporum* was often isolated from diseased plants, particularly from root systems, other *Fusarium* spp., especially *F. solani*, were also commonly isolated. Screenings of selected *Fusarium* isolates for their potential to initiate disease on seedlings are planned.

STATUS OF CHRONIC DISEASE PROBLEMS

DISEASE	HOST	LOCATION/REMARKS
STEM & BRANCH DISEASES		
Aspen trunk rot	Aspen	Decay occurs in most aspen stands in southern Idaho and is increasingly common as stands age exceeds 80 years.
Atropellis canker	Lodgepole pine	Found in pockets in pole sized stands causing defect, topkill, and some mortality.
Comandra blister rust	Lodgepole pine/ponderosa pine	Infection occurs infrequently throughout Idaho. Heavy, localized areas of infection resulting in branch, top, and entire tree mortality of sapling-size ponderosa pines occurs in offsite plantations on southern Idaho.
Cytospora canker	True firs	Branch flagging, top killing, and mortality attributed to this fungus occurs wherever hosts are found. This disease is associated with environmental stress damage, drought, frost, and freezing. Western balsam bark beetles frequently kill the diseased trees.
Sphaeropsis blight	Ponderosa pine	Is causing widespread branch dieback in many Idaho areas; especially common in riparian areas.
Dwarf mistletoes	Douglas fir, western larch, lodgepole and ponderosa pine	Suppression projects continue to remove infected overstory trees; however, this forest disease remains the most widespread and damaging throughout the state.
Indian paint fungus	True firs, hemlock	Causes 90 percent of decay in these species throughout the state; especially common as age increases beyond 60 years. Common in mature and overmature stands of true firs throughout southern Idaho.
Pinyon blister rust	Pinyon pine	This disease occurs in the Raft River Mountains on the Sawtooth National Forest.
Red ring rot	Western larch, true firs, Douglas-fir, pines, spruce	Can cause serious decay problems in mature conifers. Infection intensity varies throughout host stands in southern Idaho.
Stalactiform blister rust	Lodgepole pine	This rust occurs in localized areas throughout the host type. Heavy infection has been in very localized areas of the Boise, Payette, Sawtooth, and Targhee NF's.
Western gall rust	Lodgepole and ponderosa pine	Gall rust occurs throughout the host types. Infection levels vary, with localized heavy infection present in both host species.
White pine blister rust	Western white pine, limber pine, whitebark pine	This introduced disease is common throughout its host ranges in Idaho. A formal survey of five-needled pines was conducted in 1995-1997 in southern Idaho to quantify disease incidence and intensity, and determine site and stand characteristics of infected areas.
ROOT DISEASES		
Annosus root disease	Pines, true firs, Douglas-fir, spruce	Causes mortality, root and butt rot especially in young trees near old stumps; frequently in complexes with other root diseases; may predispose trees to windthrow and/or bark beetles. This root disease fungus can be found on pines throughout southern Idaho and on firs and spruce in northern Idaho.
Armillaria root disease	Douglas-fir, grand fir, other conifers especially when young and improperly planted	In northern Idaho, a widespread killer of all sizes of trees; In southern Idaho usually found as a weak pathogen or saprophyte causing little direct mortality or in complexes with other root diseases.
Black stain root disease	Pines, Douglas-fir	Found infrequently in Idaho; caused pinyon pine mortality in southern Idaho; usually in association with other root diseases.
Laminated root rot	Douglas-fir, true firs, occasionally other conifers	Primary killer in many stands from the Nez Perce NF north; may be found with Armillaria or other root diseases.
Schweinitzii root rot	Douglas-fir, pines	This decay is common in mature and overmature forests throughout the host type, especially those with a frequent fire or logging history. The fungus is often associated with other root pathogens and bark beetle activity.

Tomentosus root disease	Douglas-fir, subalpine fir, Engelmann spruce, lodgepole pine	Usually found as root/butt rot with other root diseases; occasionally causes mortality. It causes root and butt rot of pole sized and larger trees, predisposing them to bark beetle attack and windthrow. Most common in southern Idaho, but present throughout the state.
White mottled rot	Aspen	This pathogen is increasing in incidence throughout southern Idaho. The disease can be found on windthrown aspen on the Caribou and Sawtooth National Forests.
FOLIAGE DISEASES		
Cedar apple rust	Juniper, Apple, Serviceberry	In eastern Idaho, this disease caused a leaf spot on residential apple trees in Challis and Salmon, ID and to *Amelanchier* throughout the range of serviceberry in eastern Idaho.
Rhabdocline needle casts	Douglas-fir	Very widespread but relatively light levels statewide.
Swiss needlecast	Douglas-fir	Widespread in northern Idaho; generally at very low levels of infection.
Elytroderma needlecast	Ponderosa pine	Systemic and annual infections occur throughout the host type. Infection was especially severe on the Salmon National Forest.
Fir broom rust	True firs	Widespread throughout the state; usually of little consequence, but is "extremely common" in stands south of the Snake River in southern Idaho.
Fir needlecast	Subalpine fir Grand fir	Infection occurred at low levels throughout the host type.
Fir needle rust	Subalpine fir	Scattered infection occurs on seedlings and sapling trees throughout the host type.
Larch needle disease	Larch	Incidence and severity of infection in west central Idaho is cyclical.
Lodgepole pine needlecast	Lodgepole pine	Infection intensity is worse following periods of drought. During intervening years, the disease is of minor localized importance.
Marssonina blight	Aspen	In 2003, this disease was moderate in central and eastern Idaho. Affected trees had brown colored foliage from mid-July until leaf drop.
Pine needle rust	Pines	Scattered incidence of light to moderate intensity scattered throughout the host types in southern Idaho.
Spruce broom rust	Engelmann spruce	Scattered through host range; most common in southeastern Idaho.
White pine needlecast	Western white pine	Widespread in dense stands but at low levels.
NURSERY DISEASES		
Cylindrocarpon	Western white pine whitebark pine	Common in soil or contaminated containers, usually a saprophyte but may be a weak parasite, caused losses at several nurseries.
Diplodia tip blight	Pines	Low levels in areas with a history of problems.
Fusarium root disease	Douglas-fir, larch, spruce, others	The most common and widespread nursery disease; amount of damage varies widely. This disease causes small amounts of mortality primarily of 1-0 conifer seedlings at the Lucky Peak Nursery in Southern Idaho.
Grey mold	most conifers, esp. larch, spruce	Common at low levels in many nurseries. Can be a serious problem during seedling storage.
Meria needlecast	Larch	Infection levels are low on bare root western larch.
Phoma blight	Pines	Commonly isolated from seedlings and soil samples.
Phytophthora/Pythium root rot		These fungi occur infrequently on seedlings and in soil at Lucky Peak Nursery in southern Idaho. Infection results in patch mortality and culling of 2-0 seedlings.
Sirococcus tip blight	Spruce, Pines	Found at average levels at several nurseries.

COMMON AND SCIENTIFIC NAMES OF INSECTS

Balsam woolly adelgid	*Adelges picea* (Ratzburg)
Black-headed budworm	*Acleris gloverana* (Walsingham)
Boxelder leafroller	*Caloptilia negundella* (Chambers)
California five-spined Ips	*Ips paraconfusus* (Lanier)
Cone feeding adelgid	*Pineus coloradensis* (Gillette)
Cone moth	*Eucosma recissoriana* (Heinrich)
Cone worms	*Dioryctria* spp.
Cranberry girdler moth	*Chrysoteuchia topiaria* (Zeller)
Douglas-fir beetle	*Dendroctonus pseudotsugae* (Hopkins)
Douglas-fir tussock moth	*Orgyia pseudotsugata* (McDunnough)
Fir engraver	*Scolytus ventralis* (LeConte)
Gypsy moth	*Lymantria dispar* (L.)
Larch casebearer	Coleophora laricella (Hubner)
Lodgepole terminal weevil	*Pissodes terminalis* (Hopping)
Lodgepole needleminer	*Coleotechnites milleri* (Busck)
Mountain pine beetle	*Dendroctonus ponderosae* (Hopkins)
Pine engraver	*Ips pini* (Say)
Pine needle sheath miner	*Zelleria haimbachi* (Busck)
Red turpentine beetle	*Dendroctonous valens* (Le Conte)
Rusty tussock moth	*Orgyia antiqua* (L.)
Spruce beetle	*Dendroctonus rufipennis* (Kirby)
Tip moth	*Rhyacionia zozara* (Kearfott)
Western balsam bark beetle	*Dryocoetes confusus* (Swaine)
Western conifer seedbug	*Leptoglossus occidentalis* (Heidmann)
Western hemlock looper	Lambdina fiscellaria lugubrosa (Hulst)
Western pine beetle	*Dendroctonus brevicomis* (LeConte)
Western pine shootborer	*Eucosma sonomana* (Kearfott)
Western spruce budworm	*Choristoneura occidentalis* (Freeman)

COMMON AND SCIENTIFIC NAMES OF DISEASES

Annosus root disease	*Heterobasidion annosum* (Fr.) Bref.
Armillaria root disease	*Armillaria ostoyae* (Romagn.) Herink
Atropellis canker	*Atropellis piniphila* (Weir) L. & H.
Black stain root disease	*Leptographium wagneri* (Kendr.) Wingf.
Brown cubical butt rot	*Phaeolus schweinitzii* (Fr.) Pat.
Comandra blister rust	*Cronartium comandrae* Pk.
Conifer-aspen rust	*Melampsora medusae* Thum.
Conifer-cottonwood rust	*Melampsora occidentalis* Jacks.
Cylindrocarpon root disease	*Cylindrocarpon* spp.
Cytospora canker of firs	*Cytospora abietis* Sacc.
Diplodia tip blight	*Sphaeropsis sapinea* (Fr.) Dyko
Dutch elm disease	*Ophiostoma ulmi* (Buism.) Nannf.
Dwarf mistletoes	*Arceuthobium* spp.
Elytroderma needlecast	*Elytroderma deformans* (Weir) Dark.
Fir broom rust	*Melampsorella caryophyllacearum* Schroet.
Fir needlecast	*Lirula abietis-concoloris* (Mayr:Dearn) Darker
Fir needle rust	*Pucciniastrum epilobii* Otth
Fusarium root disease	*Fusarium* spp.
Grey mold	*Botrytis cinerea* Pers. ex Fr.
Indian paint fungus	*Echinodontium tinctorium* (Ell.& Ev.)Ell.& Ev.
Laminated root rot	*Phellinus weirii* (Murr.) Gilb.
Larch needle blight	*Hypodermella laricis* Tub.
Larch needlecast	*Meria laricis* Vuill.
Lodgepole pine needlecast	*Lophodermella concolor* (Dearn.) Dark.
Marssonina blight	*Marssonina populi* (Lib.) Magn.
Phoma blight	*Phoma* spp.
Pine needle rust	*Coleosporium sp.*
Pythium root disease	*Pythium ultimum* Trow.

Red ring rot	*Phellinus pini* Pilat.
Rhabdocline needle cast	*Rhabdocline pseudotsugae* Syd.
	Rhabdocline weirii Parker & Reid
Schweinitzii root/butt rot	*Phaeolus schweinitzii* (Fr.) Pat.
Shepard's crook	*Venturia macularis* (Fr.) E.Muller & Von Arx
Sirococcus tip blight	*Sirococcus strobilinus* Preuss.
Stalactiform rust	*Cronartium coleosporioides* (Diet. & Holw.) Arth.
Spruce broom rust	*Chrysomyxa arctostaphyli* Diet.
Spruce mottled needlecast	*Rhizosphaeria kalkhoffii* Bud.
Swiss needle cast	*Phaeocryptopus gaeumannii* (Rhode) Pet.
Tomentosus root rot	*Inonotus tomentosus* (Fr.) Gilb.
Western gall rust	*Endocronartium harknessii* (Moore) Hir.
White pine blister rust	*Cronartium ribicola* Fisch.
White pine needlecast	*Lophodermella arcuata* (Darker) Darker

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