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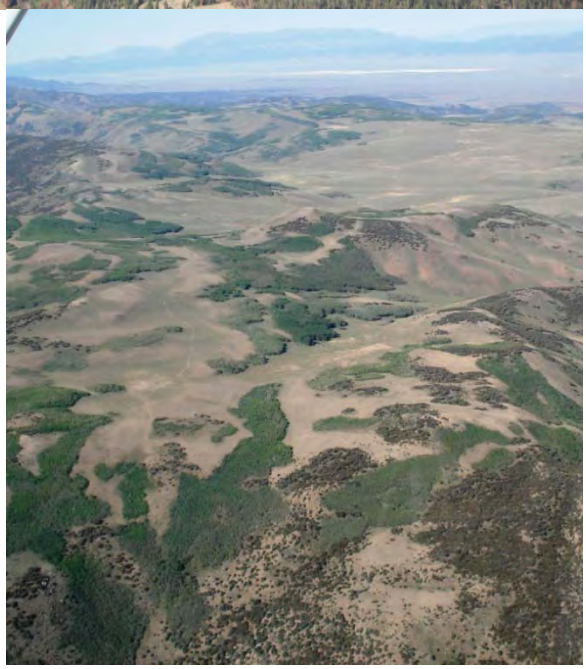
State of Nevada
Division of Forestry
Department of
Conservation and
Natural Resources

Forest Pest Conditions in Nevada 2008



Front Cover Photos Mountain pine beetle on whitebark pine in the Jarbidge Mountains, July 2008 – Rob Cruz & Gail Durham; Aspen and Curlleaf mountain mahogany decline damage in the Toquima Range - July, 2008 by Gail Durham

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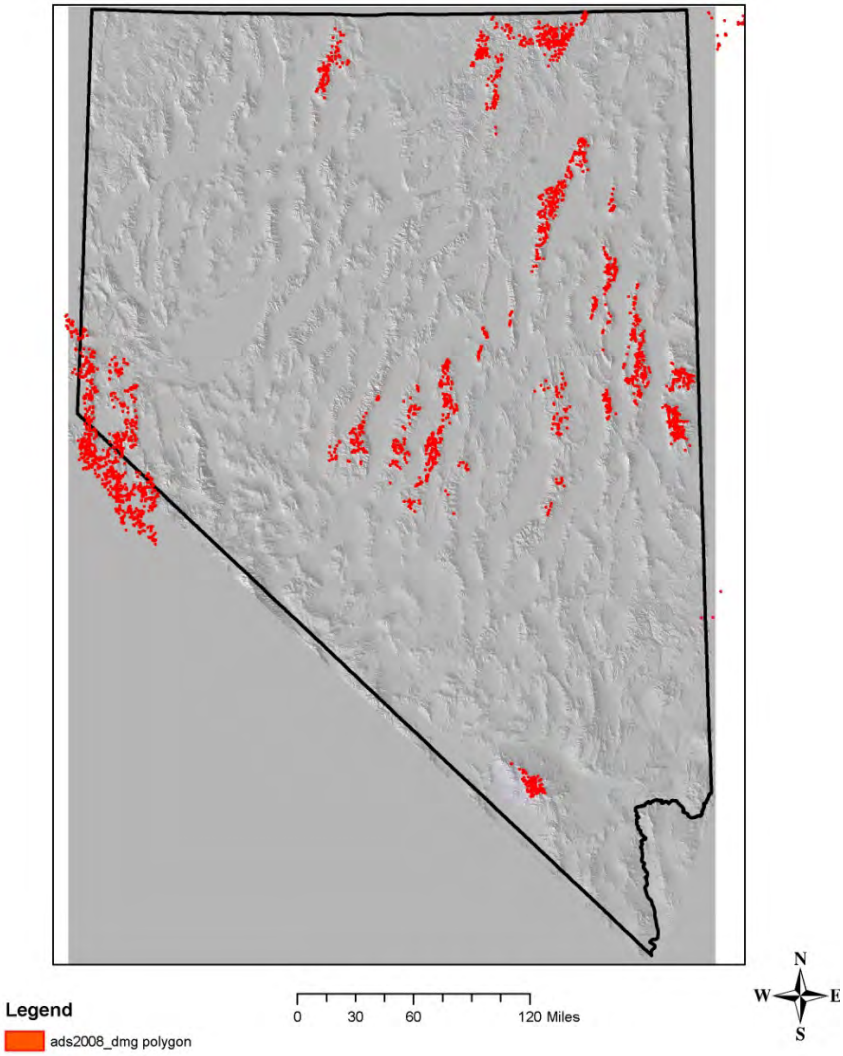
NV 2008 Aerial Detection Survey Damage Areas



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Introduction and Summary

In an effort to simplify discussions of forest health in Nevada, this report focuses only on the impacts of insects, diseases, and weather on the various tree species of the state. Aerial detection surveys (ADS) from USDA Forest Service and Nevada Division of Forestry are the principle data used to describe mortality trends in the state from year to year. Mortality trends are described in terms of acres affected; however, not all trees on these acres are dead. Thus, an estimate of the number of trees killed is also provided. Not all forested lands are surveyed, and not all the same acres are surveyed every year. If the same areas are surveyed and tree mortality occurred, the same acres may be counted more than once in separate years. Total acres tallied may also change between years due to increases or decreases in the total number of acres surveyed. In 2008, over a million more acres were surveyed than in 2007 (Table 1). Most of this area was the National Forest Service (FS) and Bureau of Land Management (BLM) lands in eastern and central Nevada. The ADS data encompasses most of the Humboldt-Toiyabe National Forest including portions of the Bridgeport and Carson Ranger Districts located in California. A large portion of the survey area is also composed of BLM acres with smaller acreage surveyed for Great Basin National Park, other federal lands, state lands, and private lands (Table 1).

Table 1. Total number of acres surveyed in each of the ownership categories for the years 2002-2008.

Land Ownership/Year	2002	2003	2004	2005	2006	2007	2008
NF H-T (NV)	3,760,500	3,551,800	3,924,900	3,697,000	2,508,400	3,739,200	4,757,970
NF-HT (CA)	515,900	529,400	595,000	531600	548,000	560,700	582,000
BLM	554,300	1,069,100	1,076,400	1,109,000	712,300	938,600	1,924,990
Private (NV)	309,800	284,900	298,600	344,300	153,200	381,900	440,637
Private (CA within NF)	29,800	30,500	32,600	31,500	38,000	36,200	31,800
Great Basin NP	76,500	77,100	76,200	76,700	77,000	76,900	75,995
Other Federal*	2,600	1,500	42,000	2,900	1,0800	4,500	41,967
NV State Lands	17,900	18,300	17,800	18,000	3,000	20,100	17,073
TOTAL	5,267,300	5,562,600	6,063,500	5,811,000	4,050,700	5,758,100	7,258,632

*Includes United States Fish and Wildlife Service, Department of Defense, Bureau of Indian Affairs, and other tribal lands

Long term insect trend data summarizes activity detected on all surveyed ownerships in NV and CA. However, discussion of activity by individual insect and disease agents detected in 2008 is for Nevada only and summarized on a county basis. Total acres surveyed and percent of each county surveyed in 2008 are provided in Table 2.

Table 2. Number and percent of acres surveyed in Nevada counties in 2008.

COUNTY	Total Acres in County	2008 Acres Surveyed	2008 % Surveyed
Carson City	103,569	84,469	81.6
Clark	5,176,177	228,561	4.4
Douglas	478,351	281,173	58.8
Elko	10,979,963	1,539,212	14.0
Eureka	2,663,738	317,268	11.9
Humboldt	6,219,557	246,831	4.0
Lander	3,534,543	35,096	1.0
Lincoln	6,782,623	17,270	0.3
Lyon	1,310,315	108,393	8.3
Mineral	2,462,989	0	0.0
Nye	11,686,348	1,461,665	12.5
Pershing	3,863,680	0	0.0
Storey	167,774	41,851	24.9
Washoe	4,234,009	177,373	4.2
White Pine	5,676,727	1,613,181	28.4
Total	65,340,363	6,152,343	9.4

In 2008, insect and disease mortality numbers increased for the third year in a row. Both 2006 and 2007 had below average precipitation in Nevada. Adequate precipitation is necessary to maintain tree vigor and resistance to insects and pathogens. The western states, including Nevada, experienced below average precipitation from 1999 to 2004 and in 2006 to 2008 (Figure 1). March-October 2008 was the driest such 8-month period on record for California and Nevada (National Climate Data Center). Oftentimes drought-induced mortality will become evident one or more years after a drought.

In 2008, most estimates of mortality caused by insects and diseases (acres affected and number of trees killed) remained the same or increased significantly from 2007 levels, although there were local increases in mortality from specific agents in some counties (Table 3). Nearly every mortality agent killed more trees killed and affected more acres in 2008 than in 2007 with two exceptions: Fir engraver beetle on white fir decreased between 30 to 40% of 2007 levels and Douglas fir tussock moth defoliation decreased to near zero this year.

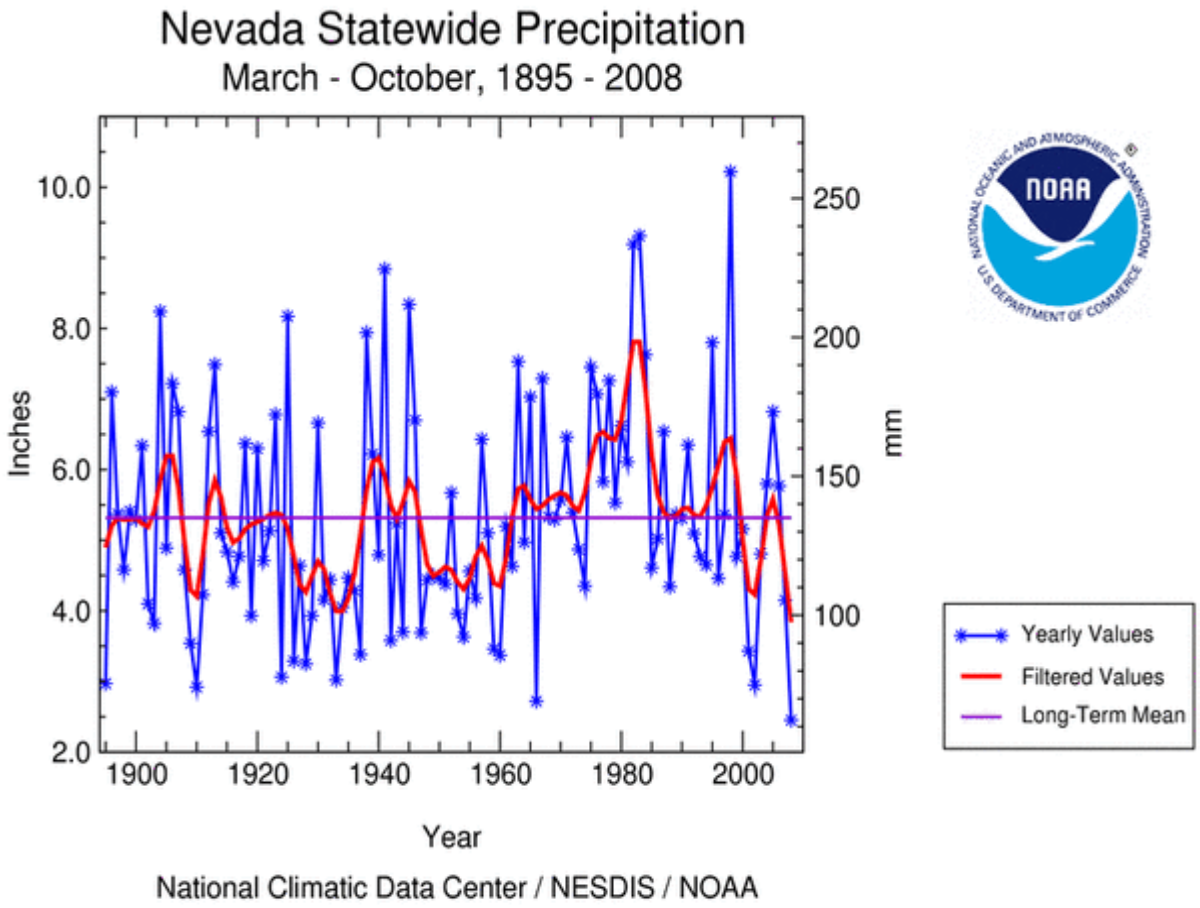

Figure 1. National Oceanic and Atmospheric Administration (NOAA) Statewide Precipitation for Nevada from 1895-2008.
(http://www.ncdc.noaa.gov/img/climate/research/2008/ann/Reg026Dv00Elem01_03102008_pg.gif)

Most of the mortality noted in 2008 is attributed to bark beetle activity and/or drought affects. Please note that most bark beetle-killed trees are not typically symptomatic (faded foliage) until the summer following the year of attack. Therefore, the numbers of acres affected or trees killed by bark beetles as recorded by the ADS flights are typically a reflection of the previous year's beetle populations and attacks. Defoliation levels, however, reflect current year's activity or activity since bud break. Aspen and curlleaf mountain mahogany declines/drought damage are attributed to current as well as past year's drought and or other factors.

Table 3. Mortality detected in 2008 of forest pest for Nevada counties[1]

	Mountain Pine Beetle White Pines[1]		Fir Engraver Beetle		Jeffrey Pine Beetle		Pinyon Engraver Beetle		Subalpine Fir Mortality Complex	
COUNTY	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Carson City	6	3	25	13	73	37	22	11	0	0
Clark	253	127	180	90	0	0	35	18	0	0
Douglas	24	182	25	13	136	68	1,340	2,573	0	0
Elko	16,085	19,039	7	5	0	0	7	4	1,785	7,942
Eureka	286	160	0	0	0	0	2	5	0	0
Humboldt	20	25	0	0	0	0	0	0	0	0
Lander	0	0	0	0	0	0	0	0	0	0
Lincoln	0	0	0	0	0	0	5	3	0	0
Lyon	35	276	0	0	0	0	33	17	0	0
Mineral	0	0	0	0	0	0	0	0	0	0
Nye	1,199	2,708	21	11	0	0	215	92	0	0
Pershing	0	0	0	0	0	0	0	0	0	0
Storey	0	0	0	0	0	0	221	111	0	0
Washoe	96	200	90	129	103	336	66	42	0	0
White Pine	4,163	2,708	1,543	1,019	0	0	305	146	0	0
Total	22,167	25,428	1,891	1,280	312	441	2,251	3,022	1,785	7,942

[1] Mountain pine beetle-caused mortality occurred in western white, whitebark, bristlecone and limber pines only and does not include lodgepole/ponderosa pine mortality. Mortality in lodgepole included 6 trees/3 acres, 232 trees/184 acres, and 551 trees/372 acres in Carson, Douglas, and Washoe counties, respectively. Mortality in ponderosa included 134 trees/67 acres, 5 trees/3 acres, and 47trees/20 acres in Clark, Nye and White Pine counties, respectively.

In 2008, most estimates of defoliation and decline caused by insect and disease activity in Nevada (acres affected) were more than 2007 levels including a more than 200% increase in white pine mortality attributed to mountain pine beetle, more than 250% increase in mountain mahogany decline, and a six fold increase of pinyon pine engraver-caused mortality. Acres with aspen decline were similar to 2007 however the number of acres with aspen defoliation by the forest tent caterpillar was higher than the 2007 acres with either defoliation or decline.and Douglas-fir tussock moth defoliation decreased back to zero (see Figure 2 and Table 4).

Table 4. Insect defoliation and decline by Nevada County in 2008.

	Aspen Decline	Forest Tent Caterpillar on Aspen	Douglas Fir Tussock Moth on Sub Alpine Fir	Curl leaf Mountain Mahogany Drought Damage
COUNTY	Acres	Acres	Acres	Acres
Carson City	0	0	0	0
Clark	0	0	0	0
Douglas	45	0	0	1475
Elko	5,925	729	0	800
Eureka	498	0	0	7606
Humboldt	1,315	102	0	0
Lander	0	0	0	1477
Lincoln	0	0	0	0
Lyon	0	0	0	1590
Mineral	0	0	0	0
Nye	3,386	0	0	14313
Pershing	0	0	0	0
Storey	0	0	0	27
Washoe	57	0	0	726
White Pine	227	0	0	6120
Total	11,453	831	0	34134

[2] Tables 3 & 4. Produced by G. Durham, Nevada Division of Forestry, using data provided by USDA FS Forest Health Protection.

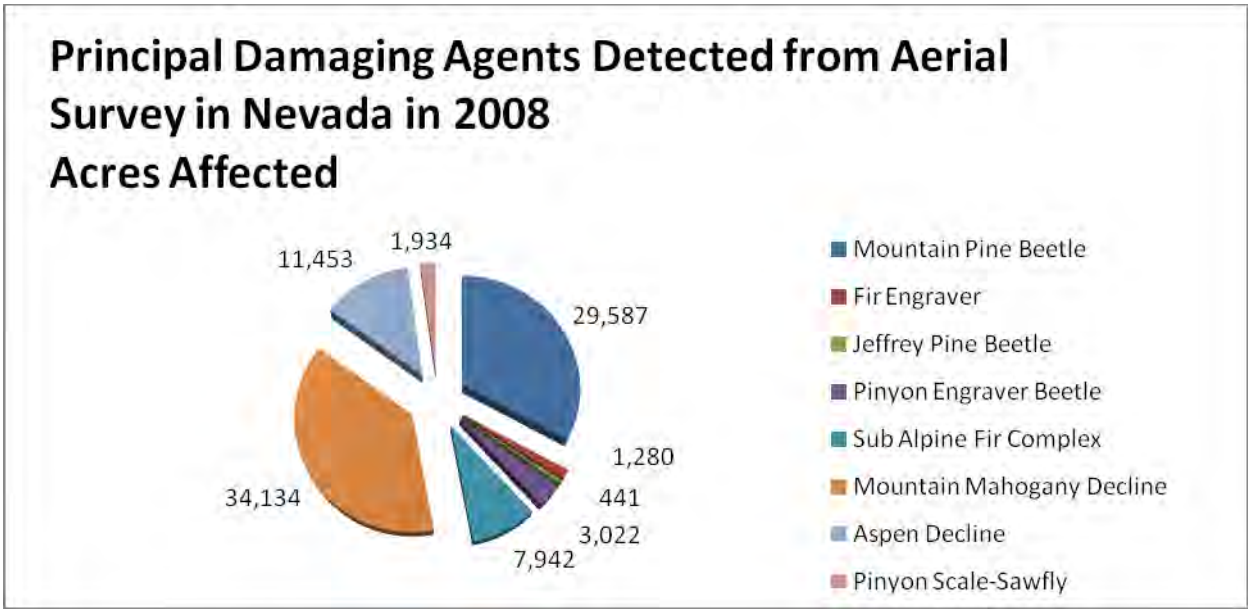

Figure 2- Acres of mortality detected in 2008 from various insects/diseases and drought affects.

Invasive weed species are widespread throughout the State. A few species are widespread such as salt cedar (tamarisk), perennial pepper weed, hoary cress, Russian knapweed and Scotch thistle (Table 5).

Table 5 - Noxious weeds by Nevada Counties in 2008

									Nevada	**County**							
State Declared Noxious Weeds	Carson City	Churchill	Clark	Douglas	Elko	Esmeralda	Eureka	Humboldt	Lander	Lincoln	Lyon	Mineral	Nye	Pershing	Storey	Washoe	White Pine
African Rue		X										X					
African Mustard			X							X			X				X
Black Henbane					X		X		X				X				X
Canada Thistle	X			X	X		X	X	X	X	X		X	X		X	X
Dalmatian Toadflax				X	X					X			X		X	X	X
Diffuse Knapweed				X	X		X		X	X			X			X	X
Dyer's Woad					X											X	
Fountain Grass			X														
Giant Reed																	
Goat's Rue			X														
Hoary Cress/Whitetop	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X
Houndstongue					X												
Leafy Spurge	X				X		X	X					X				X

State Declared Noxious Weeds	Carson City	Churchill	Clark	Douglas	Elko	Esmeralda	Eureka	Humboldt	Lander	Lincoln	Lyon	Mineral	Nye	Pershing	Storey	Washoe	White Pine
Malta Starthistle			x														
Medusa Head grass																x	
Mediterranean Sage					x											x	
Musk Thistle		x			x		x	x	x	x	x		x		x	x	x
Perennial Pepperweed	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x
Poison Hemlock				x	x		x						x		x	x	x
Puncturevine			x		x											x	
Purple Loosetrife											x					x	
Rush Skeletonweed	x																
Purple Starthistle				x	x		x		x								
Russian Knapweed	x	x	x	x	x	x	x	x	x	x	x		x	x		x	x
Salt Ceder (Tamarisk)		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Scotch Thistle	x	x	x	x	x		x	x	x	x	x	x	x	x		x	x
Sowthistle													x				
Spotted Knapweed			x	x	x		x			x			x		x	x	x

State Declared Noxious Weeds	Carson City	Churchill	Clark	Douglas	Elko	Esmeralda	Eureka	Humboldt	Lander	Lincoln	Lyon	Mineral	Nye	Pershing	Storey	Washoe	White Pine
Squarrose Knapweed					x				x	x			x				x
Sulfur Cinquefoil					x												
Water Hemlock					x		x		x								
Yellow Toadflax					x												
Yellow Starthistle	x	x	x	x	x	x		x			x			x		x	

X indicates the weed is located in the respective county according to the Nevada Noxious Weed GIS database, Natural Resources Conservation Service, 5/24/02, NDOA Weed Coordinator, the various weed control districts representatives and BLM personnel as of 2007. Current weed database housed at Nevada Dept. of Conservation and Natural Resources Natural Heritage Program contact kimwilliams@heritage.nv.gov

Nevada Department of Agriculture (NDOA) began receiving USDA State and Private Forestry grants in 2002. Working cooperatively with Coordinated Weed Management Areas (CWMA), they have been able to treat over 50,000 acres of noxious weeds statewide since 2002. Currently there are 31 CWMA's in the state, most created in the past six years. Each county in Nevada has at least one CWMA. In 2007, NDOA released bio-control agents for the following weeds and counties: spotted knapweed in Ely in White Pine County, Canada thistle in Gardnerville in Douglas County, and dalmatian toadflax in Pioche in Lincoln County. Dalmatian toadflax and tamarisk beetle collections and releases are being coordinated by Jeff Knight, State Entomologist.

STATUS OF INSECTS

Insects: Native

DEFOLIATORS

Douglas-fir Tussock Moth
Orgyia pseudotsugata

Hosts: All true firs and spruce

The Douglas-fir tussock moth (DFTM) is an important native insect capable of causing significant defoliation. Heavy defoliation causes reduced growth, stress, and tree mortality. Heavy defoliation can cause top kill and mortality of advanced regeneration during a single season. Outbreaks are cyclic, usually appearing quickly followed by an abrupt decline within a one to four year period.

Figure 3. Douglas-fir tussock moth larvae.

DFTM defoliation was not detected during aerial surveys in 2008 but some light damage was seen on the ground in Elko County in Nevada. Traps set in the Spooner Lake State Park area of Lake Tahoe, NV captured no DFTMs.

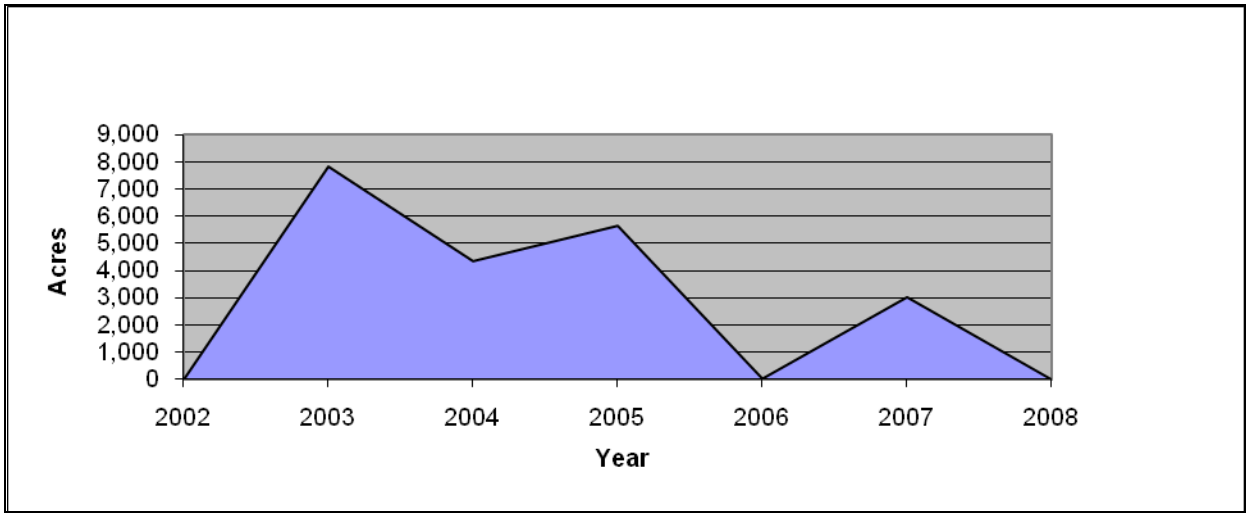

Figure 4. Acres with Douglas-fir tussock moth defoliation in Nevada during six years (2002-2008).

Pinyon Sawfly
Neodiprion edulicolus

Host: pinyon pine

The pinyon sawfly is an important native insect capable of causing significant defoliation, but usually goes undetected because it occurs in small numbers, and causes little damage. Heavy defoliation causes reduced growth, stress, and tree mortality. Past outbreaks have caused widespread defoliation and mortality of smaller trees. Between 2006 and 2008, a large area of defoliation was reported on the east side of Whistler Mountain just northwest of Eureka, NV (Figure 5) This outbreak has been observed for over four years and has severely defoliated the pinyon in all size classes with mortality occurring in many of the trees in 2007 and 2008. The defoliation extends across the mountain range along a mid-slope band over hundreds of acres. In 2007, the pinyon sawfly defoliation spread to the west side of Whistler Mountain, affecting hundreds of acres on this west-facing slope. In 2008, a total of 1,158 acres was affected in Eureka County on both sides of Whistler Mountain and in a small spot just north of Cine Mountain in the Hot Creek Range.

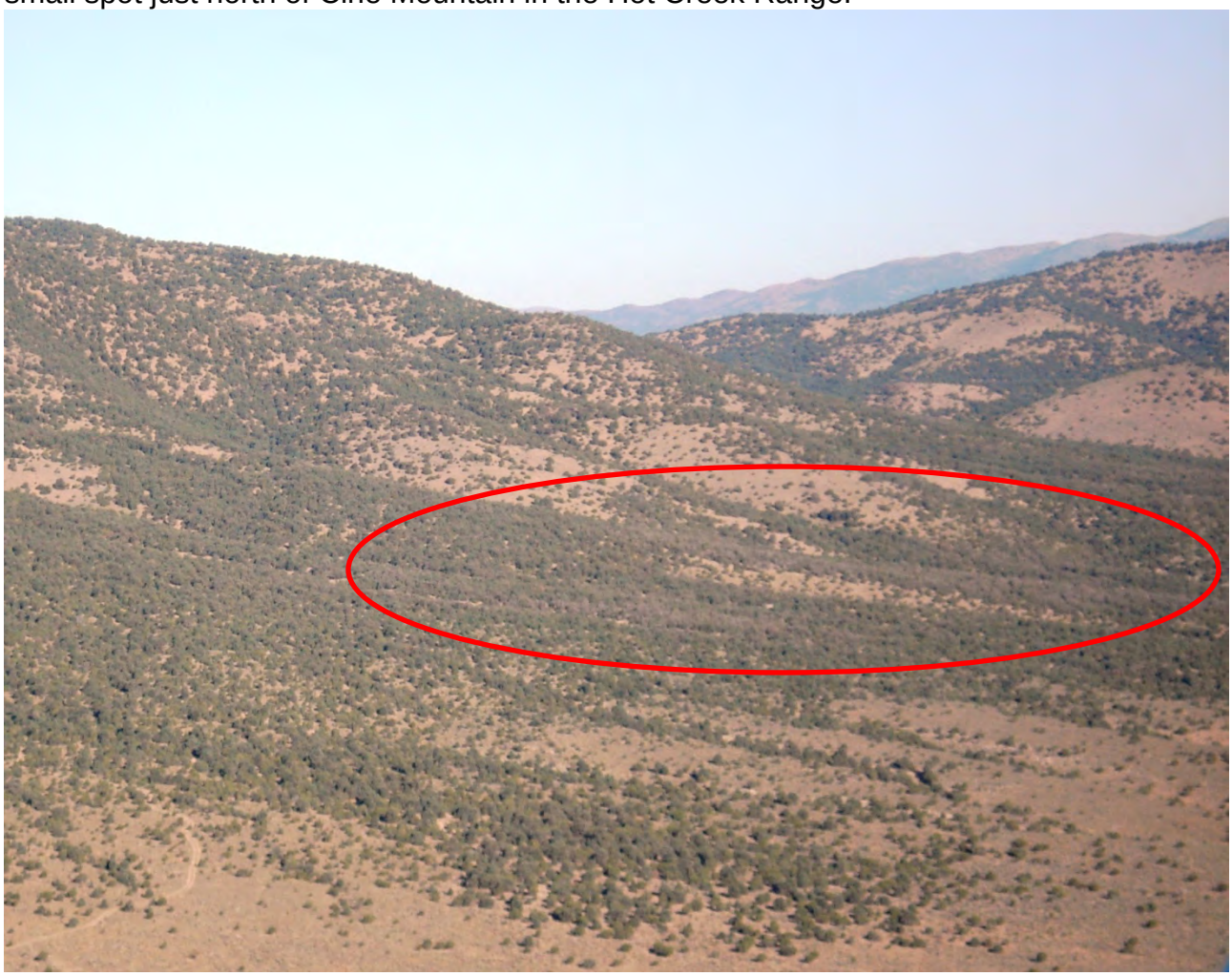

Figure 5. Note the gray see-through appearance of the pinyon sawfly defoliated areas on the east side of Whistle Mountain in summer of 2008

Pinyon Needle Scale
Matsucoccus acalyptus

Host: pinyon pine

The pinyon needle scale is a sap-sucking insect that feeds on previous year's needles. Foliage of infested trees turns yellow then brown. Heavy defoliation causes reduced growth, stress, and tree mortality. Past outbreaks in Nevada have been recorded since 1959 throughout Nevada causing localized defoliation and mortality of some trees. In 2007 a localized outbreak was found on Currant Summit on the border of Nye and White Pine Counties. In 2008, an area of 776 acres was found on the east side of the Schell Creek Mountains, in the low foothills north and south of Cleve Creek and north of Taft Creek in White Pine County. In 2009, more evidence of this infestation is being seen further south on the east side of Connors Pass on the Schell Creek Mountains.

Figure 6. Pinyon pine scale on singleleaf pinyon needles mid-summer on the east side of Schell Creek mountains in summer of 2008

Giant Conifer Aphid
Cinara spp.

Host: singleleaf pinyon, Jeffrey pine

Small populations of giant conifer aphid (Figure 7) were found on pinyon pine on private land in the Virginia Highlands of Storey County and in spots on BLM land north of Eureka Nevada on the east side of the Mountain Boy Range east of Whistler Mountain in 2006. No giant conifer aphid has been reported since 2006.

Figure 7. Giant conifer aphid (*Cinara spp*) on pinyon pine in the Virginia Highlands in 2006.

Spruce Spider Mite
Oligonychus spp.

Host: Engelmann Spruce

The spruce spider mite causes a yellowing of the older spruce foliage by piercing the needles and feeding on fluids. A 7 acre spot was mapped in the Snake Creek Range in White Pine County in 2008. This represents only 1% of the acreage mapped in 2007.

Figure 8. Spruce spider mite damage on Engelmann spruce in the Schell Creek Mountains in July 2007. (Photo by April Johnson, United States Forest Service, Ely Ranger District).

Forest Tent Caterpillar
Malacosoma disstria

Hosts: aspen, birch, oak, some maples, and other deciduous species

The forest tent caterpillar is a native defoliator of aspen. Overwintering takes place as a fully developed embryo inside the egg shell. When they hatch in the spring, the larvae tend to migrate high in the tree where they feed in groups on expanding flower and leaf buds. After bud break, larvae feed on the foliage, being most gregarious in their early life stages. The adult is a tan moth about 4 cm long with two dark brown, oblique stripes on each forewing. The caterpillar (the most often seen life stage) is mostly dark blue with wavy reddish brown lines and distinct white, keyhole shaped markings down the back. Flight and mating activities begin late afternoon through most of the night. There is one generation each year. Parasites tend to keep the outbreaks of this insect cyclic and in check over time.

831 acres of defoliation by this insect were seen in Nevada in 2008., including small scattered patches in aspen in the Santa Rosa Mountains of Humboldt County totaling 102 acres, and 729 acres in the Bull Run, Independence, and Mahogany Mountains, around Tennessee Mountain and one spot on the northwest edge of the Jarbidge Mountains.

BARK BEETLES

Fir Engraver Beetle
Scolytus ventralis

Hosts: true firs

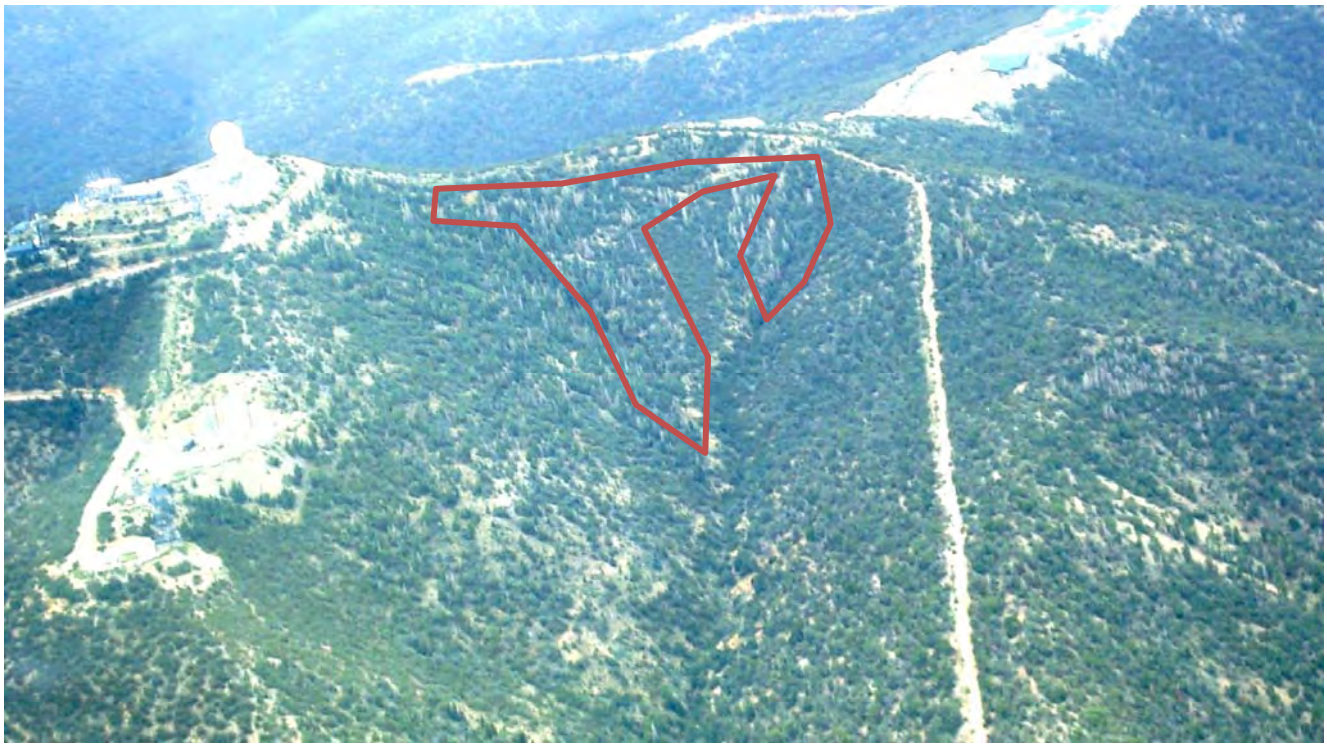

Figure 9. Older (with little new) white fir mortality from fir engraver beetle on the north slope of Angel Peak in the Spring Mountains, Clark County, NV, July, 2008.

Mortality due to Fir-Engraver Beetle (FEB) decreased to less than half of the number of trees killed in 2007, with 1,891 trees killed in 2008 (Figure 10). In 2008, the 1,280 acres affected was less than half of 2007 acres.

For the sixth consecutive year, White Pine County had the highest amount of tree mortality with approximately 1,543 dead trees on about 1,019 acres in 2008, but this represents a decrease to half of the 2007 levels. Fir mortality in Clark, Lincoln, Nye and White Pine counties decreased significantly from 2007 figures but increased in Carson City, Douglas and Washoe counties.

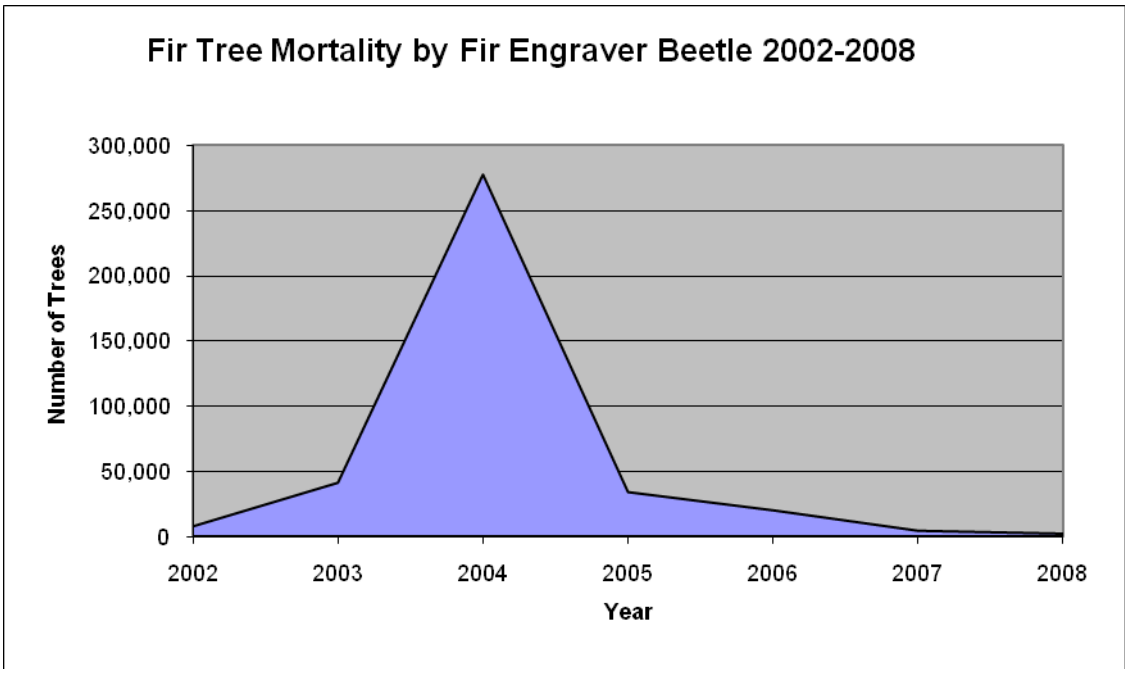

Figure 10. Number of trees with mortality caused by the fir engraver beetle in Nevada and Alpine and Mono counties in CA during six years (2002-2008).

Carson City – Although there was only 25 trees on 13 acres mapped in 2008, this is more than 2007's zero mortality. There were two pockets, one located west of Spooner Lake and Highway 28 and another at the headwaters of Clear Creek.

Clark County- Mortality decreased to about 20% of last year's levels. Only 180 trees on 90 acres were mapped as mortality in 2008. Scattered pockets were mapped throughout the upper elevations of the Spring Mountains with small areas of mortality in Kyle Canyon on the north facing slope above the subdivisions and canyon mouth. Other small pockets were mapped at the top of Lee Canyon, near Edna Gray Spring, east side of Wallace Canyon, on the north face above Willow Peak, and just northwest of Bonanza Peak.

Douglas County – Mortality increased slightly from the 15 trees killed on 7 acres in 2007 to 25 trees on 13 acres in 2008. These were scattered spots near the top of the Carson Range on the east-facing slope between Water Canyon and James Canyon and in clear creek just below State Highway 50.

Elko County – Although there was only 7 trees on 5 acres mapped in 2008, this is just one patch found in the Cherry Creek Range right on the Elko/White Pine county lines.
Lincoln County –Because there was no survey of true fir done in this county in 2008, there was a decrease since 2007 when it was surveyed.
Nye County – Approximately 21 trees on 11 acres were mapped, approximately 10% of 2007 levels. Most of this mortality was found in small spots on south east portion of the Grant Range and the southernmost area of the White Pine Range.
Washoe County – Approximately 90 trees on 129 acres were mapped in 2008, this represents greater than 900% increase in trees compared to 2007. This mortality was found in the Carson Range in small spots north or Incline Village, NV and a larger patch due west of Incline Village.
White Pine County – This county accounted for most of the mortality in Nevada – 1,543 trees on 1,019 acres. However, these acres were only half of the number reported in 2007. The majority of the 2008 FEB activity was found in small spots or large tracts of fir on the north end of Snake Range, north of Table Mountain and Mount Moriah, and in a few patches scattered east and south of Mt Moriah. Spots were found scattered around the north, east and southern edges of Great Basin National Park. A few spots were also found north of Success Summit on the Schell Creek Range and in the northern end of the Egan Range, throughout the Cherry Creek Range, in the headwaters of White River Pass Canyon on the south end of the White Pine Range, on Ward Mountain, and in the headwaters of Eph and Water Canyons in the southern area of Ward Mountain Range.

Jeffrey Pine Beetle
Dendroctonus jeffreyi

Host: Jeffrey pine

The Jeffrey pine beetle is the most destructive bark beetle of Jeffrey pine. Endemic populations usually attack scattered, slower growing, mature and over-mature trees and trees struck by lightning. In Nevada, Jeffrey pine is only found along the Sierra Nevada Mountains. Field examinations of some of the mortality mapped in Alpine County, California revealed that some of the Jeffrey pine is also being killed by *Ips pini* in combination with roundhead and flathead borers. Flathead borers are also the main mortality agent on Jeffrey pine along the eastern front of the Carson Range in western Nevada.

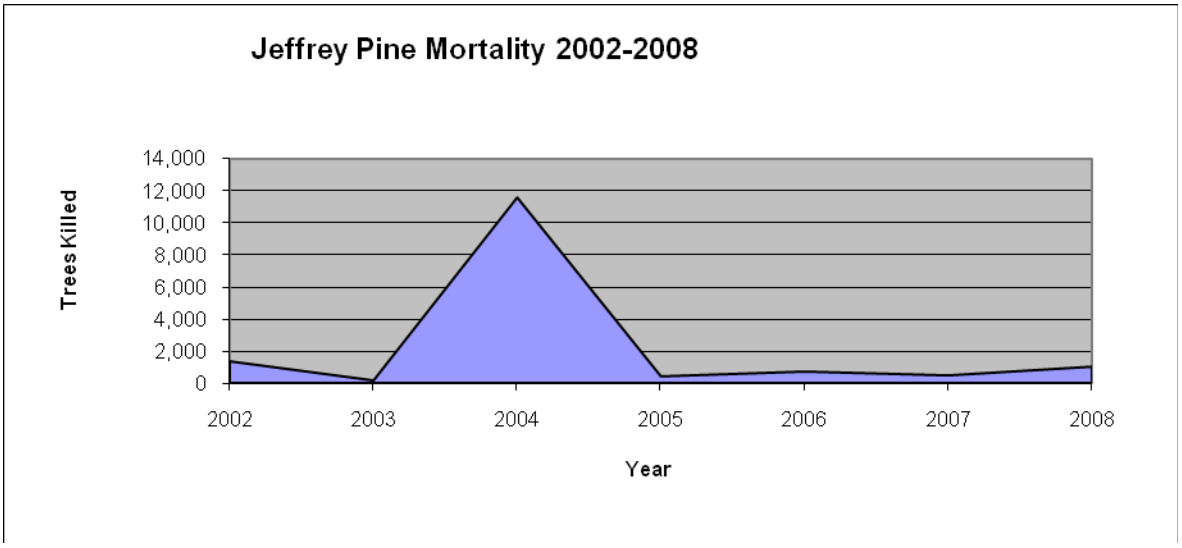

Figure 11. Jeffrey pine mortality in Nevada and in two California counties (Alpine and Mono) during seven years (2002-2008)

Figure 12. Jeffrey pine mortality in Alpine county in California along Highway 88. (Photo by Sheri Smith, Forest Health Protection, Susanville, CA)

In 2008, Jeffery pine beetle-caused tree mortality increased over 200% from 2007, affecting 312 trees on 441 acres in Nevada (Figure 11). The mortality was divided nearly equally among Washoe, Douglas and Carson City counties.

Carson City County – 73 trees killed on 37 acres in spots scattered throughout the Carson Range including south of Ash Canyon on the north facing slope and north of Spooner Summit and west to Secret and Skunk Harbors
Douglas County – 136 trees killed over 68 acres scattered throughout the Carson Range with spots found mostly in the mid-slope elevations and higher. Pockets of mortality were observed along Edgewood and Burke Creeks and near the headwaters of the South Fork of Daggett, Coarser, Mott and Monument Creeks.
Washoe County – 103 trees killed on 336 acres were scattered in small spots along the west side of Deep Canyon, the north end of Mt. Rose Wilderness, just south of Browns Creek and east of Joy lake, near the headwaters of Winters Creek, west and south east of Marlette Lake, and on the south facing slopes north of Incline Village.

Mountain Pine Beetle
Dendroctonus ponderosae

Hosts: whitebark, bristlecone, limber, lodgepole, sugar, and ponderosa pine

Mountain pine beetle (MPB) can kill thousands of trees per year during outbreak conditions and millions of trees during extended epidemics in western forests. At endemic levels, MPB favors weakened, less vigorous trees with adequate phloem thickness to complete its life cycle. During epidemics, beetles may attack smaller diameter trees down to 4 inches diameter at breast height. Extensive mortality may alter large forest landscapes by converting pine forest ecosystems to grass and shrub landscapes for a period of 10-20 years. This conversion affects wildlife species, water yields and fuel loading.

In 2008, MPB-caused mortality in lodgepole pine increased five-fold from the amount reported in 2007, and limber, western white, whitebark and bristlecone pine mortality increased over 220% of the number of trees reported in 2007. This increase in upper elevation white pine mortality mostly occurred in Clark, Douglas, Elko, Eureka, Lyon, Nye, Washoe and White Pine counties. The increased whitebark and bristlecone pine mortality occurred mostly in Elko and White Pine counties due to increased outbreaks in the Jarbidge and Snake Ranges (Figure 13 & 14).

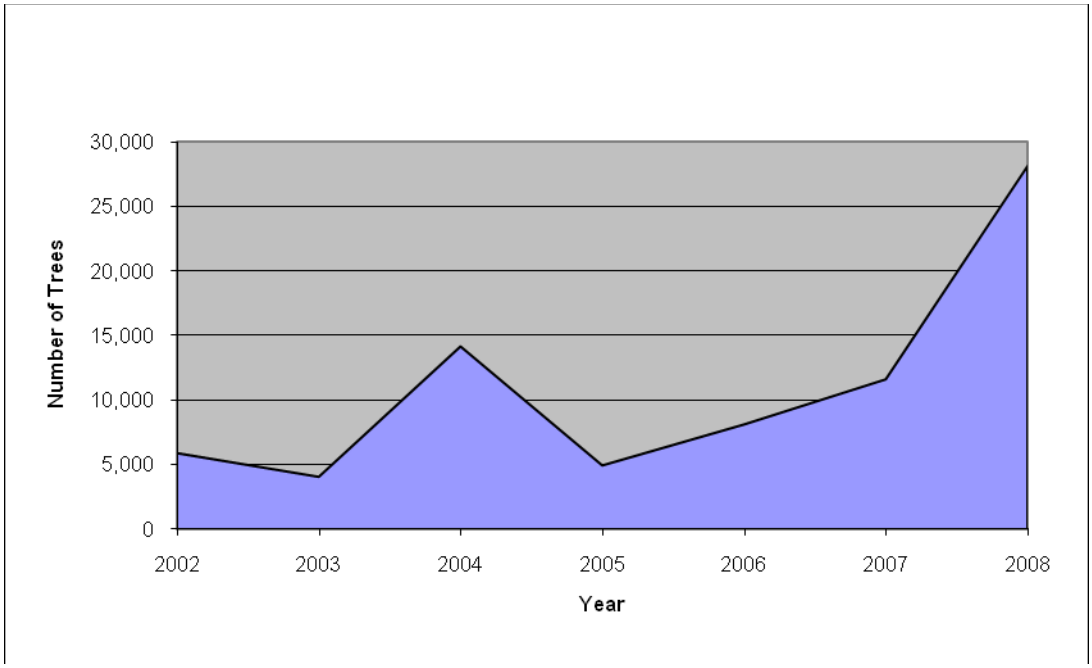

Figure 13. Number of whitebark, limber, and bristlecone pine trees killed by mountain pine beetle in Nevada and eastern California in the last seven years (2002-2008).

Mountain Pine Beetle – Limber/Whitebark/Bristlecone/Western White Pine

In 2008, mortality of limber pine caused by MPB increased to 5,887 acres and 6,481 trees, which is 387% of the 2007 acreage and 227% of the 2007 tree mortality. Most of the mortality occurred as small spots of up to five trees on tops of the mountain Ranges surveyed. Whitebark, bristlecone and western white pine tree mortality in 2008 increased over 220% in the entire state, mostly from continued increases in Elko County in the Jarbidge area.

Carson City County – Mortality in western white pine in 2008 was found at the headwaters of North Canyon and Clear Creek.

Clark County – Small increases from 2007 were due to a slight increase in the amount of limber pine affected as well new bristlecone mortality in the upper elevations of the Spring Mountains. Most of the mortality for both species was in scattered spots of five trees, each mostly at the headwaters of Lee and Kyle Canyons at the highest elevations of the Spring Mountains.

Douglas County – 182 acres with 24 scattered western white pine trees were observed in 3 spots near the California border and East Peak Lake in the Heavenly Ski area.

Elko County – 683 limber pine trees on 366 acres, and 15,402 whitebark pine trees on 18,673 acres were mapped in 2008. Although the amount of limber pine mortality is about 80% of what was mapped in 2007, there is 240% more whitebark pine mortality than was mapped in 2007. Most of the limber pine mortality was scattered in small pockets at moderate elevations throughout t the Ruby Mountains, on the

northern end and eastern side of the East Humboldt Mountains with one spot on southern half of the Bull Run Mountains. There were large areas of whitebark pine mortality throughout the higher elevations of the Jarbidge Mountains (see Figure 14) with smaller areas in the Ruby and East Humboldt Mountains, and along the ridge tops of the north half of the Independence Mountains and southern half of the Bull Run Mountains. In addition, there were numerous patches of limber pine mortality in the north end of the Cherry Creek Mountains and at the higher elevations of Spruce Mountain. Many of these areas also had mortality reported in 2006 and 2007.

Eureka County – 160 acres, 286 limber pine trees were mapped in ten spots at the north end of the Monitor Range around Summit Mountain and Antelope Peak representing a nearly 250% increase in tree mortality from 2007.

Humboldt County - Twenty limber pine trees were killed at the headwaters of Buffalo Canyon in the south western Santa Rosa Range on 25 acres for the second year in a row.

Nye County – In 2008, 1,199 dead limber pine trees were observed on 2,708 acres. This is nearly 350% more mortality than 2007 mostly found in numerous small to medium sized spots of limber pine mortality mapped throughout the highest elevations of the Toiyabe, Toquima and Monitor Ranges with the vast majority of the spots in the Arc Dome, Alta Toquima, Table Mountain Wilderness Areas, Stoneberger Basin in the northern Toquimas. In addition, limber pine mortality on three spots on the north end and one spot on the southeast end of the Hot Creek Range, two small spots on the south end of the White Pine Range along with four spots on the south end of the Grant Mountains were also mapped.

Washoe County – 200 acres, 96 western white pine and whitebark pine trees were scattered throughout the higher elevations of the Carson Range with one large area with 40 dead western white pines at the headwaters of Bronco Creek and 20 western white pines tree spots at the top of Thomas and Whites Creeks.

White Pine County – 2,516 acres with 4,070 dead limber pine trees were observed in small to medium sized spots of scattered mortality along the tops of Ward Mountain in the Egan Range, throughout the Snake Range (including Great Basin National Park), throughout the Schell Creek Range, and in one spot on Pequop Ridge and a few spots near the tops of the White Pine Range. Numerous spots and small patches were also seen on the north end of the Egan Range and throughout the upper elevations of the Cherry Creek Range This represents a nearly 300% increase in limber pine mortality in White Pine County from 2007. Bristlecone mortality decreased to a third of the 2007 numbers down to 93 trees on 192 acres in 2008 and was mostly seen along the ridgelines in Great Basin National Park and one spot in the north end of the Schell Creek Mountains.

Figure 14. Mountain pine beetle caused mortality in Jarbidge Mountains.
Photo by Rob Cruz

Mountain Pine Beetle in Lodgepole Pine
In 2008, MPB activity in lodgepole pine in Nevada increased five-fold over 2007 numbers with 793 dead trees on 559 acres.

Carson City County – Mortality increased to 10 trees in one small spot (three acres total) just south of Snow Valley Peak.
Douglas County –Mortality recorded in 2008 increased to 232 trees over 184 acres made up of a large pocket at Heavenly Valley above the Gondola Fire, and small spots around East Peak Lake, and at the headwaters of James Canyon.
Washoe County – 372 acres, 551 trees were observed in small spots scattered throughout the Carson Range and on the west side of Little Valley with larger mortality pockets near Mt. Rose and the Mt. Rose Wilderness Area.

Mountain Pine Beetle/Western Pine Beetle in Ponderosa Pine
In 2008, bark beetle activity increased threefold from 2007 and was found in three counties killing 186 trees over 90 acres.

Clark County – Mortality increased to 67acres and 134 trees scattered in small spots in the canyon bottoms throughout the Spring Mountains.
Nye County - Three acres with five trees were mapped in a spot on the White pine Range due east of White Pine Peak.
White Pine County Mortality increased ten-fold over 2007 to 20 acres, 47 trees in a number of spots at the top of Murphy Wash in the southern Snake Range.

Pinyon Engraver Beetle
Ips confusus

Host: single leaf pinyon

The pinyon engraver is a pest in pinyon-juniper ecosystems often affecting valuable home landscape trees. The insect produces multiple generations each year and consequently populations can build and spread rapidly.

Figure 15. Mortality caused by pinyon Ips in the Pinenut Mountains during peak outbreak in 2004.

Prior to 2003, pinyon pine was not frequently surveyed. In response to increasing concern of pinyon pine mortality in 2003, a multi-state effort was made to survey the extent of pinyon Ips-caused pinyon mortality. Approximately 3 million of the estimated 11.9 million acres of single-leaf pinyon that occur in Nevada were surveyed in 2003. In 2004, approximately 3.5 million acres of pinyon-juniper woodlands were flown and pinyon Ips-caused mortality of single leaf pinyon increased again. Again in 2005, 2006 and 2007, a dramatic decrease in pinyon mortality was seen within the surveyed area, in twelve counties. In 2008, this mortality increased back up to 2006 levels, but did not represent a significant increase compared to the 2003 to 2005 mortality (Figure 16 below).

In 2008, 3,022 acres were infested by pinyon Ips, affecting over 2,251 trees. This was nearly a 300% increase of 2007's tree mortality (see Figure 16). For a third year, Douglas County had the greatest number of trees killed (1,340 trees, 59 %of the state total).

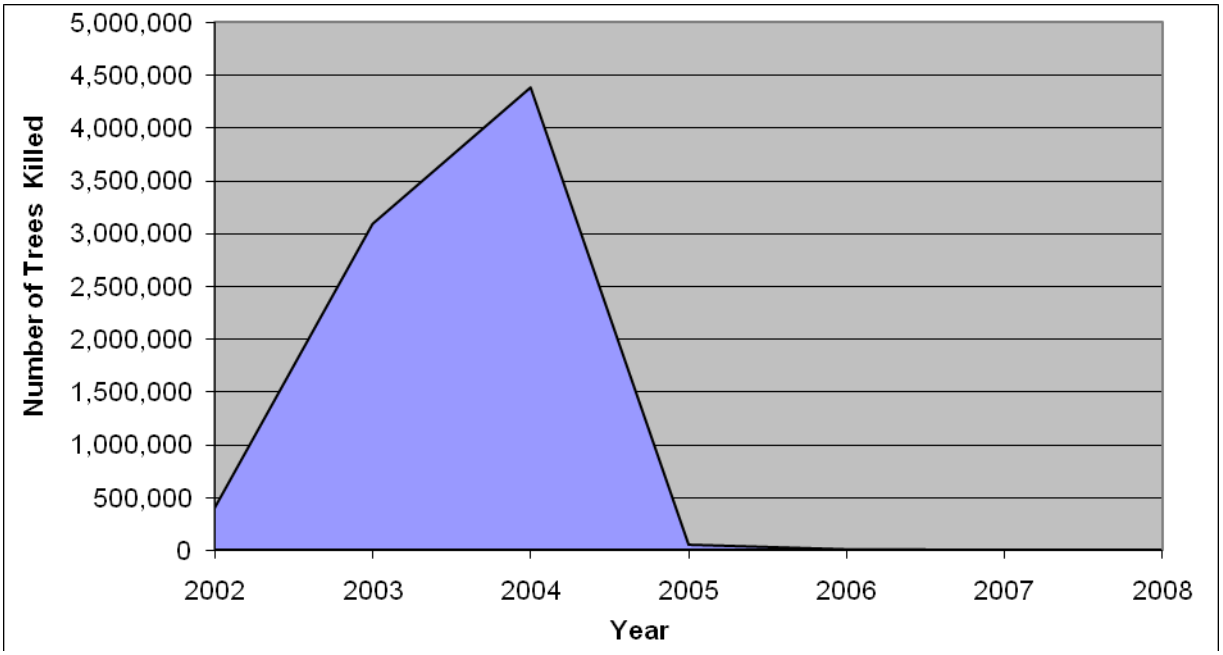

Figure 16. Number of pinyon pine killed by pinyon Ips in Nevada and two adjacent California counties (Alpine and Mono) during seven years (2002-2008).

Carson City County - 11 acres with 22 trees in small spots were recorded throughout Brunswick Canyon in the Pine Nut Range.
Clark County –18 acres with 35 trees in three spots east of Trout Canyon in the south end of the Spring Mountains were observed in 2008.
Douglas County – A fivefold increase from 2007 to 2,573 acres and 1340 trees killed was recorded in this county, including in the Pine Nut Mountain Range from the Highway 395 at Holbrook Junction north into Lyon/Carson City Counties. Small areas (20 to 25 tree polygons) of mortality still exist in Pinenut Valley, but a significant increase in larger polygons of mortality occurring in the Double Springs, Holbrook Junction and Blossom Canyon areas.
Elko County – Three spots (seven acres total) with four trees were mapped in the Spruce Mountains.
Eureka County –Two trees and five acres were recorded in one spot in South Fork Pass in the northern Monitor Range.
Lincoln County - There were 5 trees on 3 acres scattered in a small spot in the area around Beaver Dam State Park. The Wilson Creek and White Rock Ranges were not surveyed in 2008, so some significant pinyon mortality may have been missed.
Lyon County - 17 acres with 33 trees were mostly a continuation of the mortality in the northeast Pine Nut Range east of El Dorado Canyon.
Nye County – 92 acres with 215 trees in scattered spots of mortality occurred throughout the northern Grant Range, mostly at the headwaters of cold Springs

Canyon and north to Morgan Springs. In addition, numerous spots throughout the southern Shoshone Mountains and a single spot located east of East Manhattan and another spot located southwest of clipper Gap in the Toquima Range were observed.
Storey County – 111 acres with 221 trees were mapped in the Virginia Range in spots east of Gold Hill and Virginia City north to Chalk Hill and the Flowery Range and west with spots throughout the Virginia Highlands.
Washoe County – 42 acres with 66 trees was mapped in the northwestern portion of the Virginia Range, south and north of Geiger Grade
White Pine County – Mortality was mapped on 146 acres with 305 trees. In western White Pine County, small pockets of scattered mortality occurred in the eastern White Pine Range up in the headwaters of Ellison and Cottonwood Creeks and White River; as well as around Mormon Ridge. A few spots occurred on the north end of the Schell Creek Mountains, due east of Forty Mile Knoll and in the south Schell Creek around North Taylor Springs and Taylor Peak. Two spots were also found north of Mt. Moriah and The Table on Smith and Timber Creeks in the Northern Snake Range. In addition, there are a few spots in the Cocomongo Mountains, southern Cherry Creeks and one spot in the north end of the Egan Range.

Pitch Mass Borer
Dioryctria spp.

Hosts: Singleleaf pinyon, ponderosa pine, Jeffrey pine

In the larval stage, *Dioryctria spp.* bore into the cambium of the trunk, branches, and shoots, killing lateral branches and treetops of singleleaf pinyon and Jeffrey pine. With prolonged drought, this injury has weakened pinyon trees sufficiently to allow pinyon engraver beetle to successfully attack and kill pinyon pine trees. Pitch mass borer is found throughout the state of Nevada in most counties with singleleaf pinyon. The heaviest concentrations seem to occur in western Nevada where it also affects Jeffrey and ponderosa pine. Many young Jeffrey pines on the east slope of the Carson Range have been affected by this insect. In 2006 several entomologists, pathologists and foresters conducted a pinyon blister rust (*Cronartium occidentale)* search through the central portion of Nevada. They noted that pitch mass borer frequently uses rust cankers as an entry point (Figure 17). The rust and borer damage are found extensively across the state but are not mapped by ADS.

Figure 17. Pitch mass borer on pinyon pine infected with pinyon blister rust.

TWIG INSECTS

Pinyon Tip Moth
Dioryctria albovitella

Host: Singleleaf pinyon

The pinyon tip moth causes tip killing, branch flagging, and stunted growth. Larvae of this small gray moth feed in the tips of branches, killing new shoots and giving the tree a conspicuous scorched appearance. Pinyon tip moth is found throughout Nevada wherever singleleaf pinyon occurs. In 2007, a large outbreak over hundreds of acres was noted throughout the lower elevations of the east side of the Wilson Creek Mountains west of Camp Valley Creek, and south of Pine Creek (Figure 18). There is still moth activity in this eastern Nevada area in 2008 and early 2009.

Figure 18. Pinyon tip moth damage having a gray hazy appearance from the air and on the ground on the west side of Camp Valley Creek south of Pine Creek in 2007.

INSECTS: NON-NATIVE

European Gypsy Moth
Lymantria dispar

Hosts: various deciduous species

In 2008, a survey of gypsy moth (*Lymantria disar*) was conducted in all 17 Nevada counties by Nevada Department of Agriculture (NDOA). Traps were placed and then recovered at the end of the season. A total of 977 traps, almost double last year, were set but no gypsy moths

were captured. The last identified adult male was discovered in an RV park in Winnemucca in 1999.

Figure 19. Adult gypsy moths, female above, male below.

Banded Elm Bark Beetle
Scolytus schevyrewi

Hosts: various deciduous species, primarily elm

Statewide detection surveys from 2003 to 2005 conducted by the Nevada State Department of Agriculture's entomologist using pheromone attractants showed banded elm bark beetle (BEBB) from Washoe (2003), Pershing, White Pine, Douglas, Lyon, Churchill, Elko, and Storey counties. In 2006 and 2007, studies by UC Davis and USDA, Forest Service Pacific Southwest Research Station showed that BEBB occurs in western Nevada in Douglas, Washoe and Carson City counties.

Figure 20. Banded elm bark beetle (*Scolytus schevyrewi* Semenov) from Forestry Images (http://www.forestryimages.org).

Mediterranean Pine Engraver Beetle (MPE) and Red-haired Bark Beetle (RHBB)
Orthotomicus erosus, and *Hylurgus ligniperda*

In 2007, Nevada Department of Agriculture (NDOA) placed 58 Lindgren traps in 10 Nevada counties along with five Colossus traps placed in Washoe and Lincoln counties for various woodborers, MPE, and RHBB and did not capture any. None RHBB or MPE have been found in Nevada to date. Steve Seybold and Jana Lee of the FS Pacific Southwest Research Station and the University of California Davis checked for these beetles in Las Vegas in March 2007 and found neither beetle in their prime habitats.

Sirex Wood Wasp *(Sirex noctillo)/* **Emerald Ash Borer Beetle** *(Agrilus planipennis)* **Asian Long-horned Beetle (***Anoplophora glabripennis)*

In 2007, Nevada Dept of Agriculture placed 58 Lindgren funnel traps and 50 Sirex traps in 10 Nevada counties along with 5 Colossus traps placed in Washoe and Lincoln counties for various woodborers. No sirex wood wasp, emerald ash borers (EAB) or Asian long-horned beetles were found in these traps.

In 2008, surveys for the EAB were conducted in 12 counties with 137 traps but no EAB were captured. In 2008, forty-two sirex wood wasp flat panel traps were placed in eight counties and 67 Lindgren funnel traps were placed in fourteen counties. No sirex wood wasps were captured.

European Pine Shoot Moth (EPSM) (*Rhyaclonia buoliana)*

In 2007, NDOA trapped for EPSM with 141 traps in 9 counties in 2007. Four traps caught EPSM in Douglas County in 2006 and one trap caught EPSM in Washoe County in 2007.

Light Brown Apple Moth (*Epiphyas postvittana*)

In 2008, fourteen counties were surveyed with 477 traps. Most of the traps were placed in the Reno and Las Vegas areas. No LBAM were captured.

Japanese Beetle (*Popillia japonica* Newman)

In 2008, 545 traps were placed in 16 counties with the majority concentrated in the greater Reno and Las Vegas metropolitan areas**.** This was an increase of about 150 traps from last year. No Japanese Beetle were found in 2007 or 2008.

Toadflax Bio-control

On June 10th an inspection of the four Dalmatian toadflax (*Linaria dalmatica*) stem boring weevils (*Mecinus janthinus*) release sites in Pioche Nevada was performed. One of the four sites had been mowed in the spring. At two of the sites only one adult weevil was found at each. The forth site showed promise with the majority of plants within a half acre area of the initial release containing adult weevils. Additional inspections of the Pioche release sites were conducted on July 30th and August 13th with similar results. Inspections of the Virginia City and Gardnerville release sites were conducted on June 26th, August 13th, and December 11th. No adult weevils, signs of oviposition, or larva were observed.

STATUS OF DISEASES

STEM AND BRANCH DISEASES

Dwarf Mistletoes
Arceuthobium spp.

Hosts: Douglas-fir, pines, true firs, and single-leaf pinyon

Dwarf mistletoes (DMT) are the single-most damaging agent of coniferous trees. These parasitic plants remain the most widespread and frequently observed disease within the state. Profusely branched, dense masses of host branches called “witches brooms” are often observed. Heavy dwarf mistletoe infestation can predispose trees to insects and other diseases, reduce incremental growth, affect the forest canopy structure, lower resistance to drought, affect production of seed, and affect recreation and aesthetics. Since dwarf mistletoe infests trees of all ages, infections may exist in secondary growth and regeneration, as well as large trees.

Dwarf mistletoe on pinyon pine can be found throughout the state, but it has never been comprehensively surveyed. The State Forest Health Specialist has found DMT from the Spring Mountains in the south to the Toiyabes in the north and east and west to both borders of the state. Pinyon engraver beetle-caused mortality was observed in some of the heavy dwarf mistletoe infected pinyon pine stands around the state of Nevada. Some of the dwarf mistletoe-weakened trees succumbed to pinyon engraver beetle attacks. Heavily infected Ponderosa and Jeffrey pines are often attacked by Ips, flathead borers, Jeffrey pine beetle, and western pine beetle as well as other agents, especially during prolonged drought periods.

Pinyon Blister Rust
Cronartium occidentale

Host: singleleaf pinyon pine

An informal survey of central Nevada by various FS pathologists and entomologists as well as BLM and Nevada State Foresters revealed that the disease is prevalent throughout the state. It attacks and kills small trees (Figure 21) and causes branch flagging on larger trees. Many of the rust infections were attacked by pitch mass borer. This disease is mainly found in a band between 6000 and 7000 feet of elevation near drainages that are suitable for the alternate host (*Ribes* spp).

Figure 21. Singleleaf pinyon pine infected at the base by pinyon blister rust.

White Pine Blister Rust
Cronartium ribicola

Hosts: limber, bristlecone, whitebark, sugar, and western white pine

White pine blister rust has been known to exist in western Nevada on the east side of the Sierra Nevada Mountains for several years. The rust has expanded its Range in Nevada in recent years, with populations of rust now confirmed in the Jarbidge Mountains. Forest Health Protection conducted a ground survey for white pine blister rust in the mountain Ranges in eastern Nevada primarily focused on high elevation Great Basin bristlecone pine in 2004. No newly infected areas were discovered, and the previously reported rust infection in the Ruby Mountains was found to be dwarf mistletoe. At this point the only confirmed population of white pine blister rust in eastern Nevada is in the Jarbidge Mountains.

Sudden Oak Death
Phytophthora ramorum

Sudden Oak Death (SOD), a newly identified forest disease caused by the pathogen *Phytophthora ramorum*, has been killing thousands of tanoak and oaks in the coastal areas

of California, but has not been known to exist in Nevada. However, with the release of potentially infected nursery stock into all 50 states from a single California nursery, NDOA officials contracted with the USFS to conduct surveys in forest areas on host and potential host species near nurseries or where landowners may have out planted this potentially infected stock. Nevada Division of Forestry personnel have assisted NDOA officials with these surveys. NDOA forest SOD survey data showed no SOD for all regions surveyed to date.

ROOT DISEASES

Annosum Root Disease
Heterobasidion annosum

Hosts: Douglas-fir, lodgepole pine, ponderosa pine, spruce, true firs, and incense cedar

This disease can be found throughout the state on true firs, but it frequently acts as butt decay or as a saprophyte on dead trees, stumps, roots, and cull logs or fallen stems. The fungus occasionally kills young ponderosa pine, especially in plantations on droughty soils. Symptomatic small trees can frequently be found around stumps that had butt decay. The symptoms on larger trees include a thinning crown and fruiting bodies that develop at the base of the tree or inside stumps.

Figure 22. Annosum conk at the base of a tree.

Armillaria Root Disease
Armillaria spp.

Hosts: All trees

Figure 23 Armillaria mushrooms.

Evidence of Armillaria root disease can be found throughout the state causing mortality in all species of trees. This disease also frequently functions as a weak pathogen or saprophyte. Fruiting bodies grow in clusters from the roots or at the base of the tree during moist conditions. There is a close association between root disease pockets and endemic level bark beetle populations. Armillaria was observed on pinyon pine roots in the Virginia Highlands of Storey County and on white fir in the Success Summit

area of the Schell Creeks of White Pine County in 2006. It has also been found on Jeffrey pine roots in Carson City County in the Clear Creek area.

Black Stain Root Disease
Ophiostoma wageneri

Hosts: pinyon pine, ponderosa pine, and Douglas-fir

Figure 24. Black stain root disease pockets (circled) in pinyon pine south of Mount Wilson in 2004.

Black stain root disease is an important disease of several hosts, but it is only found on pinyon pine in the state of Nevada. It usually kills affected trees within a few years, and it can produce groups of mortality several acres in size. Pockets of infected trees are preferred host for low-level populations of pinyon engraver beetles. No new pockets of black stain root disease were observed by aerial survey in 2008.

LEAF AND NEEDLE DISEASES

Aspen Leaf Spot
Marssonina populi

Host: Aspen

Blight and leaf spot caused by this disease have been seen in the past throughout the host type. Although it was not observed in aerial surveys in 2008, it was seen in the northern Toiyabes in heavily frost damaged aspen stands.

Figure 25. Symptoms of aspen leaf spot.

DECLINES / COMPLEXES

Subalpine Fir Mortality Complex

Host: Subalpine fir

The western balsam bark beetle (WBBB) is the most significant mortality agent in a complex of forest insects and disease causing subalpine fir mortality. Endemic populations will occur in storm-damaged trees, slash, or trees of poor vigor. WBBB infestations may build to epidemic levels, where mortality can occur in groups of 100 to 10,000 trees. Annosum root disease, woodborers and several species of smaller bark beetles are also involved in this complex. Environmental stress due to drought or overcrowding may also have a role in the death of trees in this category.

In 2008, mortality caused by WBBB increased slightly from the low 2006-7 levels to 1,792 trees (Figure 26). The acreage affected in 2008 was 7942 acres. This increased acreage is due to the scattered nature of the mortality. Most of this subalpine fir mortality was on the Mountain City and Jarbidge Ranger Districts of the Humboldt-Toiyabe National Forest.

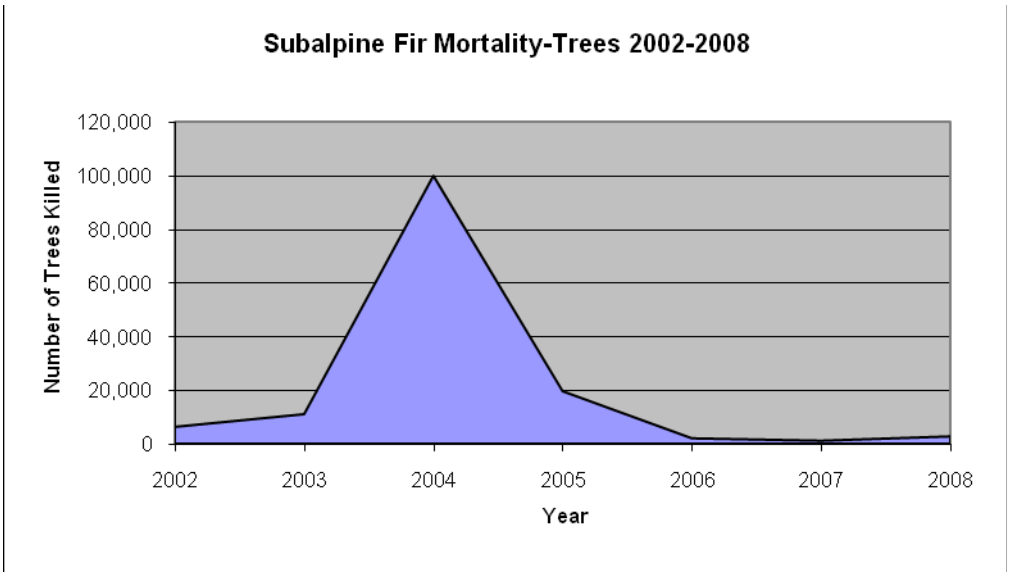

Figure 26. Number of subalpine fir killed in Nevada during seven years (2002-2008).

Figure 27. Subalpine fir mortality.

Elko County – Over 1,792 trees in scattered mortality were mapped in the northern Jarbidge Mountains, including the Jarbidge Wilderness. Additional mortality was reported in the western Bull Run Mountains.

Aspen Decline

Host: Aspen

A decrease in the amount of aspen forest acreage has been reported throughout the western U.S. for many years. The primary forces involved are succession of aspen forest to other vegetation types due to fire exclusion, and damage to young aspen sprouts by grazing animals. This phenomenon has been labeled “aspen decline” by some authors. This type of “decline” should be distinguished from the aspen dieback that has been detected in aerial survey that is caused by several agents including drought stress, insects, diseases and other stresses. This dieback can impact aspen clones that have been impacted by fire exclusion and grazing pressure causing them to decline and die.

Aspen dieback has been noted anecdotally for many years in the Intermountain Region, and dieback has been recorded by aerial survey since 2003. In 2004, Intermountain Region FHP examined what had been mapped as insect defoliator damage or Cytospora canker in

several areas in north-central Nevada and discovered that a number of insect and disease agents were involved. In 2006, FHP established monitoring plots in several areas in Nevada.

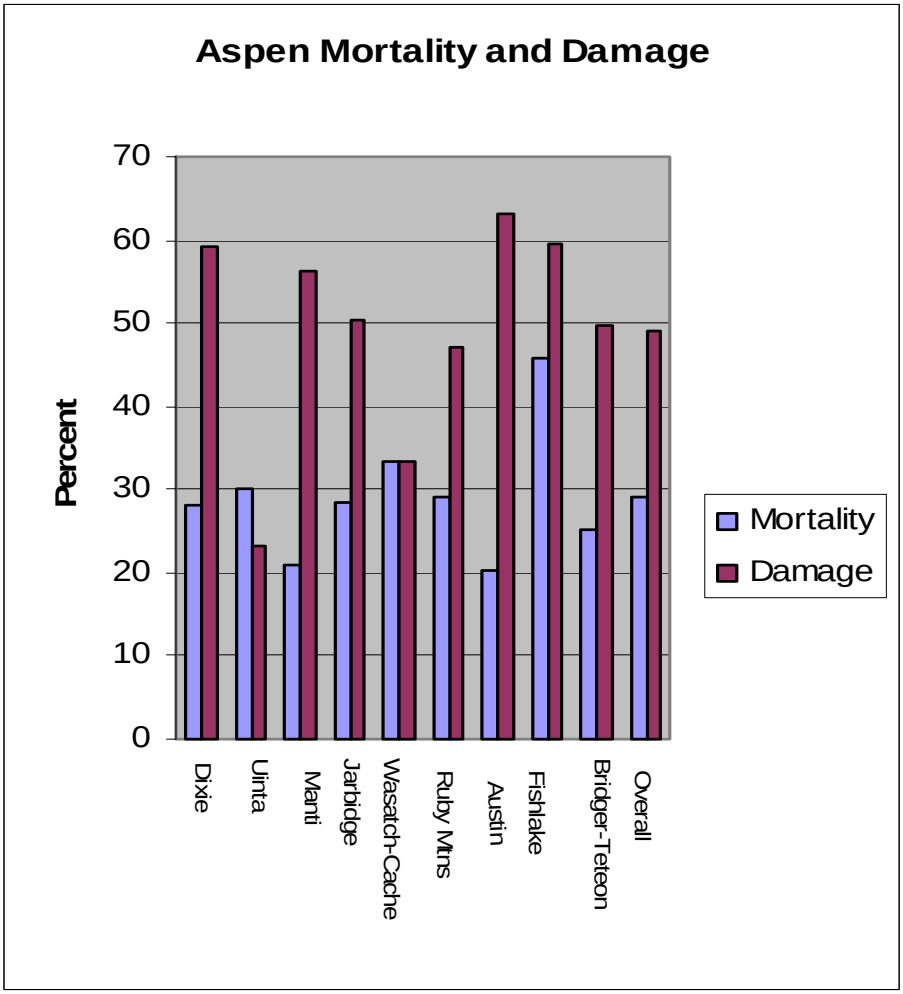

Figure 28. 2006 Percent of aspen damaged and killed in National Forests/Ranger Districts.

Data analysis of these plots is ongoing but a few trends were evident from an early review of the data. In the areas evaluated, there were observed high levels of mortality and moderate to heavy damage in the trees over 2 inches in diameter at breast height (Figure 28). The most common agents involved were canker diseases and insect borers. Aspen regeneration, was highly variable (Table 6). In some cases regeneration was heavily damaged, primarily by animal browsing.

In many cases, if grazing pressure was not heavy, the clones involved seemed to be recovering and had produced a good crop of new sucker sprouts. However, in some cases heavy grazing pressure was removing sucker sprouts produced as a response to death of overstory trees which may contribute to the eventual death of these clones. In other cases, the clones were not recovering even in the absence of grazing pressure.

Table 6. 2006 aspen regeneration plots on National Forests (NF)/Ranger Districts (RD).

Forest (District)	Trees per acre	Percent Damaged
Dixie NF	2300	57.4
Uinta NF	416	5.2
Manti NF	5600	25.4
Wasatch-Cache NF	4300	11.6
Humboldt-Toiyabe NF (Jarbidge RD)	3360	36.9
Humboldt-Toiyabe NF (Rubies RD)	1450	47.8
Humboldt-Toiyabe NF (Austin RD)	1813	68.9
Fishlake NF	3550	47.9

In 2008, 11,453 acres of aspen decline were mapped in seven counties, similar to 2007's figure of 12,025 acres. The increase in aspen decline in eastern California counties results in the graph below showing an increase in 2008 (Figure 29). There were decreases in some counties such as Douglas, Humboldt, Nye, and White Pine, but significant increases in Elko, Eureka and Washoe counties.

Douglas County – 45 acres decline in the Pinenut Mountains in three spots – one in Thompson Canyon and two around Bald Mountain in the southern Pinenut Mountains.

Elko County – 5,925 acres decline was mapped in numerous spots in the south and west Jarbidge Mountains , in small spots throughout the Tennessee, Elk, Bull Run, Independence Mountains, and around the Mahoganies. Many spots of mostly light decline occurred throughout the lower to middle elevations of the Ruby Mountain and East Humboldt Ranges.

Eureka County - 498 acres of light decline was mapped in the northernmost end of the Monitor Range.

Humboldt County – 1,315 acres of light to heavy aspen decline occurred throughout the Santa Rosa Mountains in small to medium sized pockets. This is about half of the 2007 acreage.

Nye Counties – 3,386 acres, similar to 2007. Decline was mapped in scattered small spots in the lower elevations of the southern Toiyabes at the headwaters of the Reese River, Clear Creek, and the Ophir Creek. It was found in small spots throughout the Toquima and Monitor Ranges and the northern end of the Hot Creek Range.

Washoe County – Dieback increased to 190 % to 57 acres, mostly in small pockets in the headwaters of Bull Ranch Creek, and one spot due west of Copperfield.

White Pine County – Dieback decreased 50% to 227 acres in 2008. Most of the decline was from the small patches scattered throughout the northwestern Schell Creek Range from Mattier Creek south to First Creek and in the south at East Canyon Spring.

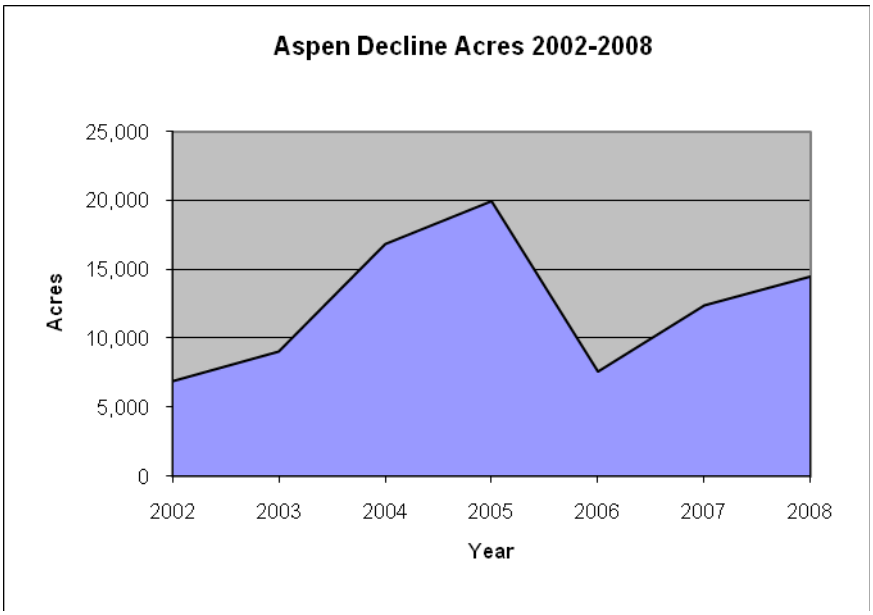

Figure 29. Acres with aspen decline in portions of California and Nevada during seven years (2002-2008).

Cytospora Canker
Cytospora spp.

Host: aspen

Cytospora canker is one of the most common diseases affecting aspen in ornamental situations and often attacks stressed trees through wounds. This fungus girdles branches by killing the cambium. Large, vigorous trees can withstand the disease and are rarely killed. Activity from this pathogen is most likely a symptom of several years of drought or defoliation from other insects or diseases. From the air, decline due to Cytospora canker looks similar to decline by forest tent caterpillar defoliation. The decline was mistakenly identified by aerial observers as forest tent caterpillar defoliation in 2002 and 2003. Further field study is needed to determine all the decline causes. In 2008, much of the aspen decline showed overstory decline but the understory was coming back in.

ABIOTIC DAMAGE

Drought Damage

Host: curlleaf mountain mahogany

Extensive yellowing and leaf loss of curlleaf mountain mahogany (*Cercocarpus ledifolius* Nutt. Ex Torr. & Gray) foliage was seen during the 2007 and 2008 ADS throughout the state. These evergreen leaves had turned yellow or red, and then dropped off. In many areas only small tips of green leaves remained on the trees. In 2008, many of the areas that were declining in 2007 were gray, dead centers of the large patches that are still in decline (Figure 30).

In 2008, the acreage affected nearly tripled to 34,134 acres from the 2007 acreage of 13,100. The number of counties affected increased from seven in 2007 to nine in 2008. Nye County had the highest level of damage followed by Elko County and thirdly, White Pine County. Significantly less damage was found in Douglas, Lander, and Lyon Counties. Elko, Storey and Washoe Counties had low damage.

Douglas County –1,475 acres decline in the Pinenut Mountains in numerous large patches on the east side of the Range and one large patch southwest of Holbrook Junction along the California border.

Elko County – 800 acres decline was mapped in numerous spots in the of mostly light decline occurred throughout the lower elevations of the western Ruby Mountain along Lamoille, Talbot, Thorpe, Kleckner and Lime Kiln Creeks and on the south end of Spruce Mountain and north end of the Cherry Creek mountains

Eureka County – 7,606 acres of decline was mapped in large patches in the northernmost end of the Monitor Range, the Mahogany Hills, and western Diamond Mountains .

Lander County – 1,477 acres; in large patches on the east side of the northern Toquima Range and one spot on the Lander/Nye County line on the eastern Toiyabe Mountains.

Lyon County – 1,590 acres; large to medium sized pockets around Rawe Peak south to Lyon Peak in the Pinenut Mountains. This is over five times the 2007 acreage

Nye County – 14,313 acres; Decline was mapped in many medium to large areas throughout the Monitor, Toquima, southern Toiyabe, and southern Shoshone Ranges, and one spot just south of White rock Canyon in the Hot Creek Range. This is over five times the 2007 acreage

Storey County –27 acres which was 190% of the 2007 acreage; found in small spots north, west and southwest of Virginia City.

Washoe County – 2008 acreage at 726 acres was 190% of the 2007 acreage found in small pockets north and east of Peavine Peak, and in the Evans Creek Watershed.

White Pine County – The 6,120 acres in 2008 is only 61% of the 2007 acreage. Most of the decline in acreage was from a decrease in the area affected in the Snake Range both in the north and south areas. There was still quite a bit of decline in the

northern Snakes, but much less than 2007. The rest of the mahogany decline was light and in small patches scattered throughout the Cherry Creek Range, the Schell Creek Range, the Duck Creek Range, northern Ward Mountain, and in the White Pine Range.

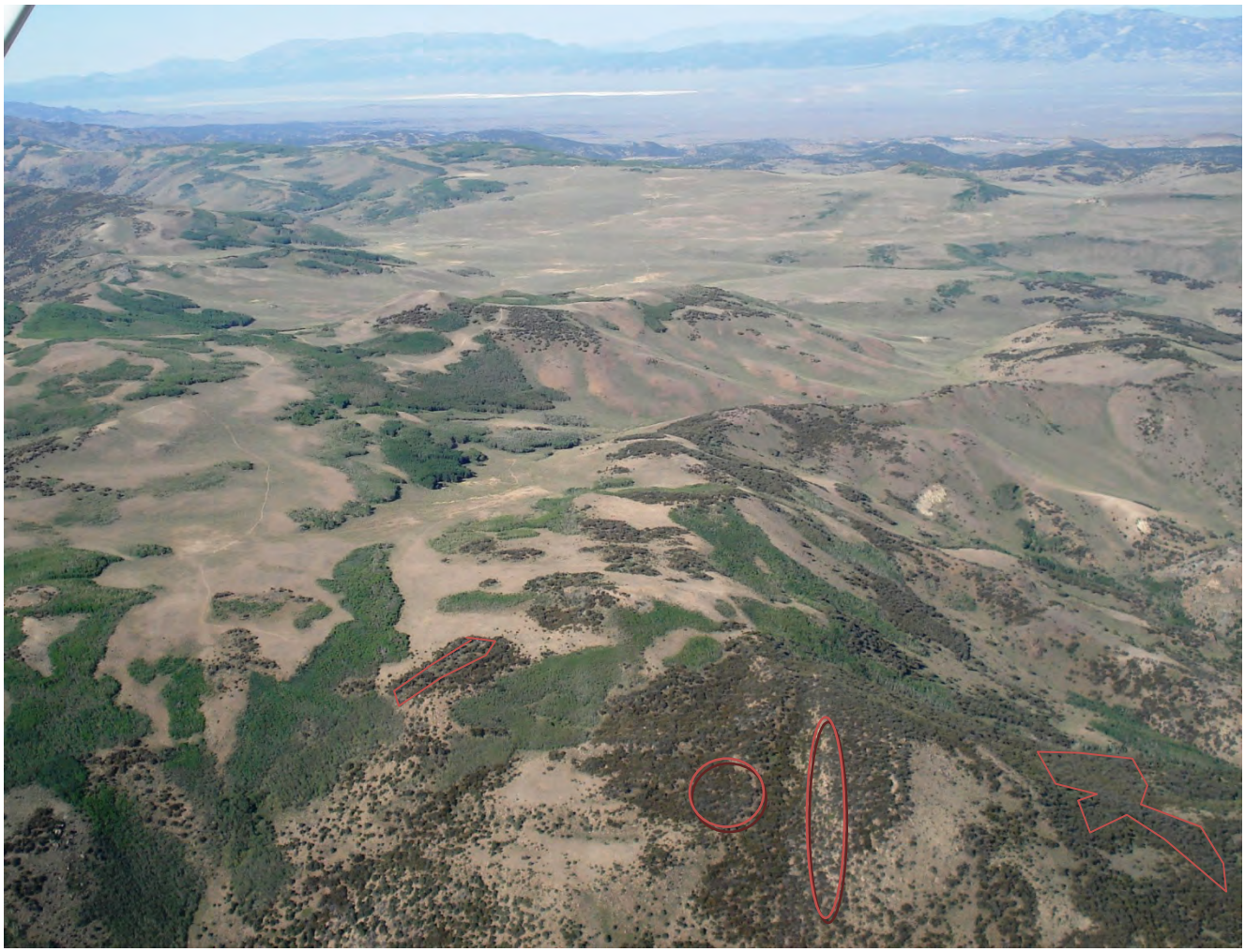

Figure 30. Drought damage on curlleaf mountain mahogany foliage and aspen decline near the top of the Monitor Range 2008. Note dead gray areas from 2007 in middle of mahogany stands with decline around the edges.

Blowdown

Areas of concentrated, high velocity winds can cause trees to blow over. Blowdown occurs in groups or as scattered trees within the landscape. Depending on the tree species, patches of blowdown in coniferous forests can provide a food source for various bark

beetles, enabling populations to build to epidemic levels. These epidemic populations may then attack and kill standing, live trees adjacent to the blowdown. No blowdown was observed in 2008.

Wildfire Damage

A small fire of about 1,725 acres burned over approximately 5,000 singleleaf pinyon pine trees on the lower slopes of the eastern Monitor Range (see Figure 31 below), and a smaller approximately 160 acre fire in the northwestern Schell Creek Range just north of Tehema Creek killed approximately 200 pinyon pines. The largest wildfire of 2008 was in the Jarbidge Mountains and occurred after aerial survey was completed. The area was heavily impacted by whitebark pine mortality from the mountain pine beetle and many beetle infested trees as well as healthy trees were killed in this fire in the northeastern corner of Nevada.

Figure 31- Fire damage on pinyon pine in the eastern Monitor Range south of Willow Creek drainage.

Noxious weeds

Noxious weeds are a continuing problem for all Western states. They have the ability to colonize disturbed habitats aggressively displacing native plant species and altering ecosystems. Several state and federal agencies have the responsibility for monitoring and controlling noxious weeds. Our intention by including this information is to increase awareness of these potential problems. Table 5 at the beginning of this document is the list of plants declared noxious weeds by the State of Nevada for specific counties. The NDOA in coordination with the Nevada Department of Conservation and Natural Resources' Natural Heritage Database Program has hired a Weed Geographic Information System Mapping Coordinator which will significantly help with monitoring weed populations in Nevada. For more up-to-date information on Nevada Noxious Weeds and the newly adopted three-tier State List go to **http://www.agri.nv.gov/PLANT_NoxWeeds_index.htm.**

The following noxious weed websites, while not inclusive, give additional information on noxious weeds such as biology, history, and control.

http://www.invasivespecies.gov
This website is the gateway to federal and state efforts concerning invasive species. There are links to numerous invasive species databases. This website should be one of your first stops.

http://www.agri.nv.gov/PLANT_NoxWeeds_index.htm
This website contains any information you need about noxious weed prevention, control and management for all land managers in the state of Nevada. Another good site to look at first.

http://www.cdfa.ca.gov/phpps/ipc/encyclowedia/encyclowedia_hp.htm
California Department of Food and Agriculture has a very comprehensive website. Information includes: identification, biology, and management. Pictures of the plants in various stages are just a click away.

http://www.nwcb.wa.gov/index.htm
State of Washington's noxious weed control board website has information on black henbane, buffalo bur, camel thorn, Canada thistle, Dalmatian toadflax, dyer's woad, goatsrue, houndstongue, johnsongrass, jointed goatgrass, diffuse, Russian and spotted knapweed, leafy spurge, Mediterranean sage, musk thistle, perennial pepperweed, purple loosestrife, puncturevine, rush skeletonweed, silverleaf nightshade, scotch thistle, St. Johnswort, yellow nutsedge, purple and yellow starthistle, and velvetleaf. Topics include description, economic importance, geographic distribution, habitat, history, growth and development, reproduction, response to herbicides, response to cultural controls, and biocontrol potentials.

http://www.ipm.ucdavis.edu/PMG/selectnewpest.landscape.html#WEED

University of California pest management website has information on Bermuda grass, field bindweed, Russian thistle, yellow starthistle, and others. Topics include identification, biology, and management through cultural and chemical control options.

http://www.ext.colostate.edu/pubs/natres/pubnatr.html
Colorado State University Cooperative Extension website in the Range section has fact sheets on musk thistle, leafy spurge, Canada thistle, diffuse, Russian, and spotted knapweeds. Information includes description, phenology, and management options such as cultural, chemical, mechanical, and biological.

http://www.weedcenter.org
An interagency website housed at the Montana State University. The Center for Invasive Plant Management (CIPM) promotes the ecological management of invasive plants in the West through education, by facilitating collaboration among researchers, educators, and land managers, and by funding research projects and weed management areas. The center serves as an information clearinghouse, providing examples of ecological management, and delivering implementation tools and products to land managers. The center operates in partnership with federal, state, counties, private industry, universities, foundations, and landowners.

http://invader.dbs.umt.edu
The University of Montana's Invaders Database has a search engine that links the user to informational websites on most of the invasive weeds. You can search the database for the list of Noxious Weeds by state and most identified plants have additional information and links to more information.