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of Agriculture



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State and Private  
Forestry  
Forest Health Protection  
Intermountain Region  
R4-OFO-TR-05-00



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

# Forest Pest Conditions in Nevada 2010



Front cover photos: (Top) Whitebark pine killed by mountain pine beetle in the Jarbidge Mountains looking down toward the town of Jarbidge, NV, July 2010 (Photo: Gail Durham); (Bottom) Pinyon pine sawfly and needle scale damage on the northeast side of the Monitor Range, August, 2009 (Photo: Gail Durham)

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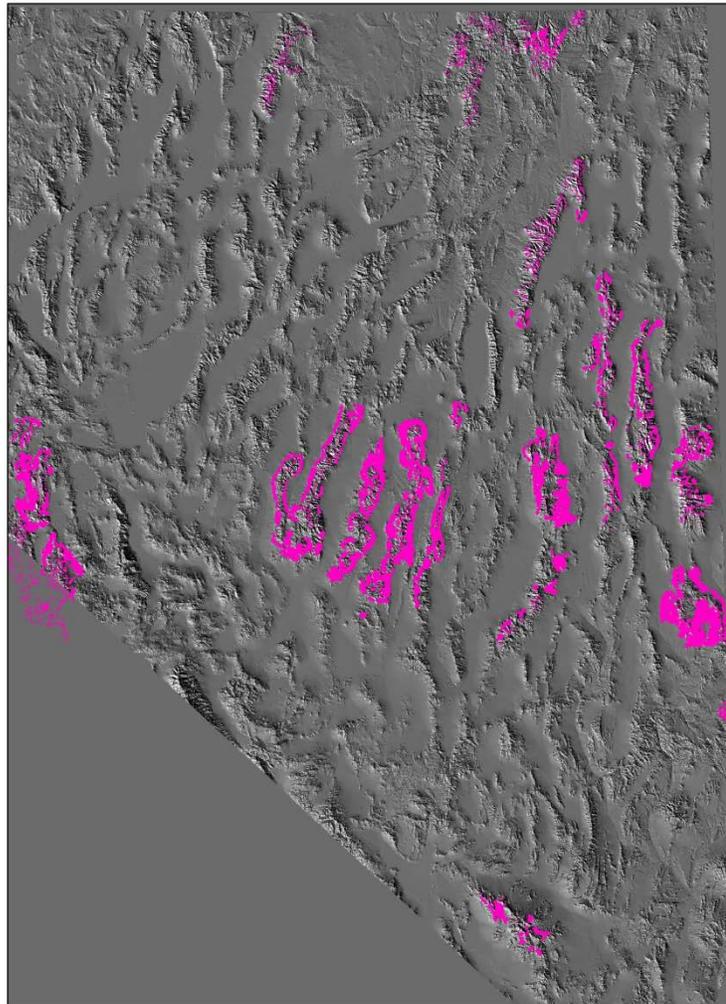
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# 2010 Nevada Aerial Detection Survey Damage Areas



## Legend

 r4\_ads2010dmg polygon

50 25 0 50 Miles



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## Introduction and Summary

In an effort to simplify discussions of forest health conditions in Nevada, this report focuses on only insects, diseases, and weather factors that impacted various tree species in the State. Data collected through aerial detection surveys (ADS) conducted by the USDA Forest Service and Nevada Division of Forestry are primarily used to determine 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 of the same acres are surveyed every year. Sometimes, tree mortality may be counted in same area in consecutive years. This can lead to inflated estimates of actual tree mortality. Total acres tallied may also change between years due to increases or decreases in the total number of acres surveyed. Consequently, interpretation of ADS data should consider these sources of inconsistency. Most of the area flown in 2010 was comprised of National Forest System (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 smaller percentage of acreage was surveyed to obtain data 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 2003 to 2010.

Land Ownership/Year	2003	2004	2005	2006	2007	2008	2009	2010
NF H-T (NV)	3551800	3924900	3697000	2508400	3739200	4757970	3998170	4340053
NF-HT (CA)	529400	595000	531600	548000	560700	582000	551238	595850
BLM	1069100	1076400	1109000	712300	938600	1924990	2074498	2299901
private (NV)	284900	298600	344300	153200	381900	440637	540760	360,865
private (CA within NF)	30500	32600	31500	38000	36200	31800	28071	32335
Great Basin NP	77100	76200	76700	77000	76900	75995	77005	76890
Other Federal*	1500	42000	2900	10800	4500	41967	38530	1007
NV State Lands	18300	17800	18000	3000	20100	17073	22113	20579
<b>TOTAL</b>	<b>5562600</b>	<b>6063500</b>	<b>5811000</b>	<b>4050700</b>	<b>5758100</b>	<b>7872432</b>	<b>7330385</b>	<b>7727480</b>

\*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, the discussions of activity for individual insect and disease agents detected in 2010 are Nevada only and summarized on a county basis. The total number of acres in each county and the percentage of acres surveyed during 2010 are provided in Table 2.

Table 2. Number and percentages of acres surveyed in Nevada counties in 2010.

<b>COUNTY</b>	<b>Total Acres in County</b>	<b>2010 Acres Surveyed</b>	<b>2010 % Surveyed</b>
<b>Carson City</b>	103,569	67,607	65.3
<b>Clark</b>	5,176,177	260,247	5.0
<b>Douglas</b>	478,351	324,009	67.7
<b>Elko</b>	10,979,963	1,311,478	11.9
<b>Eureka</b>	2,663,738	252,600	9.5
<b>Humboldt</b>	6,219,557	300,464	4.8
<b>Lander</b>	3,534,543	335,474	9.5
<b>Lincoln</b>	6,782,623	429,416	6.3
<b>Lyon</b>	1,310,315	150,491	11.5
<b>Mineral</b>	2,462,989	0	0.0
<b>Nye</b>	11,686,348	1,983,162	17.0
<b>Pershing</b>	3,863,680	0	0.0
<b>Storey</b>	167,774	53,966	32.2
<b>Washoe</b>	4,234,009	176,947	4.2
<b>White Pine</b>	5,676,727	1,790,589	31.5
<b>Total</b>	65,340,363	7,436,450	11.4

In 2010, the amount of insect and disease-caused tree mortality generally decreased for the first time in three years. This decrease can be attributed, in part, to above normal spring moisture in 2010. 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 2009, but saw an increase during the growing season of 2010 (Figure 1).

Nevada, Palmer Z-Index, June

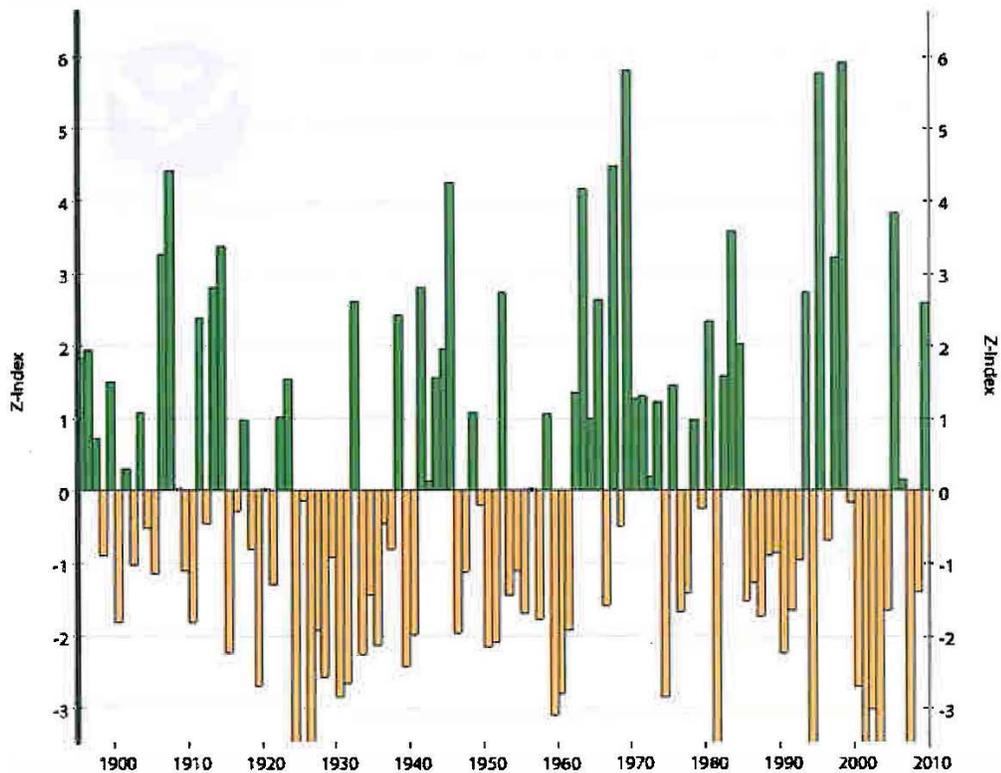


Figure 1 - National Oceanic and Atmospheric Administration (NOAA) Nevada Palmer Drought Severity Index –Z of June Precipitation from 1900-2010 (National Climate Data Center).

Most of the tree mortality noted in 2010 is attributed to bark beetle activity and/or past drought affects. Please note that most bark beetle-killed trees are not typically symptomatic (faded foliage) until one year following the year of attack. Therefore, the numbers of acres affected and trees killed by bark beetles as recorded during ADS flights are typically a reflection of the previous year's or earlier attacks. Levels of defoliation, however, may reflect either the activity of an insect or disease during the current year or activity since bud break. Most of the pinyon pine defoliation attributed to pinyon needle scale has likely been occurring for a few years, but was only visible from the air starting in 2009. Aspen and curleaf mountain mahogany declines are largely attributed to successive years of drought in conjunction with stress/damage induced by other biotic and abiotic factors.

In 2010, mortality caused by insects and diseases (number of trees killed) decreased from 2009. Decreases in tree mortality associated with specific agents in 2010 are as follows. Fir engraver beetle on white fir decreased to about 75% of 2009 levels, Jeffrey pine beetle mortality decreased to 85% of 2009 levels, and subalpine fir mortality decreased to 94% of 2009 levels, mountain pine beetle on lodgepole and white pines decreased to about 20% of

2009 levels, and pinyon pine engraver-caused mortality decreased to 15% of 2009 levels (Table 3).

Table 3. Tree mortality attributed to forest pest that was detected in 2010 by county<sup>1</sup>

COUNTY	Mountain Pine Beetle White Pines <sup>1</sup>		Fir Engraver Beetle		Jeffrey Pine Beetle		Pinyon Engraver Beetle		Subalpine Fir Mortality Complex	
	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Carson City	0	0	3	1	27	14	31	15	0	0
Clark	15	13	10	2			5	4	0	0
Douglas	0	0	28	14	53	27	714	435	0	0
Elko	12,888	14,695	10	5			8	4	1,242	1,389
Eureka	133	66					298	148	0	0
Humboldt	24	12							0	0
Lander	107	60					56	28	0	0
Lincoln	0	0	119	62			750	5,629	0	0
Lyon	11	6					146	71	0	0
Mineral	0	0							0	0
Nye	865	503	16	8			571	278	0	0
Pershing	0	0							0	0
Storey	0	0					47	24	0	0
Washoe	95	48	47	23	58	25	57	28	0	0
White Pine	3,551	3,992	623	787			314	158	0	0
Total	17,689	19,394	856	902	138	65	2,997	6,823	1,242	1,389

<sup>1</sup> Mountain pine beetle-caused tree mortality occurred in western white, whitebark, bristlecone and limber pines only and does not include lodgepole/ponderosa pine mortality. Mortality in lodgepole included 3 trees on 1 acre, 22 trees on 6 acres, and 203 trees on 51 acres in Carson, Douglas, and Washoe Counties, respectively. Mortality in ponderosa included 6 trees on 3 acres, 1 tree on 1 acres, and 14 trees on 7 acres in Clark, Nye and White Pine Counties, respectively.

In 2010, most estimates of defoliation and associated decline caused by insect and disease activity or drought in Nevada decreased from 2009 levels. The exception was an increase in the total number of acres affected by pinyon needle scale. Mountain mahogany decline decreased by 39% of the 2009 acres damaged. The number of acres with aspen decline were 62% of 2009 totals and, the total acreage of aspen defoliated by the forest tent caterpillar was about half (56%) of the 2009 acres. The biggest change noted this year was the defoliation of pinyon due to pinyon needle scale which increased by 178% of 2009 levels. Douglas-fir tussock moth defoliation decreased to 80 acres, which is just 10% of 2009 levels (see Figure 2 and Table 4).

Table 4. Insect defoliation and associated decline by county in 2009.

	Aspen Decline	Forest Tent Caterpillar on Aspen	Singleleaf Pinyon Pine Defoliation by Needle Scale & Sawfly	Curl leaf Mountain Mahogany Drought Damage
<b>COUNTY</b>	Acres	Acres	Acres	Acres
Carson City	29		16,258	
Clark			23,874	3,663
Douglas	10		73,553	323
Elko	4,199	2,021	14,066	745
Eureka	75		66,271	4,043
Humboldt	748	1,111		54
Lander	109		68,514	477
Lincoln	31		188,934	741
Lyon			35,484	664
Mineral				
Nye	2,416	76	435,306	16,222
Pershing				
Storey	7		7,610	
Washoe	67		985	111
White Pine	77	40	257,343	19,528
<b>Total</b>	<b>7,769</b>	<b>3248</b>	<b>1,188,196</b>	<b>46,572</b>

<sup>2</sup> Tables 3 & 4. Produced by G. Durham, Nevada Division of Forestry, using data provided by USDA FS Forest Health Protection.

## Principal Damaging Agents Detected from Nevada's 2010 Aerial Survey Showing Acres Affected

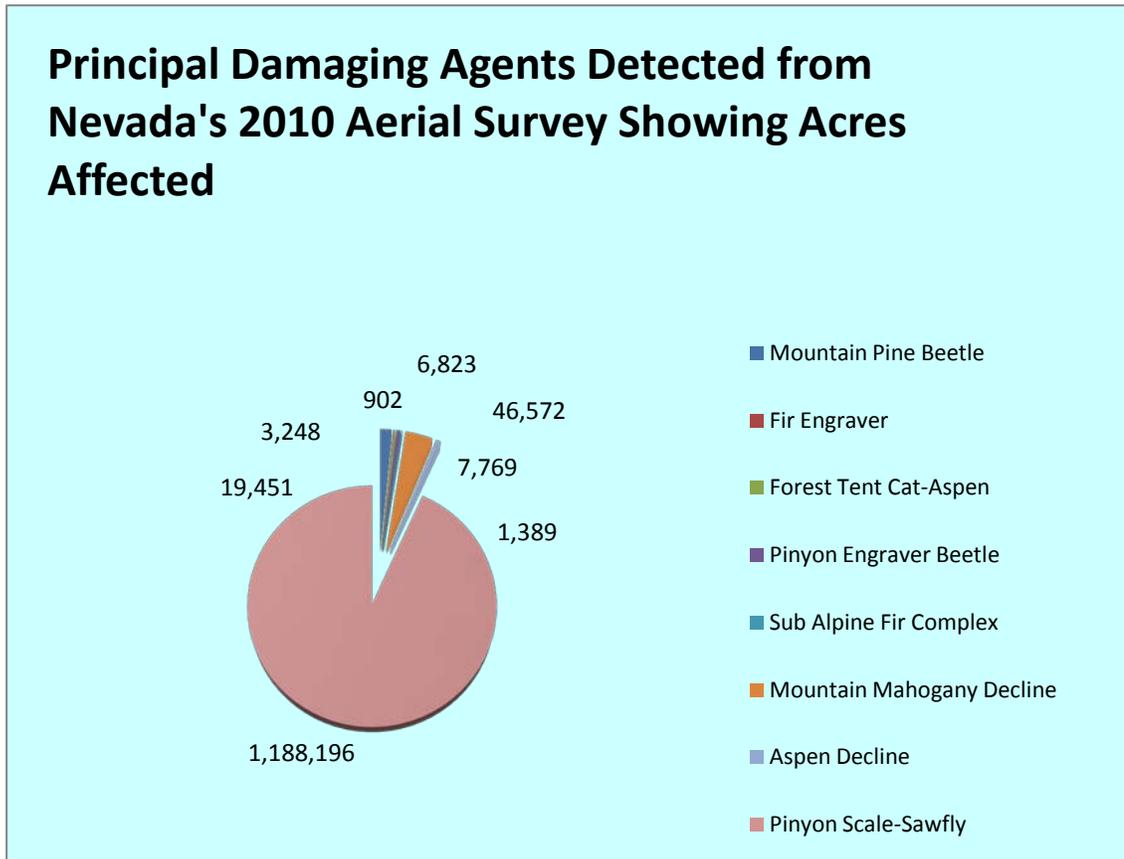


Figure 2- Acres of tree mortality and/or defoliation detected in 2010 attributed to various insects, diseases and drought.

Noxious weed species are widespread throughout Nevada. A few species are widespread such as Canada thistle, musk thistle, Scotch thistle, diffuse knapweed, spotted knapweed, Russian knapweed, salt cedar (tamarisk), perennial pepper weed, hoary cress, and yellow star thistle (Table 5).

Table 5 - Noxious weeds by county in 2010

							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			N				N					X					
African (Sahara) Mustard			X							X			X				X
Black Henbane					X		X		X				X				X
Canada Thistle	X			X	X		X	X	X	X	X		X	X	N	X	X
Camelthorn			N														
Dalmatian Toadflax			N	X	X					X			X		X	X	X
Diffuse Knapweed		N	N	X	X		X	N	X	X	N		X	N		X	X
Dyer's Woad					X											X	
Eurasian Water milfoil							N										
Green Fountain Grass			X														
Giant Reed			N														
Goat's Rue			X														
Hoary Cress/Whitetop	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X
Houndstongue					X												

Johnson Grass			X														
Leafy Spurge	X				X		X	X					X				X
Malta Starthistle			X				N										
Medusa Head grass	N		N	N	N			N					N			X	
Mediterranean Sage					X											X	
Musk Thistle	N	X		N	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	N			X	X		X	N	N	N	N		X		X	X	X
Puncturevine	N		X	N	X		N	N	N		N	N		N	N	X	
Purple Loosestrife											X					X	
Rush Skeletonweed	X															N	
Purple Starthistle				X	X		X		X								
Russian Knapweed	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Salt Ceder (Tamarisk)	N	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	N	X	N	N	X			X	N	X	X	X
Squarrose Knapweed					X				X	X			X				X
Sulfur Cinquefoil					X												
Water Hemlock					X		X		X								N
White Horsenettle			N														
Yellow Toadflax					X			N								N	N
Yellow Starthistle	X	X	X	X	X	X		X			X		X	N	X		N

**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.

**N** Indicates new location since 2007 update. From current (2009) weed database housed at Nevada Dept. of Conservation and Natural Resources Natural Heritage Program contact [kimwilliams@heritage.nv.gov](mailto:kimwilliams@heritage.nv.gov) and website: [http://agri.nv.gov/nwac/PLANT\\_NoxWeedMapping.htm](http://agri.nv.gov/nwac/PLANT_NoxWeedMapping.htm)

Nevada Department of Agriculture (NDOA) began receiving USFS, State and Private Forestry grants in 2002. Working cooperatively with Cooperative 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 (Ely, White Pine County), Canada thistle (Gardnerville, Douglas County), and dalmatian toadflax (Pioche, Lincoln County). Dalmatian toadflax and tamarisk leaf beetle collections and releases are being coordinated by Jeff Knight, State Entomologist. Tamarisk beetle (*Diorhabda elongate*) has been observed working its way south along the Virgin River from St. George Utah, defoliating the tamarisk as it spreads. The main concern with this southern movement is that defoliation may occur in southwest willow flycatcher (federally endangered bird species) habitat when the birds are nesting and leaving insufficient cover for the young. No further efforts have been made to expand the range of tamarisk beetles.

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# STATUS OF INSECTS

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## 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.

Only small amounts of DFTM defoliation was detected during aerial surveys in 2010 in Elko County, Nevada. A total of only 82 acres of light defoliation was observed in the headwaters of the East Fork of the Jarbidge River and Camp Draw in the headwaters of the Mary's River.



Figure 4 - Douglas-fir tussock moth larvae. Photo – from <http://www.bugwood.org/>

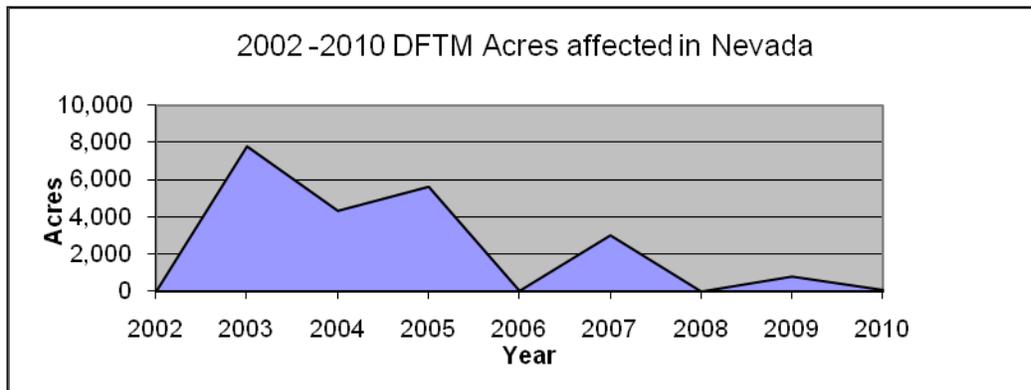


Figure 3 - Acres with Douglas-fir tussock moth defoliation in Nevada from 2002-2010.

#### 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. However, heavy defoliation causes reduced growth, stress, and tree mortality. Thin crowns cause a ghostly, transparent appearance of the forest canopy. In some locations, sawfly outbreaks are occurring in conjunction with pinyon needle scale (*Matsucoccus acalyptus*) defoliation.

In 2010, the outbreaks were still active in the same areas mapped as in 2009, but not all of those areas were aerially surveyed in 2010. Therefore, the acreage infested in 2010 dropped to 27,245 acres from the 181,000 mapped in 2009. Other areas of the State are most likely still infested but were not surveyed.



Figure 5 - Note the gray transparent appearance of pinyon sawfly defoliated areas on the northeast side of the Monitor Range in central Nevada in summer of 2009.

**Eureka County**- 11,288 acres found at the lower elevations in southern Eureka County affecting the northeast end of the Monitor Range.

**Lander County** – 9,395 acres found on the northeast end of the Toquima Range at the lower elevations

**Nye County** – 3,610 acres found at the lower elevations of Toquima Range in one large polygon in the eastern area just north of Ikes Canyon and east of White Rock Mountain.

**White Pine County** – 2952 acres in two large polygons found at the lower elevations on the west side of Cherry Creek Summit in the hills south of Butte Valley.

### **Pinyon Needle Scale**

*Matsucoccus acalyptus*

Host: pinyon pine

The pinyon needle scale is a sap-sucking insect that feeds on two year old needles. Foliage of infested trees turns yellow then brown. Heavy defoliation causes reduced growth, stress, and tree mortality. Past outbreaks have been recorded since 1959 throughout Nevada, causing localized defoliation and mortality of some trees. Historic outbreaks were noted in 1957-1963 in southeast Nevada and southwest Utah, affecting several hundred thousand acres. During 1969 and 1970, portions of the Humboldt-Toiyabe NF in California and Nevada were defoliated. A mild winter in 1969 was one of the many factors that triggered this severe outbreak. Again, it was mostly the younger trees growing at lower elevations on alluvial fans that were affected. 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 2008, more evidence of this infestation was found further south on the east side of Connors Pass on the Schell Creek Mountains.

In 2009, approximately 7% of Nevada's pinyon/juniper forest mapped was affected by this insect with many areas also having very low levels of pinyon mortality attributed to pinyon Ips or other causes. Drought and scale defoliation likely exacerbated the pinyon mortality. The most severely affected areas were larger comprised of younger trees and occurred in the lowest areas of alluvial fans and hill slopes (Figure 6). In 2010, nearly 1,161,000 acres of the approximately 9,950,000 acres of pinyon in Nevada were mapped as scale-defoliated. This represents 11.6% of Nevada's pinyon forest. Much of Nevada's pinyon forest is not mapped annually, so the amount of pinyon needle scale is probably much higher than the above figures indicate. Much of the mapped area was also affected by a combination of insects such as twig beetles (*Pityophthorus spp.*, *Pityogenes spp.*), and pinyon tip moth (*Dioryctria albobitella*). From the air, the damage caused by these insects is similar in appearance to that of pinyon needle scale infestation, and some areas will be dominated by one or a mixture of these insects. Consequently, differentiating damage attributed to these various causal agents can be extremely difficult, and often areas are exclusively mapped as scale-infested.



Figure 6 - Pinyon pine needle scale on singleleaf pinyon located on the lower elevations of the Toiyabe Mountain Range as seen from the air, August 2010 (note the dusty gray appearance of the foliage), and close up of small black scale insects on the needles.

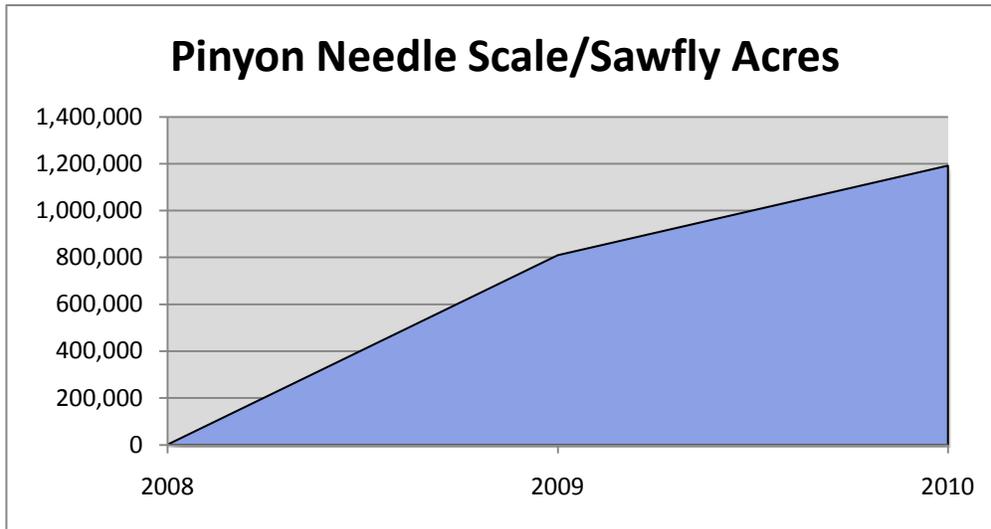


Figure 7 - Acres with pinyon pine needle scale and sawfly in Nevada from 2008-2010.

**Carson City** – 16,258 acres occupying most of the woodlands on the northwest side of the Pinenut Mountain Range in the lower alluvial fans and typically on the smaller trees. Most of the defoliation in this county was severe.

**Clark County** – 23,874 acres in the Spring Mountains at the lowest elevations

**Douglas County** – 73,553 acres of the Pinenut Mountain Range on the lower alluvial fans and hill slopes of all aspects. Most of this defoliation was light to moderate. Many of the smaller trees are succumbing to this third year of defoliation and are being killed outright by needle scale, or in combination with twig and/or bark beetle. The north end of the Sweetwater Mountains at the lower elevations is also lightly to moderately infested.

**Elko County** – 14,066 acres found in large patches on the lower elevations of the southern end of the East Humboldt Mountains, the north and west edges of the Cherry Creek Range in southeast Elko County, and one small patch on the southwest end of the Ruby Mountains.

**Eureka County**- 54,983 acres found in large patches on the northwest end of the Monitor Range, and throughout the Mahogany Hills.

**Lander County** – 59,119 acres found in large patches at lowest elevations of the Toiyabe and Toiyabe Ranges. Much of the infestation in the Toiyabe Range was first detected this year.

**Lincoln County** –188,934 acres found in large swaths along the lower elevations of the Wilson Creek (including most of Camp Creek Basin) and White Rock Mountains (extending into Utah) in the area just north of Beaver Dam State Park

**Lyon County** – 35,484 acres on the southwest side of the Virginia Range in three large patches, and on the northeast end of the Pinenut Mountains in large patches at the species lowest elevations. Large stands of the lowest elevation pinyon on the northeast side of the Sweetwater Mountains including Sweetwater Summit area were lightly to moderately infested.

**Nye County** – 431,696 acres throughout the lower elevations of the Antelope, Hot Creek, Monitor, Toiyabe, Shoshone, Toiyabe, Grant, Quinn, Horse and White Pine Ranges in large elevational band swaths. In addition, three large polygons on the

northwest end of the Spring Mountains were mapped for the first time this year.

**Storey County** – 7,610 acres in large patches on the lowest edges of the Flowery Range, on the northeast edges of the Virginia Range.

**Washoe County** – 985 acres on the west and southwest edges of the Virginia Range.

**White Pine County** – 254,391 acres in large patches at the lower elevations on the west and south end of the Ward Mountain, scattered large swaths at the lowest elevations of the Egan Range north of Ely, much of the lower elevation pinyon on the White Pine Mountains from Hwy 50 south to Currant Summit, north and south end of the Cherry Creek Range, west and south portions of the Cocomongo Mountains, multiple polygons on the south end of the Ruby Mountains, south, west and northern edges of the Schell Creek Mountains especially near Conner's Pass and the north end of the range where it abuts into the Antelope Range. In addition, large patches were mapped on the Snake Range at the mouth of Mill Canyon, Mill Creek, and Snake Creek as well as the area west and north of Pilot's Knob and most of the area north and south of Sacramento Pass. On the Northern Snake Range (Mt Moriah area) much of the lower elevation pinyon is infested throughout the range.

### **Forest Tent Caterpillar**

*Malacosoma disstria*

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

The forest tent caterpillar (FTC) 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 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. Larvae feed in groups without making any webbing. (Western Tent Caterpillar makes the large webs found on chokecherry and are reddish brown caterpillars). 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.

In 2010, the area of FTC defoliation decreased to 2,348 acres which was nearly half of the 5,789 acres mapped in 2009. This mortality was observed in Nye, White Pine, Humboldt and Elko Counties. This includes scattered patches of aspen in the Santa Rosa Mountains of Humboldt County totaling 1,111 acres (Figure 8), and 2,021 acres in Elko County in the Bull Run, Independence, and Mahogany Mountains, around Tennessee Mountain and the Jarbidge Mountains. In White Pine County, there were two spots totaling 40 acres at the headwaters of Sestanovich and Willow Creeks. New spots, totaling 76 acres, were mapped in two locations on the Monitor Mountains at the top of Butler Basin and Barley Creek headwaters (Nye County).



Figure 8 – Forest tent caterpillar on aspen on the Santa Rosa Mountains, NV in 2009.

## BARK BEETLES

### Fir Engraver Beetle

*Scolytus ventralis*

Hosts: true firs



Figure 9 - Primarily older white fir mortality caused by the fir engraver beetle on top of Success Summit in the Schell Creek Mountains, White Pine County, NV, in August 2010.

Mortality due to Fir-Engraver Beetle (FEB) continued to decrease in 2010 with beetles killing about 75% of the number of trees that were killed in 2009. In 2010, 856 trees were killed on 902 acres (Figure 10).

For the eighth consecutive year, White Pine County had the highest amount of fir mortality with approximately 623 dead trees scattered over about 787 acres in 2010. This represents a decrease to 75% of the 2009 mortality levels. Fir mortality decreased in Carson City, Clark, Douglas, Nye, Washoe and White Pine Counties but remained the same in Elko and Lincoln Counties compared to the 2009 data.

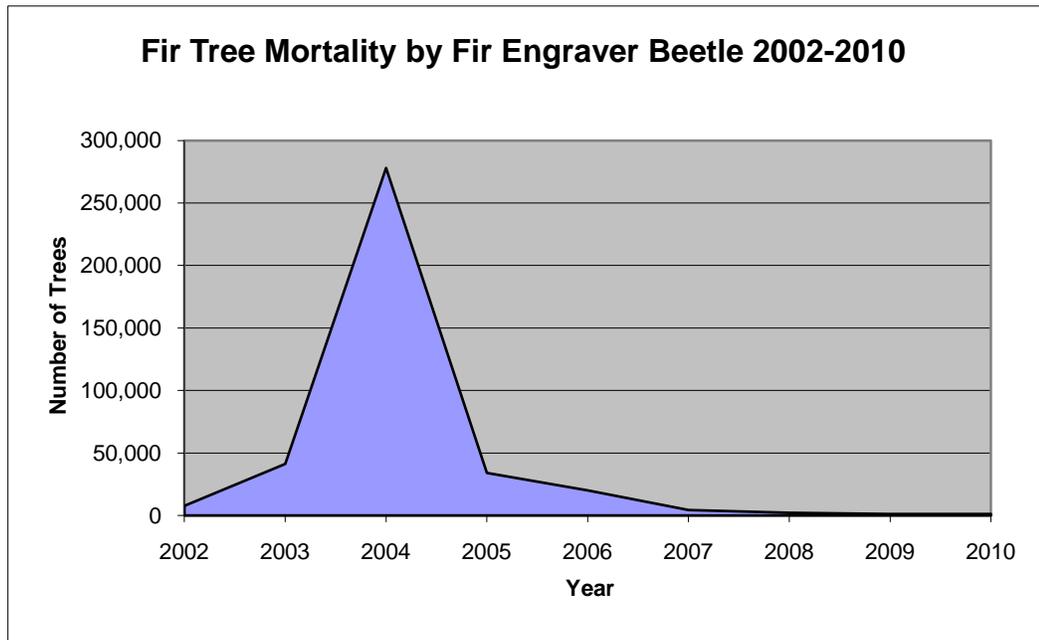


Figure 10 - Number of trees with mortality caused by the fir engraver beetle in Nevada and in Alpine and Mono counties in CA from 2002-2010.

- Carson City** – There were only 3 trees mapped on one acre in 2010, about a quarter of the amount of mortality observed in 2009. This was a spot located on the ridge between Ash Canyon and N. Kings Canyon.
- Clark County**- Mortality decreased to about half of last year’s levels. Only 10 trees were mapped on 2 acres in 2010. Scattered pockets were mapped throughout the upper elevations of the Spring Mountains.
- Douglas County** – Mortality decreased slightly from the 35 trees killed on 17 acres in 2009 to 28 trees killed on 14 acres in 2010. This was a few spots located near the north facing slope just south of James Canyon, and along the south Fork of Daggett Creek just south of Kingsbury Grade and near East Peak Lake at Heavenly Valley Ski Resort.
- Elko County** – There were only 10 trees mapped on 5 acres in 2010 on the west side of the Cherry Creek Range.
- Lincoln County** –The mortality remained the same as in 2009 with 119 trees mapped on 62 acres in the Wilson Creek and White Rock Ranges.
- Nye County** – 16 trees were mapped on 18 acres in 2010, which was approximately 46% of 2009 levels. Most of this mortality was found in small spots on throughout the Grant Range and the southernmost area of the White Pine Range.
- Washoe County** – Approximately 47 trees were mapped on 23 acres in 2010. This is 80% of 2009’s mortality numbers. This mortality was found in the Carson Range in small spots at the headwaters of Musgrove and Bronco Creeks and on the slopes northwest of Incline Village.
- White Pine County** – Most of the mortality in Nevada was found again in this county- 623 trees mapped on 787 acres. However, this tree mortality is only about 73% of the number reported in 2009. The majority of the 2009 FEB activity was scattered

throughout the Cherry Creek Range, on the south end of the Mt. Moriah Wilderness Area, and scattered throughout Great Basin National Park and surrounding lands, Schell Creek Mountains, the Egan Range, and White Pine 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 naturally 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 woodborers. California Flathead Woodborer is also found as the main mortality agent on Jeffrey pine along the eastern front of the Carson Range in western Nevada.

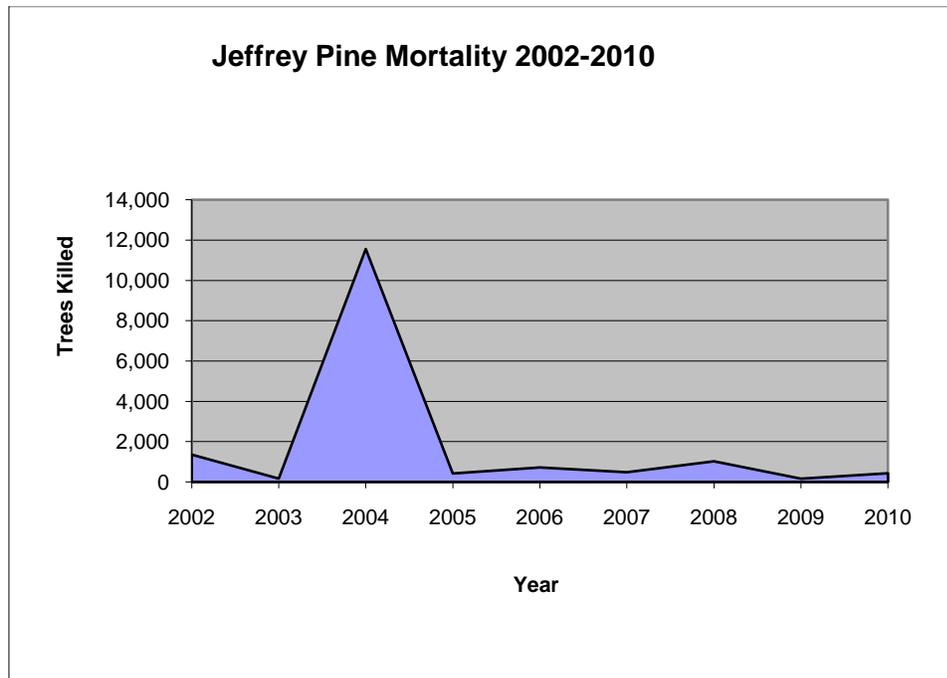


Figure 11 - Jeffrey pine beetle-caused tree mortality in Nevada and Alpine and Mono Counties, CA from 2002-2010



Figure 12 - Jeffrey pine beetle-caused tree mortality in Alpine county in California along Highway 88. Photo: Sheri Smith)

In 2010, Jeffrey pine beetle-caused tree mortality decreased to 85% of the trees observed in 2009, affecting 138 trees on 65 acres in Nevada (Figure 12). The mortality was predominantly in Washoe and Douglas counties with the remaining mortality in Carson City counties.

**Carson City County** – 27 trees killed on 14 acres in spots scattered throughout the Carson Range from Skunk Harbor to the headwaters of Kings Canyon.

**Douglas County** –53 trees killed over 27 acres scattered throughout the Carson Range with spots found mostly in the mid-slope elevations and higher. Spots were observed from just south of Kingsbury Grade north to Highway 50. Some of these trees are most likely killed by California Flathead Borer (*Melanophila californica*), especially along the eastern Carson Range front, but it is impossible to differentiate from the air.

**Washoe County** – 58 trees killed on 25 acres were scattered in small spots near Alum Creek, upper watershed of Gray Creek, headwaters of Brown's Creek below Mt Rose Highway, and in small spots from Ophir Creek south to Marlette Lake.

### **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 2010, MPB-caused tree mortality in pines in Nevada generally declined. The exception was lodgepole pine where tree mortality increased to about 112% of the amount reported in 2009. Limber pine mortality decreased to about 45% of 2009 figures, and the mortality in whitebark and bristlecone pine only decreased to 81% of the number of trees reported in 2009 (Figures 13 and 14). Most of the mortality occurred again in Elko County on the whitebark pine in the Jarbidge Mountains.

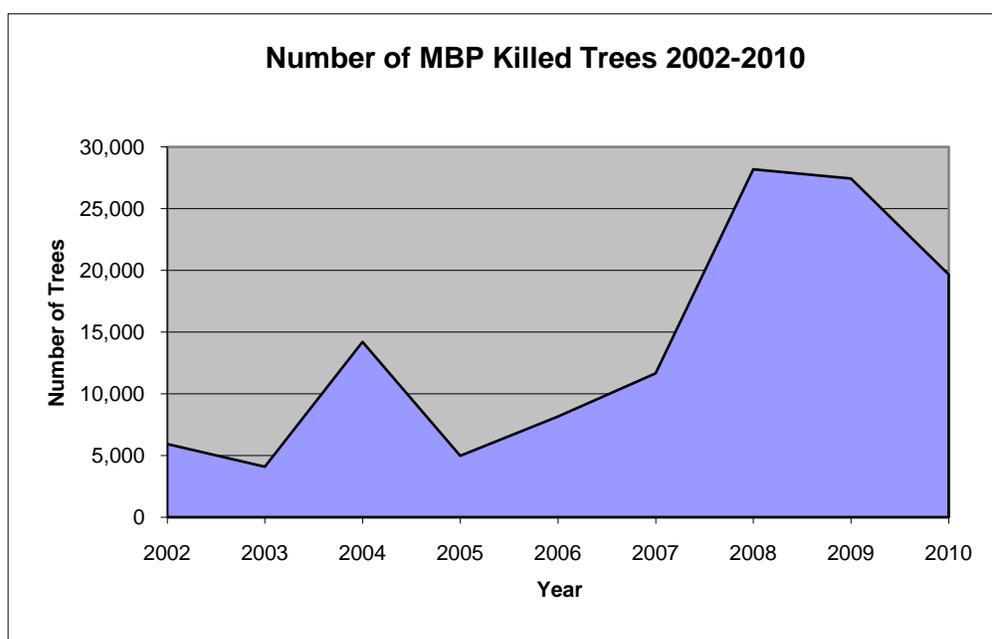


Figure 13 - Number of whitebark, limber, and bristlecone pine trees killed by mountain pine beetle in Nevada and eastern California from 2002-2010.

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

In 2010, mortality of limber pine caused by MPB decreased to 5,220 acres and 5,524 trees, which is 28% of the 2009 acreage and 45% of the 2009 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 2010 decreased slightly from 2009 values.

**Clark County** – The 15 trees mapped on 13 acres in the upper elevations of the Spring Mountains was a twentyfold decrease in mortality from 2009. The mortality was in scattered spots at the headwaters of Lee and Kyle Canyons at the highest elevations of the Spring Mountains.

**Douglas County** – Beetles killed 1 western white pine tree on the north side of East Peak.

**Elko County** – 869 limber pine and 12,019 whitebark pine trees were mapped on 594 acres and on 14,101 acres, respectively, in 2009. Although the amount of limber pine mortality decreased to 45% of what was mapped in 2009, the whitebark pine mortality only decreased to 82% of that mapped in 2009. There were large areas of whitebark pine mortality throughout the higher and mid elevations of the Jarbidge Mountains (Figure 14). The band of mortality dropped significantly lower in elevation into whitebark pine type in the Jarbidge Mountains. There were small spots of whitebark pine mortality throughout the upper elevations of the Elk Mountains. Most of the limber and whitebark pine mortality in southern Elko County was scattered in small pockets at moderate elevations throughout the Ruby Mountains, on the northern end and eastern side of the East Humboldt Mountains with a few large and small spots in the Independence and Bull Run Mountains. In addition, there were numerous patches of limber pine mortality at the higher elevations of the north end of the Cherry Creek Mountains.

**Eureka County** –133 limber pine trees were mapped on 66 acres in small spots at the north end of the Monitor Range around Summit Mountain.

**Lander County** - 107 limber pine trees were mapped on 60 acres (25% of 2009 mortality) in large to small patches along the upper elevations of the Toiyabe and northern Shoshone Ranges.

**Lyon County** – 11 whitebark pine trees were mapped on 6 acres in one small spot just north of the Middle Sister Mountain in the Sweetwater Mountains.

**Nye County** – 865 dead limber pine trees were observed on 503. This is a decrease to 23% of the mortality of 2009. Most of it was found in numerous small to medium-sized spots mapped throughout the highest elevations of the Shoshone, Toiyabe, Toquima and Monitor Ranges with the vast majority of the spots in the Arc Dome, Alta Toquima, and Table Mountain Wilderness Areas, and in the Stoneberger Basin in the northern Toquimas. In addition, limber pine mortality was mapped in one spot on the Hot Creek Range around north side of Morey Peak, in a few small spots on the south end of the White Pine Range and throughout the higher elevations of the Grant and Quinn Canyon Mountains.

**Washoe County** –95 whitebark pine trees on 48 acres (73% of 2009 mortality) were scattered throughout the higher elevations of the Carson Range, mostly north of Mount Rose.

**White Pine County** – 3,511 limber pine trees were mapped on 3972 acres and 40 whitebark/bristlecone pines on 20 acres. This represents about a 63 and 70% decrease in white pine mortality, respectively. Most mortality was observed in small to medium-sized patches that were scattered along the tops of Ward Mountain in the Egan Range, throughout the Snake Range (including Great Basin National Park and Mt Moriah area), throughout the Schell Creek Range, and in a few spot on Pogonip Ridge and near the tops of adjacent mountains in the White Pine Range.



Figure 14. Mountain pine beetle-caused tree mortality in the Jarbidge Mountains moving down slope toward the town of Jarbidge, NV in August 2010 (on far left). Photo: Gail Durham.

### **Mountain Pine Beetle in Lodgepole Pine**

In 2010, MPB activity in lodgepole pine in Nevada increased by 112% of 2009 mortality figures with 228 dead trees on 57 acres.

**Carson City County** - 3 trees mapped on 1 acre in spots on the south end of Marelette Lake, and northeast of Spooner Lake.

**Douglas County** –Mortality recorded in 2010 remained nearly the same at 22 trees mapped in 6 acres in a few spots north of East Peak, at Heavenly Valley, and north of South Camp Peak.

**Washoe County** –Increased in 2010. 203 trees on 51 acres were observed in small spots scattered throughout the Carson Range around Marlette Lake, north of Incline Village and Mt Rose Summit, and on the west side of Little Valley, and one spot near the headwaters of Bronco Creek.

### **Mountain Pine Beetle/Western Pine Beetle in Ponderosa Pine**

In 2010, for the second year in a row, western pine bark beetle activity decreased to approximately 39% of the 2009 mortality. The mortality was found in three counties killing only 21 trees over 10 acres, but mountain pine beetle mortality on ponderosa pine increased in Nye County.

**Clark County** – Mortality decreased with 6 trees mapped on 3 acres occurring in scattered, small spots mostly in the drainage bottoms in the eastern Spring Mountains.

**Nye County** – 150 trees were mapped on 5 acres in a large spot on Rim Rock Canyon in the Eastern Grant Range.

**White Pine County** – Mortality decreased to 74% of 2009 figures with 14 trees affected on 7 acres in three spots in Lehman and Baker Creek drainages in Great Basin National Park in the 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 – Tree mortality caused by the pinyon engraver beetle 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 9.9 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. In 2005, 2006 and 2007, a dramatic decrease of pinyon mortality was seen within the surveyed area, in twelve counties. Although this mortality increased in 2009 up above 2006 levels, it did not represent a significant increase and in 2010, it decreased back down to near 2008 endemic levels (Figure 16).

In 2010, 6,823 acres were infested by pinyon Ips, affecting over 2,997 trees. This represents 15% of the 2009 pinyon pine mortality figures (Figure 16). In 2010, Douglas and Lincoln Counties had the greatest number of trees killed (1,464 trees, 49% of the state total). Most of this new mortality is associated with the affects of the last three years of drought and the large pinyon needle scale and pinyon sawfly outbreaks across the state.

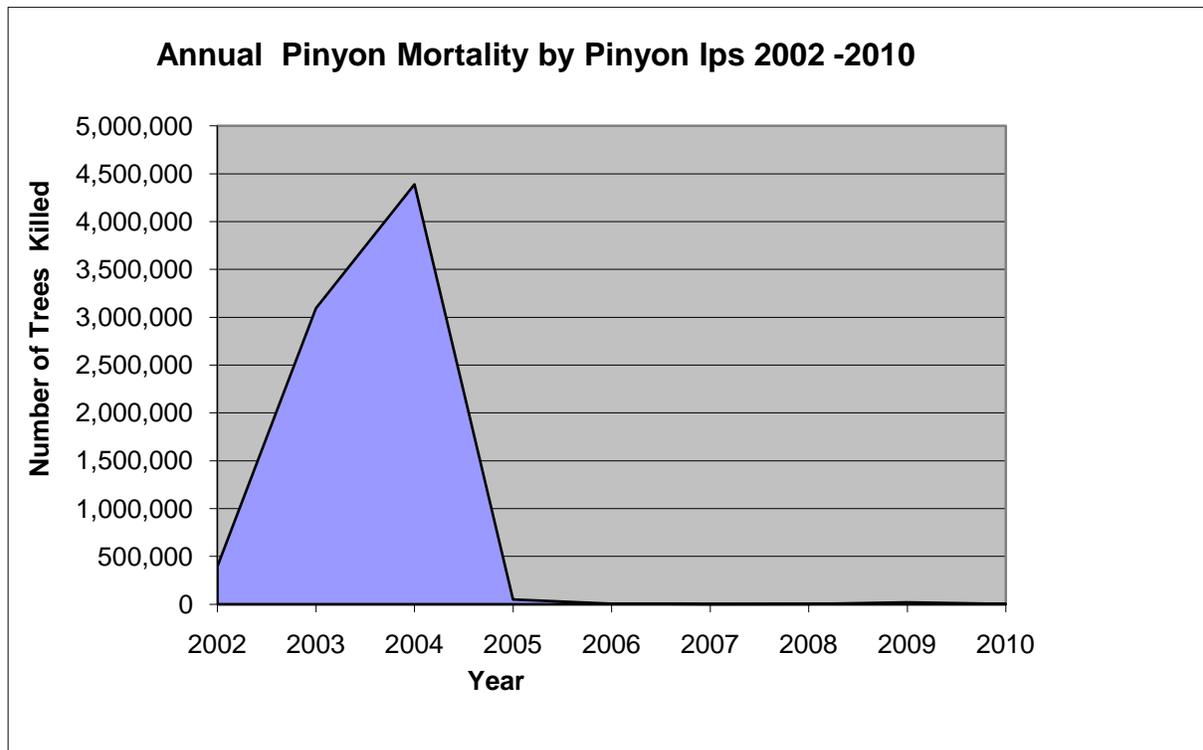


Figure 16 - Number of pinyon pine killed by pinyon engraver beetle in Nevada and two adjacent California counties (Alpine and Mono) from 2002-2010.

**Carson City County** – Pinyon mortality decreased to 15 acres with 31 trees in large areas associated with the pinyon scale outbreak and in small spots throughout Brunswick Canyon watershed and around McTarnahan Hill in the Pine Nut Range.

**Clark County** – 4 acres with 5 trees in two spots: one on the north end and one on the south end of the Spring Mountains.

**Douglas County** –714 trees killed over 435 acres in many scattered spots throughout the Pine Nut Mountain Range from California border north into Lyon County and Carson City County border

**Elko County** –8 trees were mapped on 4 acres with mortality occurring in small spots on the south end of the Ruby Mountains.

**Eureka County** – Increased to 298 trees on 148 acres. Mortality occurred in scattered, small spots at the lower elevations of the Monitor Range and mahogany Hills.

**Lander County** – 56 trees were mapped on 28 acres in scattered spots in the north Toiyabe and Toiyabe Ranges.

**Lincoln County** - There were 750 trees mapped on 5,629 acres. Dead trees were scattered in large areas of pinyon needle scale-affected areas in the White Rock Range, and in many small spots in the Wilson Creek Range.

**Lyon County** – 71 acres with 146 trees scattered in small spots of mortality in the northeast Pine Nut Range.

**Nye County** – 278 acres with 571 trees were observed in scattered spots in the southern White Pine Range, Grant and Quinn Canyon Range, Antelope, Hot Creek, Monitor, Toiyabe, and Shoshone Mountains.

**Storey County** – decreased to 24 acres with 47 trees mapped in the Virginia Range in scattered spots in the northeast area of the Virginia Range.

**Washoe County** – 28 acres with 57 trees was mapped in small spots throughout the northwestern portion of the Virginia Range.

**White Pine County** – Mortality was mapped on 158 acres with 314 trees killed. Some mortality was associated with pinyon needle scale in the western White Pine Range. Mortality was also observed on the north end of the Schell Creek Mountains and scattered throughout 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. This borer kills 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 that came in after fires 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 are found extensively across the state but are not mapped by ADS.



Figure 17 - Pitch mass borer infesting 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 2009, this insect was found commonly in the areas with the heavy scale infestations. 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). This moth is still active in Nevada and is mixing in with the pinyon needle scale in many of the infested areas of Nevada in 2010.



Figure 18 –The gray hazy appearance of pinyon tip moth damage as seen 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 2010, gypsy moth was surveyed by Nevada Department of Agriculture (NDOA). Trapping was conducted from May 3<sup>rd</sup> to November 16<sup>th</sup>. 656 traps were placed in 17 counties; all traps were negative. The last identified adult male was discovered in an RV park in Winnemucca in 1999.



Figure 19 - Adult gypsy moths; female above; male below, Photo: USDA APHIS PPQ archive, [www.bugwood.org](http://www.bugwood.org).

### Red palm weevil

*Rhynchophorus ferrugineus*

Hosts: various palm tree species

Red palm weevil (*Rhynchophorus ferrugineus*), South American weevil (*Rhynchophorus palmarum*), and Silky cane weevil (*Metamasius hemopterus*) were surveyed for with a modified bucket trap baited with pheromone and fermenting fruit. 33 traps were placed in 2 counties; all traps were negative.

## **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 Photo: Whitney Cranshaw, Colorado State University, bugwood.org.

## **Mediterranean Pine Engraver Beetle (MPE) and Red Haired Bark Beetle (RHBB)**

*Orthotomicus erosus* and *Hylurgus ligniperda*

In 2007, Nevada Dept. of Agriculture placed 58 Lindgren traps in 10 Nevada counties along with five Colossus traps placed in Washoe and Lincoln counties for various wood borers, MPE, and RPBB and did not capture any. None 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.

**Exotic Wood Borers including Scolytinae/Sirex Wood Wasp (*Sirex noctillo*), Asian Longhorn Beetle (*Anoplophora glabripennis*), and Emerald Ash Borer Beetle (*Agrilus planipennis*)**

Hosts: various species

In 2010, The Nevada Department of Agriculture NDOA conducted funnel trapping for exotic wood borers using EDRR style trapping methods and sites (39 traps total) surveyed in 7 counties. Samples are currently being processed.

In 2009, The NDOA and the Nevada Division of Forestry cooperatively completed the Early Detection and Rapid Response (EDRR) bark beetle survey of the state for 2009. Nine sites were selected for their proximity to a possible pathway for introductions and for their representation of local forest conditions. Over 4,700 specimens were screened by the State Entomologist. Three new state records of scolytids resulted from the survey. They were cedar (juniper) bark beetle (*Phloeosinus serratus*), fir root bark beetle (*Pseudohylesinus granulatus*), and European shothole borer (*Anisandrus dispar*). Representative specimens of these and numerous other scolytids are being incorporated into the reference collection at the Nevada Department of Agriculture. There also appears to be several new state records for cerambycids, buprestids and other beetles that have yet to be confirmed.

In 2008, forty-two intercept flat panel traps were placed in eight counties and 67 Lindgren funnel traps were placed in fourteen counties. No *Sirex* wood wasps were captured.

In 2007, Nevada Dept of Agriculture placed fifty-eight Lindgren traps and fifty *Sirex* traps in ten counties, as well as five Colossus traps in Washoe and Lincoln counties for various woodborers. No *Sirex* wood wasp, emerald ash borers or Asian longhorn beetles were found in these traps.

In 2010, all Emerald Ash Borer (*Agrilus planipennis*) trapping and data collection was performed by two NDOA part time seasonal employees with the cooperation of USDA/PPQ personnel in the Las Vegas and Reno areas. Trapping was conducted from May 3<sup>rd</sup> to November 16<sup>th</sup>. Two hundred and four traps were placed in 13 counties; all traps were negative.

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

In 2007, Nevada Dept of Agriculture trapped for EPSM with 141 traps in 9 counties in 2007. Four traps were positive in Douglas County in 2006 and one trap was found positive in Washoe County in 2007.

**Light Brown Apple Moth (*Epiphyas postvittana*)**

In 2010, Trapping was conducted from May 3<sup>rd</sup> to November 16<sup>th</sup>. 600 traps were placed in 10 counties; all traps were negative.

**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 beetles were found in 2008 or 2007.

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# STATUS OF DISEASES

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## 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 agents 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 attack by 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, infestation problems may exist in secondary growth and regeneration, as well as mature and overmature tree stands.

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 and north through the Toiyabes 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. Ponderosa and Jeffrey pines are often found heavily infected with western dwarf mistletoe and then are attacked by Ips, flathead borers, Jeffrey pine beetle, and western pine beetle as well as other agents, especially during prolonged drought periods. Additionally, true fir infected with dwarf mistletoe are commonly attacked by fir engraver beetle, or experience branch dieback due to *Cytospora* canker.

Currently, fuel reduction activities are being undertaken in heavily DMT infested stands of pinyon pine in western Nevada. The treatments are being done to create a buffer between non-infected stands and infected stands to prevent the spread of this disease (see Figure 21 below). This type of treatment can be effective due to the primarily short range spread mechanism of dwarf mistletoes.



Figure 21 – Buffer treatments and fuel breaks being installed (December, 2010) in heavily dwarf mistletoe-infested singleleaf pinyon pine stands in the Pinenut Mountains of western Nevada.

### **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 22) and causes branch flagging on larger more resistant 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 22 - Singleleaf pinyon pine that is infected with pinyon blister rust near its base.

### **White Pine Blister Rust**

*Cronartium ribicola*

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

White pine blister rust (WPBR) has been observed in western Nevada on the east side of the Sierra Nevada Mountains in sugar, whitebark and western white pines. 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 WPBR 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. There is concern that WPBR could become established in sensitive populations of Great Basin bristlecone pine. In 2010, researchers initiated an effort to collect seed from Great Basin bristlecone to include this species into breeding efforts aimed at detecting resistance to WPBR in 5 needle pines. Additionally, seed from bristlecone in Great Basin National Park will be collected in 2011.

## **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 observed 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. Annosum can be found in mature trees on the east side of the Sierras and the fungus can kill young ponderosa pine, especially in plantations on droughty soils. Symptomatic small trees can frequently be found around infected stumps with butt decay. The symptoms on larger trees include a thinning crown, decay in the root system and fruiting bodies that develop at the base of the tree or inside stumps.



Figure 23 - Annosum root disease conk at the base of a tree.

## **Armillaria Root Disease**

*Armillaria* spp.

Hosts: All trees



Figure 24 - Armillaria mushrooms, photo: Gail Durham

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 wagneri*

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



Figure 25 - 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 that are 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 2010.

## 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



Figure 26 - Symptoms of aspen leaf spot disease.

2010, it has been seen in the northern Toiyabes in heavily frost damaged aspen stands.

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## DECLINES / COMPLEXES

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### 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 2010, mortality attributed to subalpine fir mortality complex was 94% of 2009 mortality and resulted in the death of 1,242 trees (Figure 27). The acreage affected in 2010 was 1,389 acres. Most of this subalpine fir mortality was on the Mountain City and Jarbidge Ranger Districts of the Humboldt-Toiyabe National Forest in Elko County.

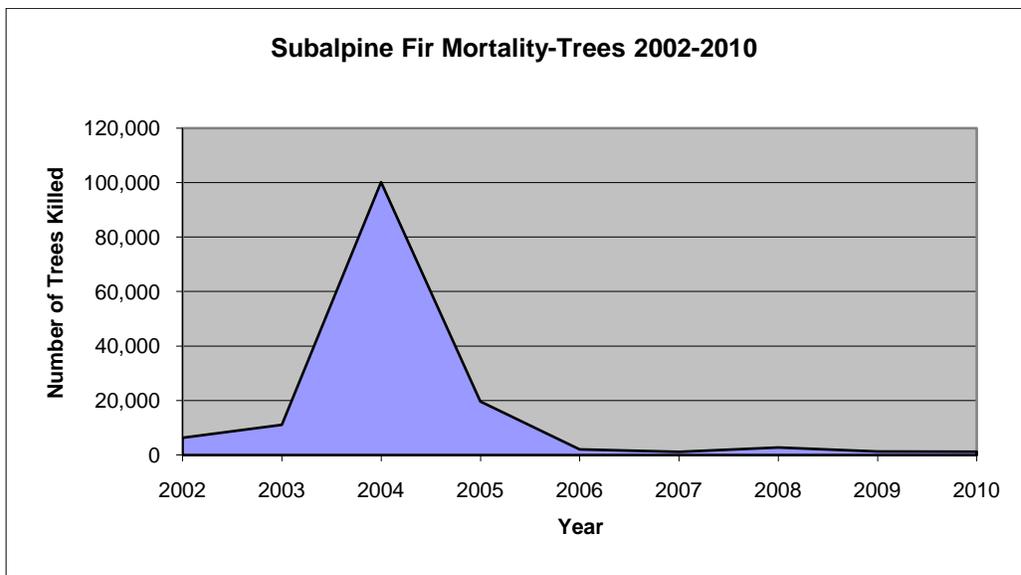


Figure 27- Number of subalpine fir killed in Nevada from 2002-2010.



Figure 28 - Subalpine fir mortality.

**Elko County** – Over 1,242 trees in scattered patches of mortality were mapped in the Jarbidge Mountains, including the Jarbidge Wilderness, in the Elk Mountains, the Bull Run Mountains, and the northern Independence Mountains.

### **Aspen Decline/Dieback**

Host: Aspen

A decrease in the amount of aspen forest acreage has been reported throughout the western U.S. for many years. The primary factors 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.

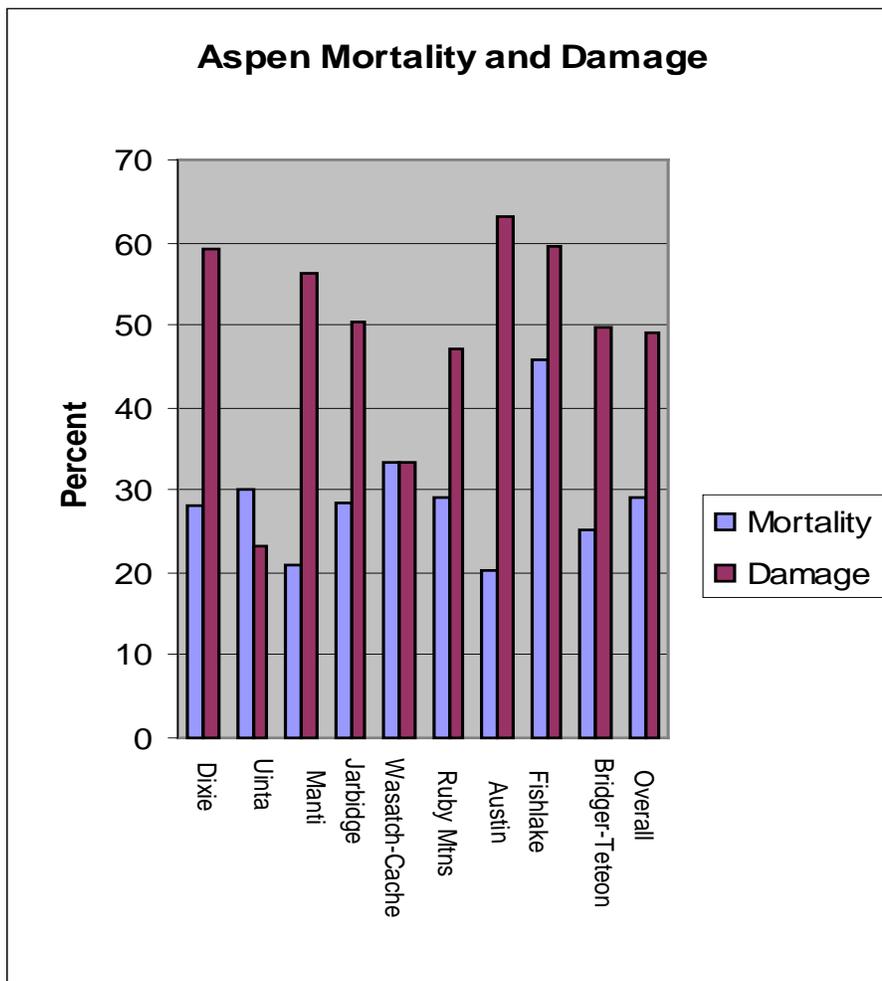


Figure 29 – Percentage of aspen damaged and killed in National Forest Ranger Districts in 2006.

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 29). The most common agents involved were canker diseases and insect borers. In the aspen regeneration, the number of trees per acre 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) and Ranger Districts (RD).

<b>Forest (District)</b>	<b>Trees per acre</b>	<b>Percent Damaged</b>
Dixie NF	2,300	57.4
Uinta NF	416	5.2
Manti NF	5,600	25.4
Wasatch-Cache NF	4,300	11.6
Humboldt-Toiyabe NF (Jarbidge RD)	3,360	36.9
Humboldt-Toiyabe NF (Rubies RD)	1,450	47.8
Humboldt-Toiyabe NF (Austin RD)	1,813	68.9
Fishlake NF	3,550	47.9

In 2010, 7,769 acres of aspen dieback were mapped in eleven counties. This is a decrease of 62% when compared to 2009's figures. There were decreases in some counties such as Douglas, Elko, Eureka, Humboldt, Lander, and Nye, but slight increases or the same amount in Carson City, Lincoln, Storey, White Pine, and Washoe counties.

**Carson City** – 29 acres of dieback in one spot in lower Kings Canyon.

**Douglas County** – 10 acres of dieback in a spot on the California State line on the Carson River.

**Elko County** – 4,199 acres of dieback was mapped in numerous spots in the lower elevations of the south and west Jarbidge Mountains, in small spots throughout the Tennessee, Mahoganies, Elk, Bull Run, Independence, East Humboldt, and Ruby Mountains.

**Eureka County** - 75 acres of light dieback was mapped in small spots in the northernmost end and a few spots just south of Ryegrass Canyon in the Monitor Range.

**Humboldt County** – 748 acres of aspen dieback occurred throughout the Santa Rosa Range and in the southeast Odell Mountains in small to medium-sized pockets. This is about 87% of the 2009 acreage.

**Lander County** – 109 acres of aspen dieback occurred in a number of small spots on the north end of the Toiyabe Range just south of Austin Summit.

**Lincoln County** – 31 acres was mapped in the Wilson Creek Mountains

**Nye Counties** – 2,416 acres of dieback was mapped in scattered small spots in the lower elevations of the Toiyabes from Stewart Creek Campground to the county line, in one spot on the Shoshone Range at Wild Carrot Springs. It was found in small

spots throughout the Toquima Range from just south of Jefferson Canyon north to White Rock Canyon, and in the Monitor Range from the top of Big Cottonwood Canyon north to the county line. The acreage of 2010 dieback was about 89% of 2009's dieback.

**Washoe County** –67 acres was found in small spots southwest of Peavine Peak

**White Pine County** – 77 acres dieback was mapped from small patches at mid elevations in Second and Third Creeks in the Schell Creek, one patch in the northern Egan Range at the headwaters of Ragsdale Canyon at the south end of Ward Mountain, and between Paris and Snow Creeks in the Cherry Creek Range.

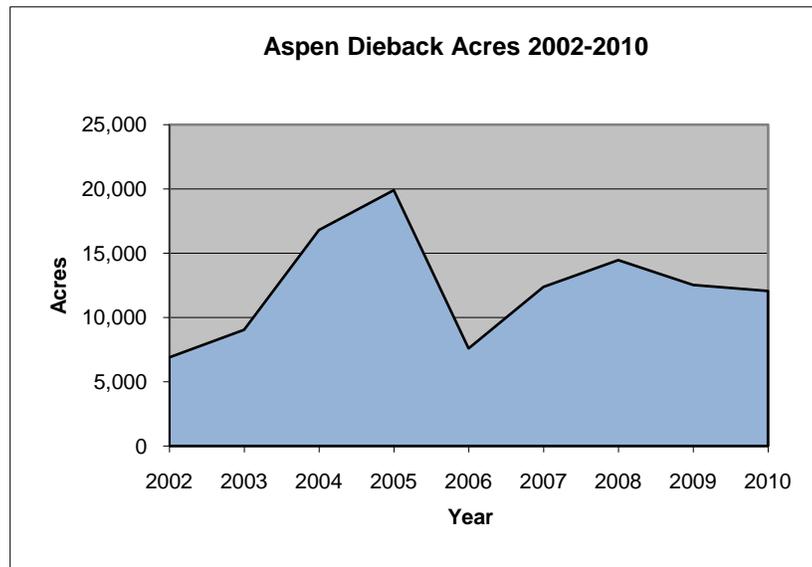


Figure 30 - Acres with aspen dieback in portions of California and Nevada from 2002-2010.

### **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 can look 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 2009, much of the aspen decline showed overstory decline but the understory regeneration was healthy.

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## ABIOTIC DAMAGE

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### Drought Damage

Host: curlleaf mountain mahogany

Extensive yellowing and loss of curlleaf mountain mahogany (*Cercocarpus ledifolius* Nutt. Ex Torr. & Gray) foliage was seen during the 2007 through 2010 ADS throughout the state. These evergreen leaves had turned yellow or red before dropping. In many areas, only small tips of green leaves remained on the trees. In many of the areas that were declining, mountain mahogany mortality has occurred in the centers of the large patches (Figure 32). In 2010, the mahogany appeared to recuperate although many have dead centers. The amount of decline decreased in 2010 (see Figure 31).

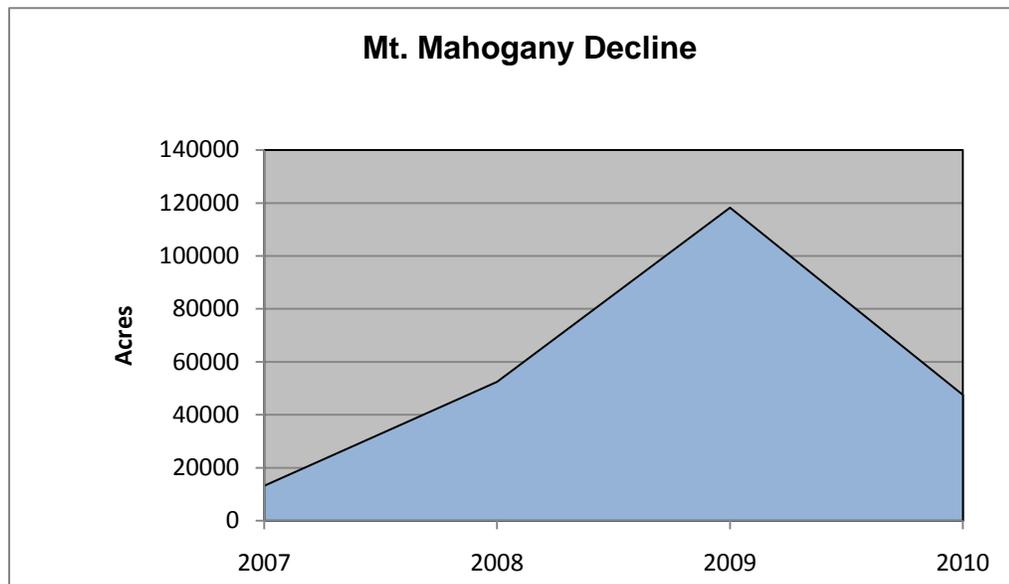


Figure 31 – The acreage of curlleaf mountain mahogany decline from 2007-2010.

In 2010, the affected acreage (46,572 acres) decreased to 39% of the 2009 acreage (118,224) (Figure 31). In 2010, the number of counties affected (eleven) remained the same as in 2009. White Pine County had the majority of the followed by Nye County with moderate amounts in Clark and Eureka County. Significantly less damage was found in Douglas, Elko, Lander, Lincoln, and Lyon Counties. Humboldt and Washoe Counties had low damage.

**Clark County** – 3,663 acres of decline was observed in the large polygons on the upper ridges of the Spring Mountains on the south side of the La Madre Mountains, south side of Kyle Canyon, the ridges between Kyle and Lee Canyons, the headwaters of Trout and Lovell Canyon.

**Douglas County** – 323 acres of decline was observed in small patches in the eastern Pinenut Mountains north of Red Canyon and on the ridge to the west of Desert Creek in the Sweetwater Mountains near the California border.

**Elko County** – 745 acres of light decline was mapped in small patches at the south end of the Mahoganies, and on the ridge just south of Coon Creek Summit and the ridges adjacent to Dry Creek in the Jarbidge Mountains, and in numerous patches in the north Cherry Creeks and in the eastern and along the south fork of Lindsay Creek in the Ruby Mountains.

**Eureka County** – 4,043 acres of decline was mapped in small patches in the northern Monitor Range, the northern Antelope Range, and the southern Mahogany Hills. .

**Humboldt County** – 54 acres was mapped in the Santa Rosa Mountains

**Lander County** – 477 acres was observed in small patches of the Northern Shoshone and northern Toquima, northern Toiyabe Mountains.

**Lyon County** – 664 acres in the Sweetwater Mountains from the top of Desert Creek Peak south to the California border,

**Nye County** – 16,222 acres decline was mapped in many medium-sized patches throughout the Monitor, Toquima, central Toiyabe, Northern Shoshone ranges, Antelope and the northern Hot Creek Ranges and small patches in the western side of the Grant, and Quinn Canyon Ranges.

**Washoe County** –111 acres(10 % of 2009 acres) decline was found in two large patches just north of the Thomas Creek and at the headwaters of Evans Creek.

**White Pine County** – 19,528 acres decline was mostly detected in large areas of the northern Snakes on the lower ridges surrounding Mount Moriah, the ridges around Windy Peak, and south scattered along the eastern side of Great Basin National Park, and in small patches scattered throughout the Cherry Creek, Cocomongo, northern Egan (including the Ward Mountain area), Schell Creek, the Duck Creek Ranges, and one small patch on Indian Garden Mountain in the White Pine Range.



Figure 32- Typical drought damage on curleaf mountain mahogany foliage near the top of the east side of the Pinenut Mountain Range, NV in 2010.

Note dead gray areas in middle of mahogany stands with yellow defoliation & 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 mapped in 2010.

## **Wildfire Damage**

A few smaller fires in western and southern Nevada burned hundreds of acres of pinyon pine, ponderosa pine and Jeffrey pines. In 2010, 705 Jeffrey pines on 116 acres in Carson City County in three areas north of Deadman's Point and south of Skunk Harbor, 50 Jeffrey pines on 25 acres in Washoe County just north west of Incline Village, 45 Jeffrey pines over 8 acres north of Deadman's Point in Douglas and 150 pinyon pines over 185 acres and the north end of the Wellington Hills in Douglas County, and 50 ponderosa pines over 34 acres just above Rainbow subdivision in Kyle Canyon in Clark County were burned over.

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## Noxious weeds

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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 had hired a Weed Geographic Information System Mapping Coordinator, Kim Williams, which significantly helped with monitoring weed populations in Nevada. There is no more funding for this work at this time. 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](http://www.agri.nv.gov/PLANT_NoxWeeds_index.htm)

### Toadflax Bio-control

Toadflax stem boring weevils (*Mecinus janthinus*)

On June 2<sup>nd</sup> NDOA made a trip to Salt Lake City to collect the stem boring weevil (*Mecinus janthinus*) off of Dalmatian toadflax. On June 3<sup>rd</sup> an inspection of the five release sites in Pioche Nevada was performed. One of the four sites had been mowed down in the spring. Of the four remaining four, all had signs of insect damage with three of the four site having adult weevils on the plants. Three additional releases of 300 weevils each were conducted on June 3<sup>rd</sup> in Pioche at the Main Street mine tilling, the elementary school, and the water treatment area. Two additional inspections of the Pioche sites were conducted on August 30<sup>th</sup> and November 3<sup>rd</sup>; all sites shown signs of plant damage and over wintering adults.

On June 9<sup>th</sup> an inspection of the Gold Hill and Gardnerville release sites was conducted. No signs of establishment have been seen since the initial release in 2007. On the June 9<sup>th</sup> another release of 500 weevils each was conducted at both sites. One additional inspection of these sites was conducted on October 16<sup>th</sup> with both site having a small number of over wintering adults in there stems.

On November 17<sup>th</sup> a trip was made to Salt Lake City to collect stems with over wintering adults. They were brought back to Reno and place in cold storage to be reared out and released in the spring of 2011.

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](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](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.