United States
Department
Of Agriculture
Forest Service
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

2013 Forest Pest Conditions In Nevada

Forest Health Specialists

Forest Health Protection

USDA Forest Service
Ogden Field Office
Forest Health Protection
4746 S 1900 E
Ogden, UT 84403
Phone: 801-476-9720
FAX: 801-479-1477

Steve Munson, Group Leader
Email: smunson@fs.fed.us
Darren Blackford, Entomologist
Email: dblackford@fs.fed.us
Danielle Reboletti, Entomologist
Email: dreboletti@fs.fed.us
Valerie DeBlander, Forestry Technician
Email: vdeblander@fs.fed.us
John Guyon II, Pathologist
Email: jguyon@fs.fed.us
Elizabeth Hebertson,
Entomologist/Pathologist
Email: lghebertson@fs.fed.us
Laura Dunning, Program Assistant
Email: ldunning@fs.fed.us

Nevada Division of Forestry

Department of Conservation
and Natural Resources
State Headquarters
2478 Fairview Dr.
Carson City, NV 89701

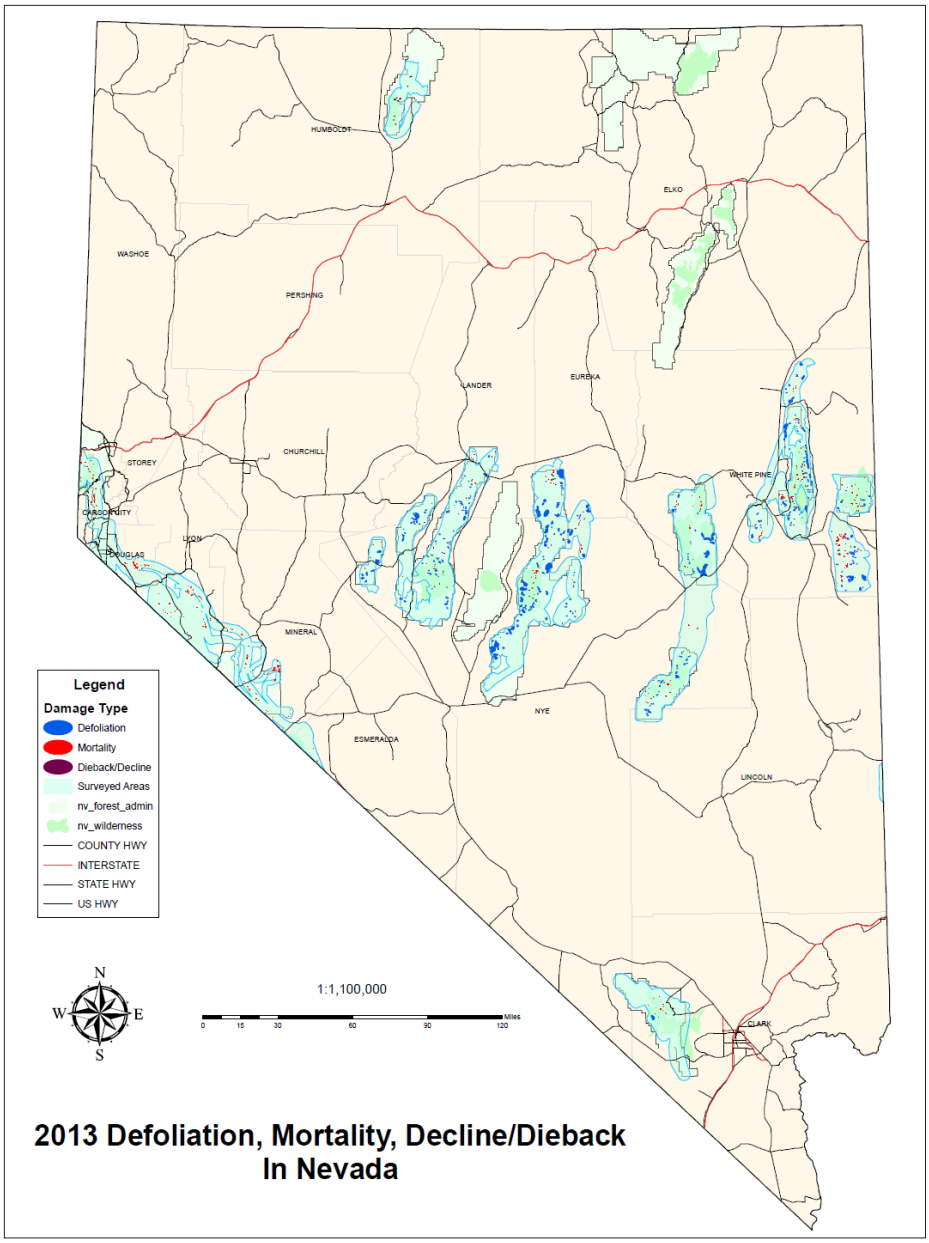
Gene Phillips, Forest Health Specialist
Email: gphillips@forestry.nv.gov
Phone: 775-849-2500 Ext..241

John Christopherson, Resource
Program Manager
Email: jchrist@forestry.nv.gov
Phone: 775-684-2507

Compiled by:
Gene Phillips, Forest Health Specialist, NDF DCNR
&
Danielle Reboletti, USFS, Entomologist

With Contributions from:
Dick Halsey, USFS FHP GIS Specialist
John Guyon II, USFS FHP Pathologist
Jeff Knight, Nevada State Entomologist
Dr. Shouhua Wang, Nevada State Pathologist

April 2014



2013 Defoliation, Mortality, Decline/Dieback In Nevada

Table of Contents

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 the 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 2013 was on 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 proportion was surveyed to obtain data for Great Basin National Park, other federal lands, State lands, and private lands (Table 1).

TABLE1. TOTAL NUMBER OF ACRES SURVEYED IN EACH OF THE OWNERSHIP CATEGORIES FOR THE YEARS 2005 TO 2013 (INCLUDES CALIFORNIA ACRES SURVEYED AS WELL AS NEVADA ACRES).

Land Ownership/Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
NF H-T (NV)	3697000	2508400	3739200	4757970	3998170	4340053	4008334	4011229	3340095
NF-HT (CA)	531600	548000	560700	582000	551238	595850	582933	582933	685252
BLM	1109000	712300	938600	1924990	2074498	2299901	1937082	1892996	1013172
private (NV)	344300	153200	381900	440637	540760	360,865	519280	306606	148504
private (CA within NF)	31500	38000	36200	31800	28071	32335	41528	29846	60155
Great Basin NP	76700	77000	76900	75995	77005	76890	75604	75604	76959
Other Federal*	2900	10800	4500	41967	38530	1007	33228	33228	6466
NV State Lands	18000	3000	20100	17073	22113	20579	20105	17163	148504
TOTAL	5811000	4050700	5758100	7872432	7330385	7727480	7218094	6949605	5479107

*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 2013 are only from Nevada and summarized on a county basis. The total number of acres in each county and the percentage of acres surveyed during 2013 are provided in Table 2.

TABLE 2 NUMBER AND PERCENTAGES OF ACRES SURVEYED IN NEVADA COUNTIES IN 2013

COUNTY	Total Acres in County	2013 Acres Surveyed	2013 % Surveyed
Carson City	103,569	20,062	19.4
Clark	5,176,177	279,089	5.4
Douglas	478,351	236,748	49.5
Elko	10,979,963	0	0.0
Esmeralda	2,294,165	54,942	2.4
Eureka	2,663,738	179,622	7.6
Humboldt	6,219,557	163,174	2.6
Lander	3,534,543	239,785	6.8
Lincoln	6,782,623	48,121	0.7
Lyon	1,310,315	286,510	21.9
Mineral	2,462,989	290,598	11.8
Nye	11,686,348	1,694,272	14.5
Pershing	3,863,680	0	0.0
Storey	167,774	0	0.0
Washoe	4,234,009	103,366	2.4
White Pine	5,676,727	1,254,614	22.1
Total	63,770,848	4,850,902	7.6

In 2013, the amount of insect and disease-caused tree mortality generally decreased. This decrease can be attributed to above normal moisture in 2010-2011. Adequate precipitation is necessary to maintain tree vigor and resistance to insects and pathogens. The western states, including Nevada, experienced below average precipitation in the winter of 2011- 2012, 2012-2013, and again in the winter of 2013-2014 (Figure 1).

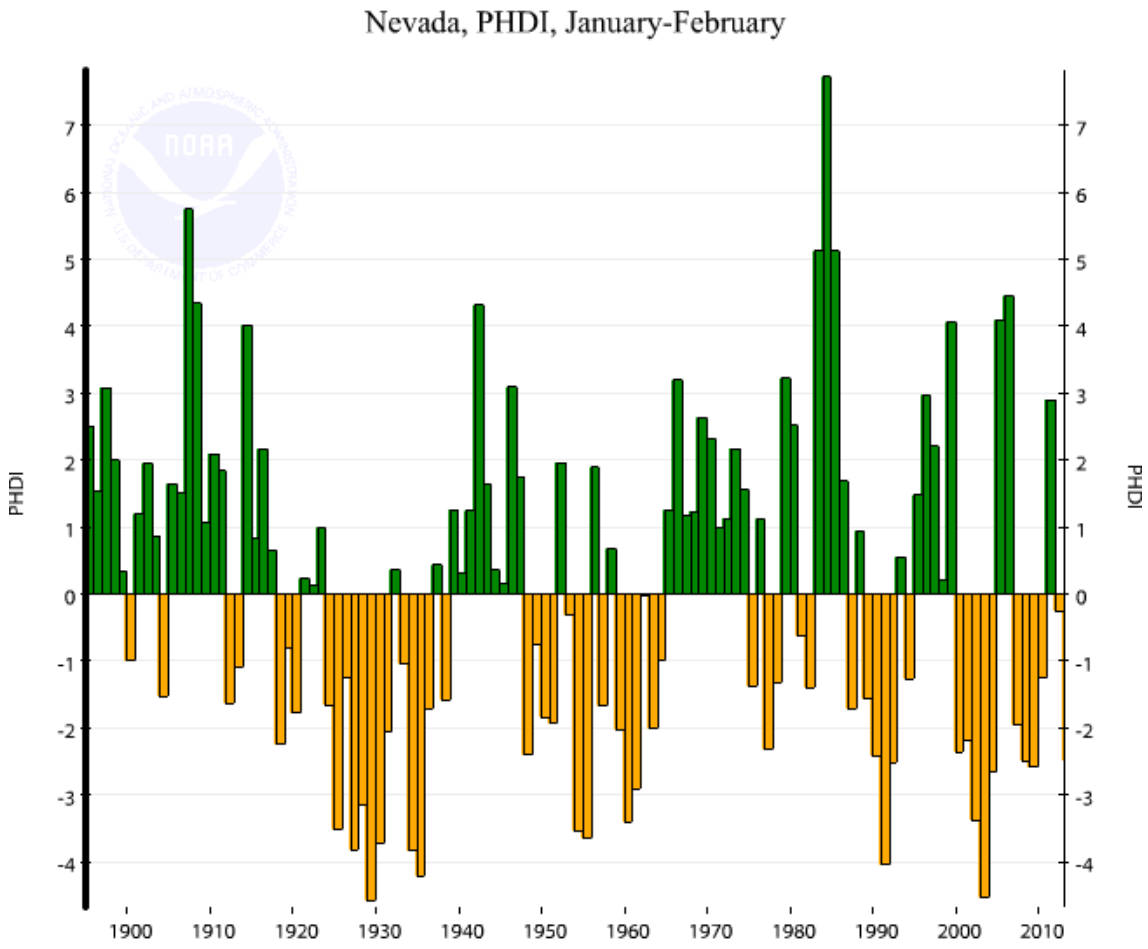


Figure 1 - National Oceanic and Atmospheric Administration (NOAA) Nevada Palmer Drought Severity Index –Z of January -February Precipitation from 1885-2013 (National Climate Data Center).

Most of the tree mortality noted in 2013 is attributed to fire (54,835 trees in Douglas and Lyon counties). Bark beetle activity caused the second most amount of tree mortality across the state. Defoliation by pinyon scale and pinyon sawfly contributed the most acres affected. Please note that some 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 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 been occurring for a few years, but was only visible from the air starting in 2009. Above average precipitation in the winter of 2010-2011, caused a re-foliation of the pinyon and a general improvement in overall pinyon health. The drought in the winter of 2011-2012 & 2012-2014 contributed to continued defoliation, and twig beetles helped increase mortality on the younger trees. Aspen and curlleaf mountain mahogany decline is largely attributed to successive years of drought, in conjunction with stress/damage induced by other biotic and abiotic factors such as a late spring/early summer frost.

In 2013, Nevada mortality caused by most insects and diseases (number of trees killed) decreased for the fourth year in a row. The exceptions were: mountain pine beetle in lodgepole pine increased 282% from 89 trees in 2012 to 340 trees in 2013 in western Nevada; western pine beetle increased

108% from 56 trees killed in 2012 to 117 trees killed in 2013; and Douglas-fir beetle caused tree mortality increased from 3 trees in 2012 to 10 trees in 2013.

TABLE 3. TREE MORTALITY ATTRIBUTED TO FOREST PEST THAT WAS AERIALLY DETECTED IN 2013 BY COUNTY

	Mountain Pine Beetle White Pines[1]		Fir Engraver Beetle		Western Pine Beetle		Jeffrey Pine Beetle		Pinyon Engraver Beetle	
COUNTY	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Carson City							8	2		
Clark	5	2	10	5	41	18			2	1
Douglas			9	2					775	228
Elko										
Eureka									6	3
Humboldt	53	26							20	10
Lander	71	36								
Lincoln	3	1							96	48
Lyon										
Mineral	10	1							1,124	369
Nye									4,283	1,432
Pershing	128	64							351	227
Storey										
Washoe	477	235					3	1		
White Pine	1,561	739	75	37	76	81			368	187
Total	2,308	1,104	94	44	117	98	11	3	7,025	2,504

[1] Mountain pine beetle-caused tree mortality occurring in western white, whitebark, lodgepole and limber pine. In 2013, mortality caused by Douglas-fir beetle included 10 trees covering 5 acres in White Pine County. Subalpine fir mortality complex included 773 trees on 712 acres in Elko County and 5 trees on 2 acres in White Pine County.

In 2013, acres affected by defoliators decreased. Pinyon needle scale decreased nearly 90% in 2013 to 48,899 acres (See 2012 ADS Damage Map- Page ii); pinyon sawfly decreased 80% to 16,201 acres affected; Douglas fir tussock moth on subalpine fir decreased to 0 acres from 299 acres in 2012; and forest tent catepillar on aspen decreased 100% as well: from 1390 acres in 2012 to 0 acres in 2013. On the other hand, mountain mahogany defoliationincreased 136% to 16,237 acres in 2013 from 6,916 acres in 2012; and aspen decline increased about 10%: from 538 acres in 2012 to 591 acres in 2013. Aspen dieback, however, decreased by 90% in 2013 (from 5757 acres in 2012 to 548 acres in 2013). The previously mapped (2012 ADS) 2247 acres of new Jeffrey and lodgepole pine needle scale defoliation (in Washoe County) was not detected in 2013. In additon, the 2012 outbreak of satin moth on aspen in locations throughout Nevada was observed in 2013 on 34 acres (down from 80 acres); the defoliation was mapped in western Nevada and reported in sites throughout northern Nevada (Table 4).

TABLE 4. INSECT DEFOLIATION AND ASSOCIATED DECLINE BY COUNTY IN 2013.

	Aspen Decline/Dieback	Forest Tent Caterpillar/Frost/Other defoliators on Aspen	Singleleaf Pinyon Pine Defoliation by Needle Scale & Sawfly	Curl leaf Mountain Mahogany Drought Damage
COUNTY	Acres	Acres	Acres	Acres
Carson City		4		
Clark			952	
Douglas				
Elko				
Eureka			12,239	
Humboldt	653			712
Lander			1516	
Lincoln	41		7	2550
Lyon				508
Mineral				
Nye			30,662	
Pershing	442			6,691
Storey				
Washoe		30		
White Pine	4		3,935	5776
Total	1140	34	49,311	16,237

Tables 3 & 4. Produced by G. Durham, Nevada Division of Forestry, with updates by D. Reboletti, Forest Health Protection, using data provided by USDA FS Forest Health Protection.

Below is a summary graph showing the acres affected in Nevada by main mortality and defoliation agents aerially mapped in 2013. The majority of the damage was from defoliation of pinyon pine in 2013.

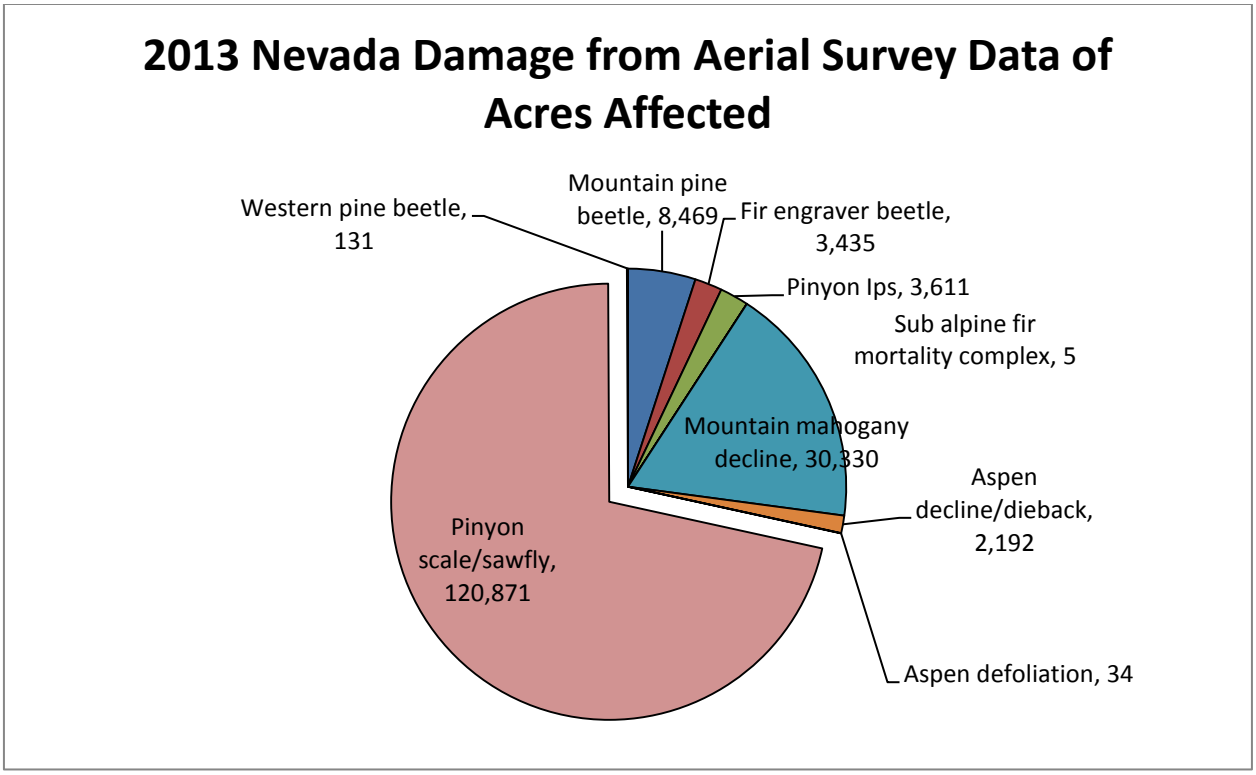


Figure 2 – Grahpic representation of the acres affected in Nevada by the main mortality and defoliation agents aerially mapped in 2013.

For additional information on forest insect and disease conditions and maps see:

http://forestry.nv.gov/forestry-resources/forest-health/

NOXIOUS WEEDS

Noxious weed species are widespread throughout Nevada. Nevada Department of Agriculture (NDOA) monitors and oversees Nevada's weed laws. Their main website for weed status, information, contacts, etc is:
http://agri.nv.gov/PLANT_NoxWeeds_index.htm

Below is NDOA's listing of Noxious Weeds in Nevada by Category A, B or C:

Common Name	Scientific Name
Category A Weeds:	
African Rue	Peganum harmala
Austrian fieldcress	Rorippa austriaca
Austrian peaweed	Sphaerophysa salsula / Swainsona salsula
Black henbane	Hyoscyamus niger
Camelthorn	Alhagi camelorum
Common crupina	Crupina vulgaris
Dalmation Toadflax	Linaria dalmatica
Dyer's woad	Isatis tinctoria
Eurasian water-milfoil	Myriophyllum spicatum
Giant Reed	Arundo donax
Giant Salvinia	Salvinia molesta
Goats rue	Galega officinalis
Green Fountain grass	Pennisetum setaceum
Houndstongue	Cynoglossum officinale
Hydrilla	Hydrilla verticillata
Iberian Starthistle	Centaurea iberica
Klamath weed	Hypericum perforatum
Malta Star thistle	Centaurea melitensis
Mayweed chamomile	Anthemis cotula
Mediterranean sage	Salvia aethiopis
Purple loosestrife	Lythrum salicaria, L.virgatum and their cultivars
Purple Star thistle	Centaurea calcitrapa
Rush skeletonweed	Chondrilla juncea
Sow Thistle	Sonchus arvensis
Spotted Knapweed	Centaurea masculosa
Squarrose knapweed	Centaurea virgata
Sulfur cinquefoil	Potentilla recta
Syrian Bean Caper	Zygophyllum fabago
Yellow Starthistle	Centaurea solstiltialis
Yellow Toadflax	Linaria vulgaris
Category B Weeds:	
Carolina Horse-nettle	Solanum carolinense

Diffuse Knapweed	Centaurea diffusa
Leafy spurge	Euphorbia esula
Medusahead	Taeniatherum caput-medusae
Musk Thistle	Carduus nutans
Russian Knapweed	Acroptilon repens
Sahara Mustard	Brassica tournefortii
Scotch Thistle	Onopordum acanthium
White Horse-nettle	Solanum elaeagnifolium
Category C Weeds:	
Canada Thistle	Cirsium arvense
Hoary cress	Cardaria draba
Johnson grass	Sorghum halepense
Perennial pepperweed	Lepidium latifolium
Poison Hemlock	Conium maculatum
Puncture vine	Tribulus terrestris
Salt cedar (tamarisk)	Tamarix spp
Water Hemlock	Cicuta maculata

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 37 Nevada CWMA's in the state. 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). In 2011, Dalmatian toadflax and tamarisk leaf beetle collections and releases are being coordinated by Jeff Knight, State Entomologist. Tamarisk beetle (*Diorhabda elongate*) has now been observed south along Lake Mead and is as far as Overton. All state (Nevada) and Federal releases of *Diorhabda* have been stopped due to a legal agreement with USDA and another party.

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 of subalpine fir in Nevada. 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.

(Photo from http://www.bugwood.org/)

None of the previous (2012) DFTM defoliation of was detected during aerial surveys in 2013 (Elko County, Nevada). No moths were trapped in 2013.

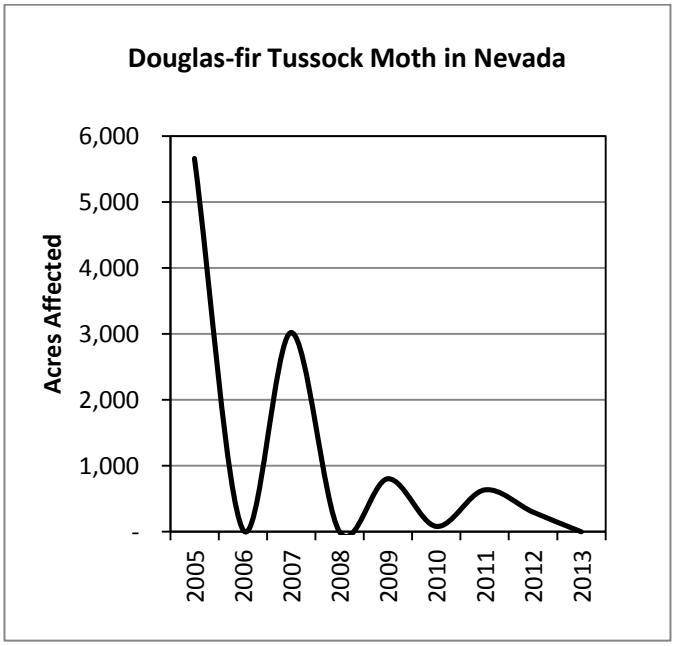


Figure 4 - Acres with Douglas-fir tussock moth defoliation in Nevada from 2005-2013.

Pinyon Sawfly
Neodiprion edulicolus

Host: pinyon pine

The pinyon sawfly is an important native insect capable of causing significant defoliation, but small, lightly damaging populations usually go undetected. However, heavy defoliation causes reduced growth, stress, and tree mortality. Thin crowns add a ghostly, transparent appearance to the forest canopy. In some locations, sawfly outbreaks are occurring in conjunction with pinyon needle scale (*Matsucoccus acalyptus)* defoliation.

In 2013, the outbreaks were still active in some of the same areas mapped in 2012 (in Nye and White Pine Counties), but acres defoliated decreased significantly (80%): from 83,354 acres mapped in 2012 to 16,201 acres mapped in 2013. Much of this area was also mapped as infestated in 2011. Re-foliation of the pinyon helped to mask some of the damage in some areas. However, after the drought year of 2012, areas that had been repeatedly defoliated are losing many small and some large trees.

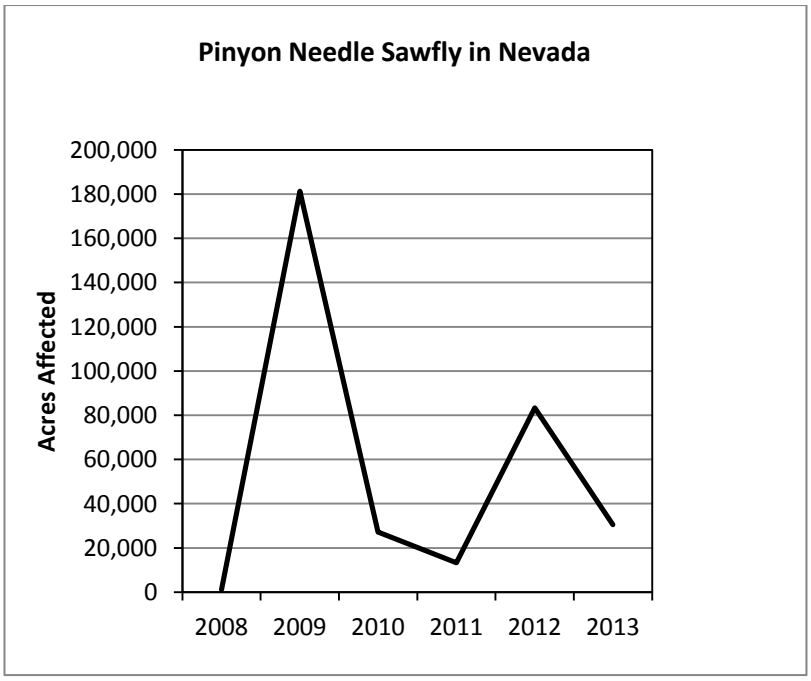


Figure 5 – Pinyon sawfly infested acres in Nevada from 2008-2013.

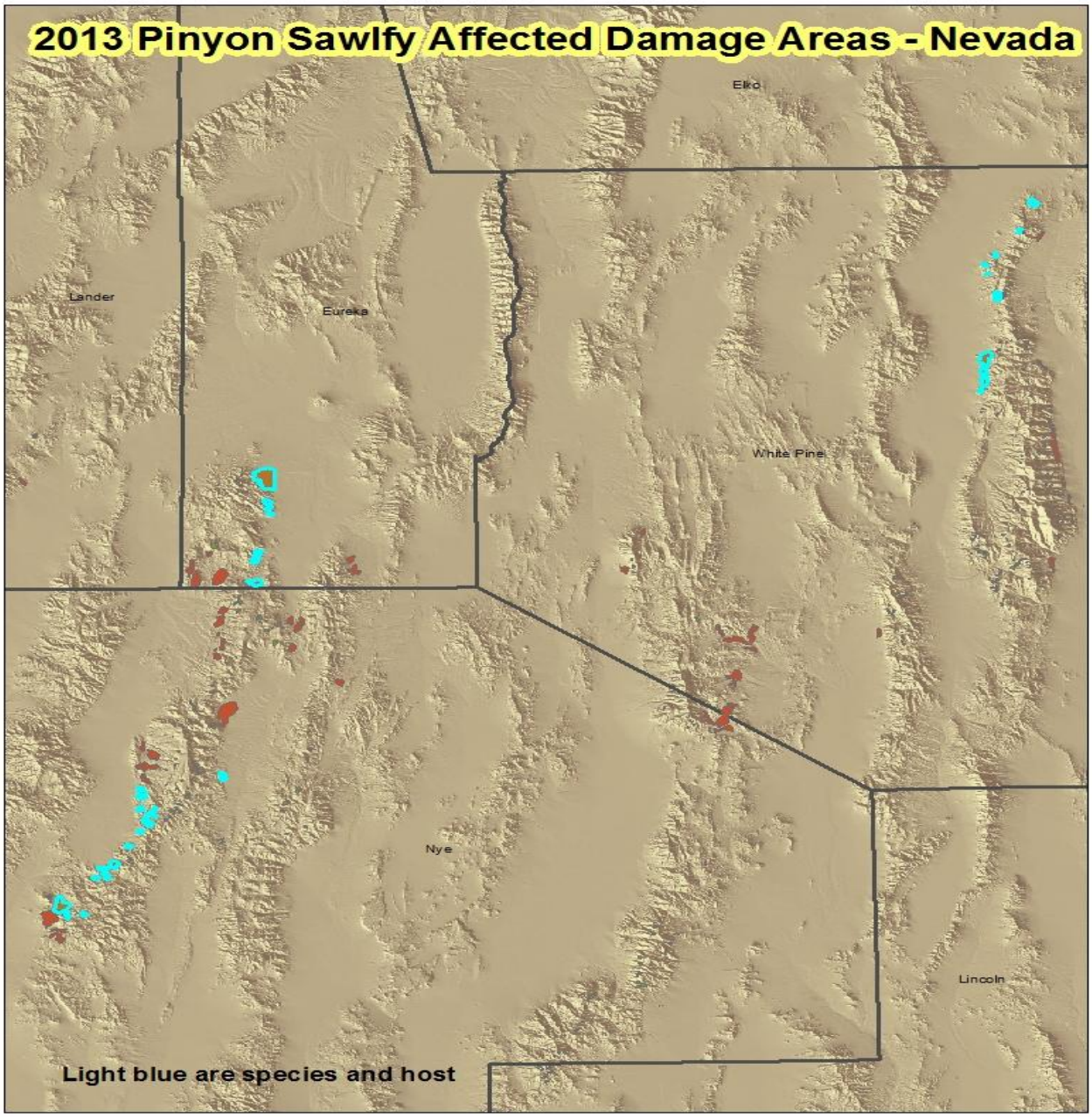


Figure 6- Map showing pinyon needle sawfly damage in 2013.

Eureka County- 6,026 acres found at the lower elevations in southern Eureka County affecting the northeast end of the Monitor Range. There was a 70% decline in acres mapped between 2012 and 2013.

Nye County – 6,240 acres of light defoliation is found throughout the Monitor and Hot Creek ranges. This is an 86% decline in acres of pinyon needle sawfly damage detected in 2013.

White Pine County – 3,935 acres is found in multiple polygons on the north half of the Schell Creek Range. This is a 78% decrease in the acreage mapped in 2013.

Pinyon Needle Scale
Matsucoccus acalyptus

Host: pinyon pine

The pinyon needle scale (PNS) 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. 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.

Drought and scale defoliation likely exacerbated past pinyon mortality. The most severely affected areas were largely comprised of younger trees and occurred in the lowest areas of alluvial fans and hill slopes. In 2010, nearly 11% of the pinyon in Nevada were mapped as scale-defoliated. At this point, PNS was affecting trees in the mid-elevation range. In 2011, the PNS decreased to approximately half of the 2010 acreage, likely due to an above average precipitation year which caused a re-foliation event and an increase in predator and parasites. The re-foliation significantly improved the condition of the trees in the higher elevation areas. In 2013, damage decreased 90% to 48,899 acres. 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 albovitella)* as well as *Matsucoccus monophyllae. Many of the smaller trees in this area have died from damage by these insects (Figure 6).* From the air, this damage is similar in appearance to that of PNS infestation and therefore are all mapped as PNS.

A .

B .

C .

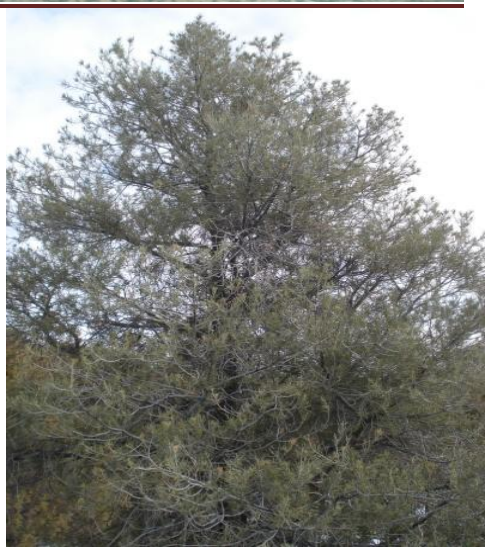


Figure 7 – (A) Top left; Berlin ichthyosaur State Park in 2007 before PNS infestion. Top right; the same area in 2011 (note the see-through appearance of the foliage). (B) nearly epicormic re-growth on the defoliated pinyon in the spring 2011; (C) mature pinyon with heavy PNS infestation in 2012 in central NV.

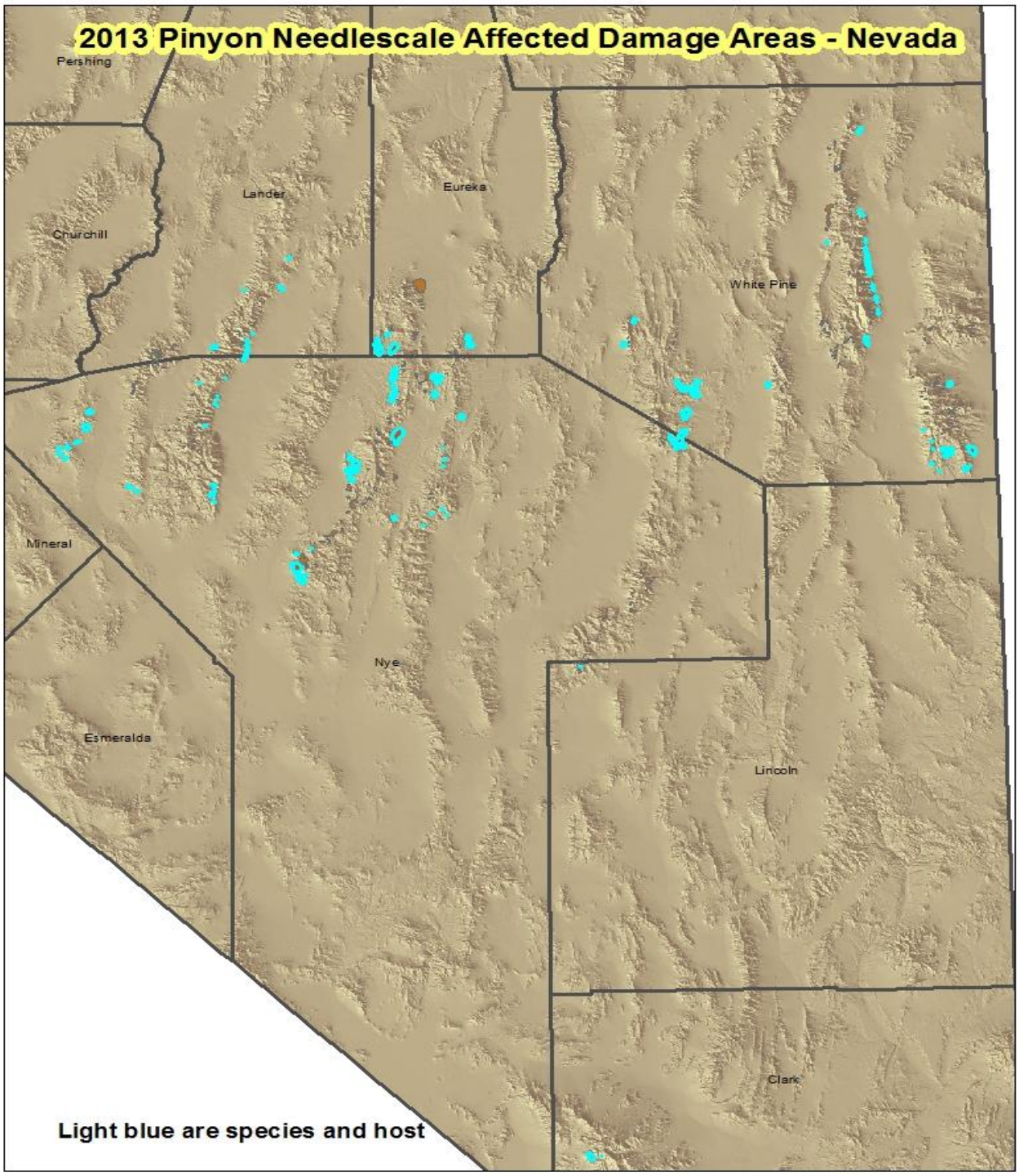


Figure 8- Pinyon needle scale and other insect damage in 2013.

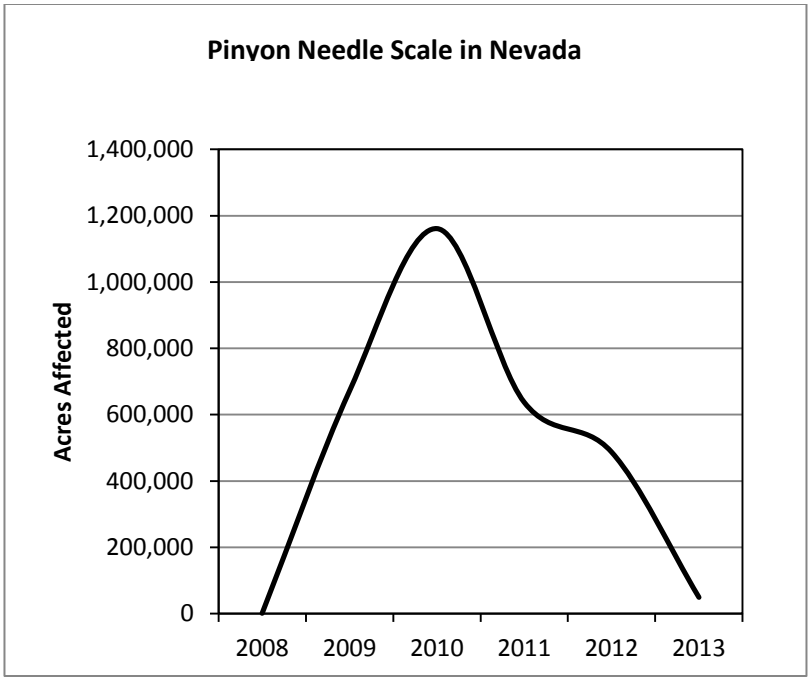


Figure 9 - Acres affected by pinyon pine needle scale in Nevada from 2008-2013.

Clark County – 952 acres of PNS defoliation were mapped; this includes the central Spring Mountain Range, south of Wallace Canyon.
Eureka County- 6,213 acres were detected in large patches on the northern end of the Monitor Range, and the eastern slopes of the Antelope Range.
Lander County – 1,516 acres were mapped in large patches at lower elevation of the Toiyabe Range. This is a reduction from last year.
Lincoln County – 7 acres of PNS defoliation were detected in the center of the Quinn Canyon Range, at mid-elevations, and were moderately infested.
Nye County – 24,422 acres were detected throughout low elevation stands in the Park, Hot Creek, Monitor, Toquima, Shoshone, Toiyabe, Grant, Paradise, Horse and White Pine Ranges in large swaths.
White Pine County – 15,789 acres were mapped in large, low elevation patches in the Schell Creek Mountains scattered from Snowbank Creek south to Hwy 6 – Connor Pass. Damage was also detected along the central part of the Egan Range, scattered large, low elevation swaths in the Egan Range, and much of the lower elevation pinyon on the White Pine Mountains from Hwy 50 south to Currant Summit and on the southern end of the Snake Range

Pinyon Axil Scale
Matsucoccus monophyllae

Host: pinyon pine

In the spring of 2011, *M. monophyllae* was found on many of the singleleaf pinyon trees infested with pinyon needle scale in Western Nevada. Although it is impossible to differentiate from pinyon needle scale from the air, it is probably more widespread than just Western Nevada. Spring surveys for this insect would be necessary to determine their extent. Species were taxonomically identified by Jeff Knight, Nevada State Entomologist in Spring 2011 from collections by Gail Durham from the western Pinenut Mountains in Douglas County, NV. This insect was noted throughout Nevada in needle scale infested areas.

Figure-10- *Matsucoccus monophyllae* in twig axil on *M. acalyptus* infested twig, May 2011.

Figure 11 – *M. monophyllae* at the base of the needles on twig on *M. acalyptus* infested twig.

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. 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 and continue 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 2013, the area of FTC defoliation decreased; no acres were mapped, compared to the 1,453 acres detected in 2012.

Unknown and Frost Damage

Hosts: aspen, willows, cottonwoods, and other deciduous species

Approximately 8 acres of unknown or frost damaged aspen was mapped in northern Nevada in 2013. The mapped area is in inaccessible wilderness located in Mineral County, so the cause of the defoliation was not verified in the field in 2013.

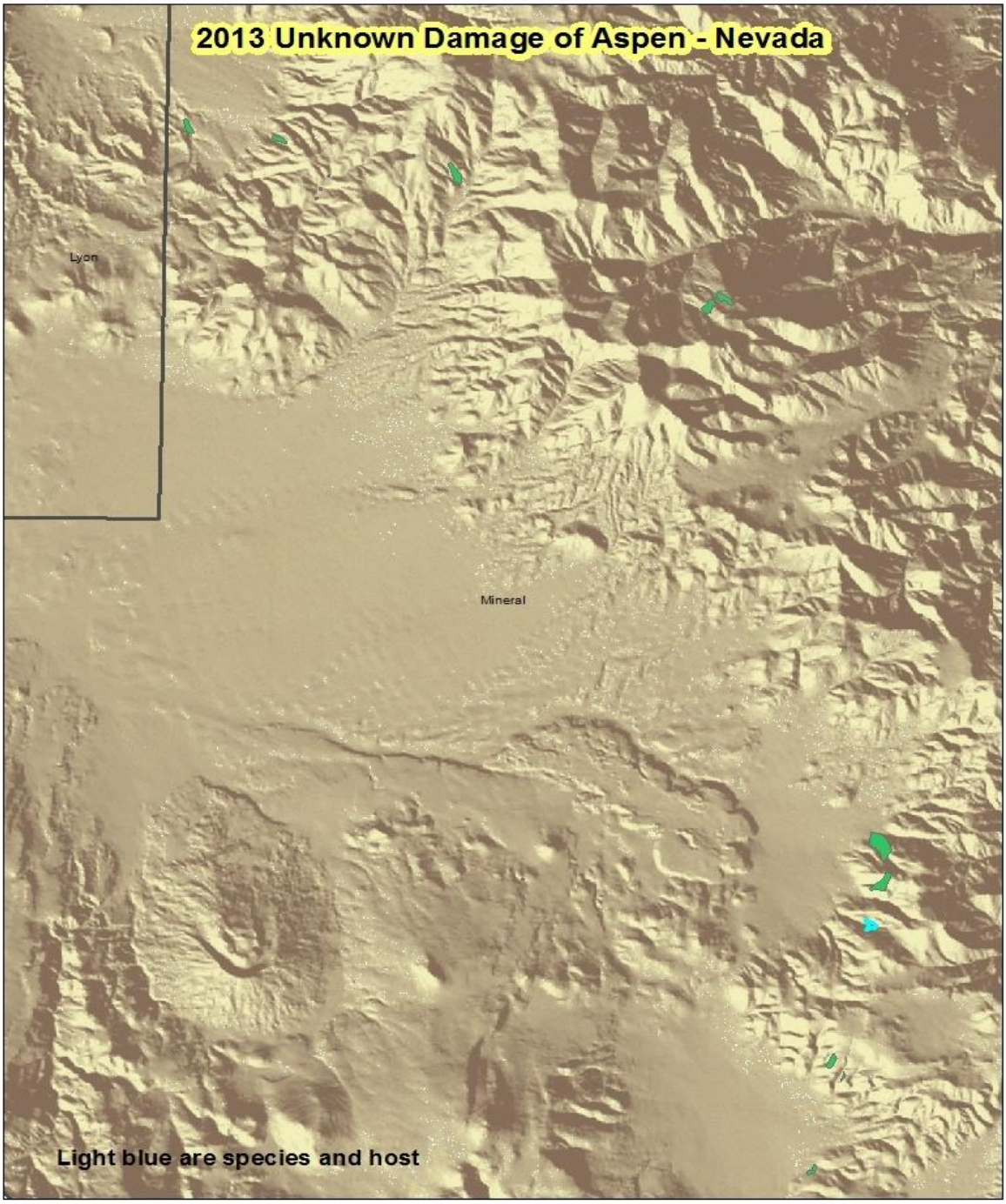


Figure 13 – Unknown and Frost damaged aspen areas mapped in 2013.

INSECTS: NATIVE

BARK BEETLES

Fir Engraver Beetle
Scolytus ventralis

Hosts: true firs

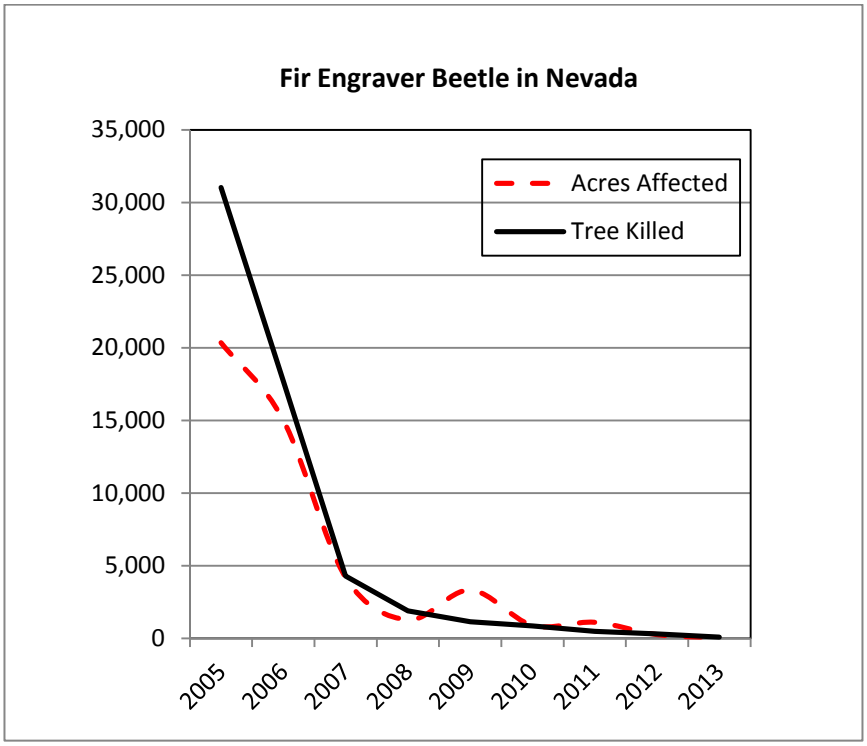


Figure 13- Number of trees killed and acres of fir engraver beetle damage in Nevada from 2005 – 2013.

In 2013, 94 trees were killed on 44 acres (Figure 13) by fir engraver beetle (FEB), a 70% decrease.

For the eleventh consecutive year, White Pine County had the highest amount of fir mortality with approximately 75 dead trees scattered over about 37 acres. Fir mortality decreased in Carson City and White Pine Counties, remained relatively static in Clark County, and slightly increased in Douglas County in 2013.

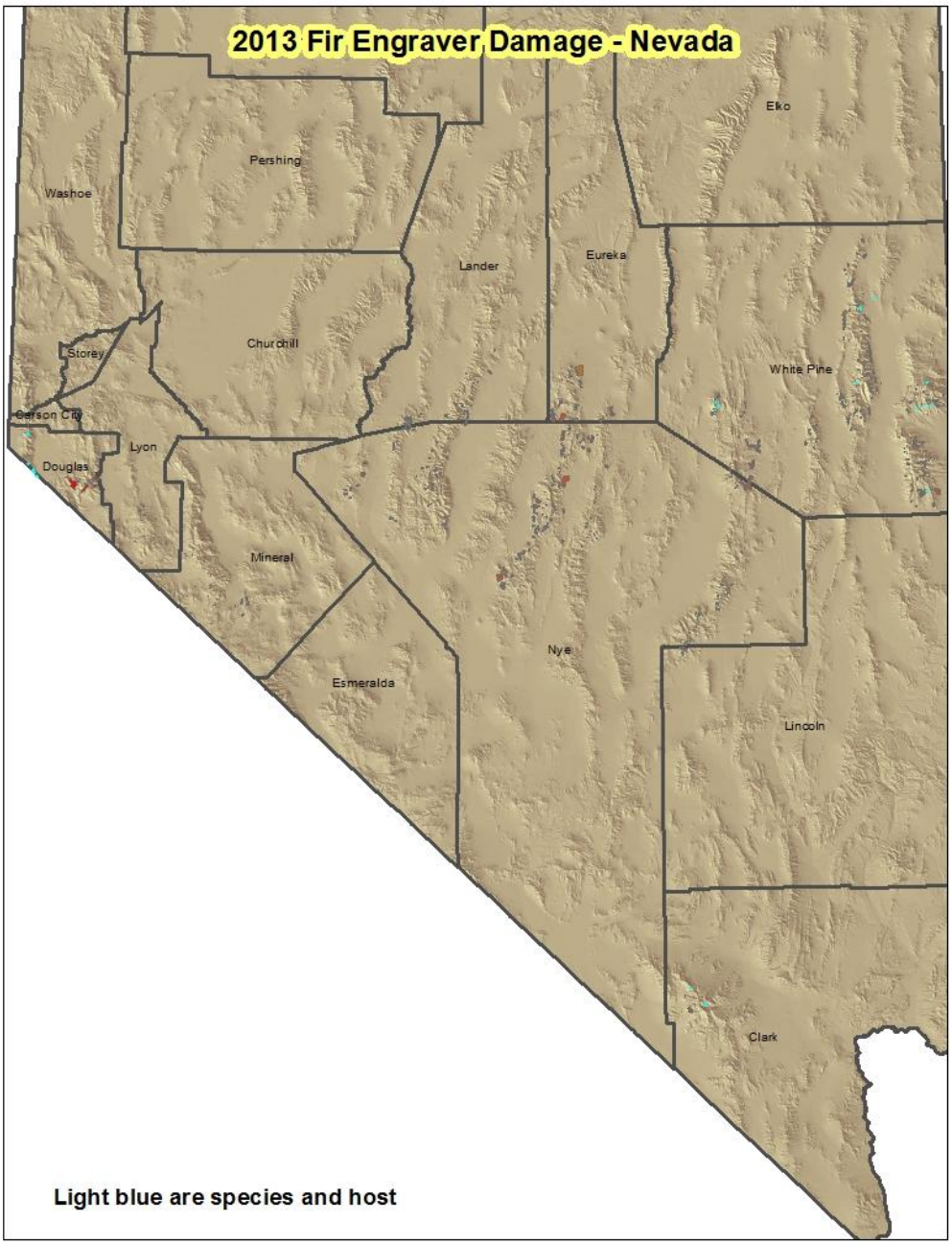


Figure 14 – Areas of mortality caused by the fir engraver beetle in Nevada in 2013.

Clark County- Mortality was static in 2011-13 with 10 trees killed each year. The area mapped was found in Trail Canyon north of Mount Charleston.
Douglas County – Mortality increased in 2013 to 9 FEB-killed trees mainly in the Carson Range within the county.
White Pine County – Most of the 2013 mortality in Nevada was found again in White Pine County - 75 trees on 37 acres. In 2012, 172 trees were mapped on 99 acres. Mapped activity is found in scattered pockets in the White Pine, Schell Creek and Snake Ranges.

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 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.

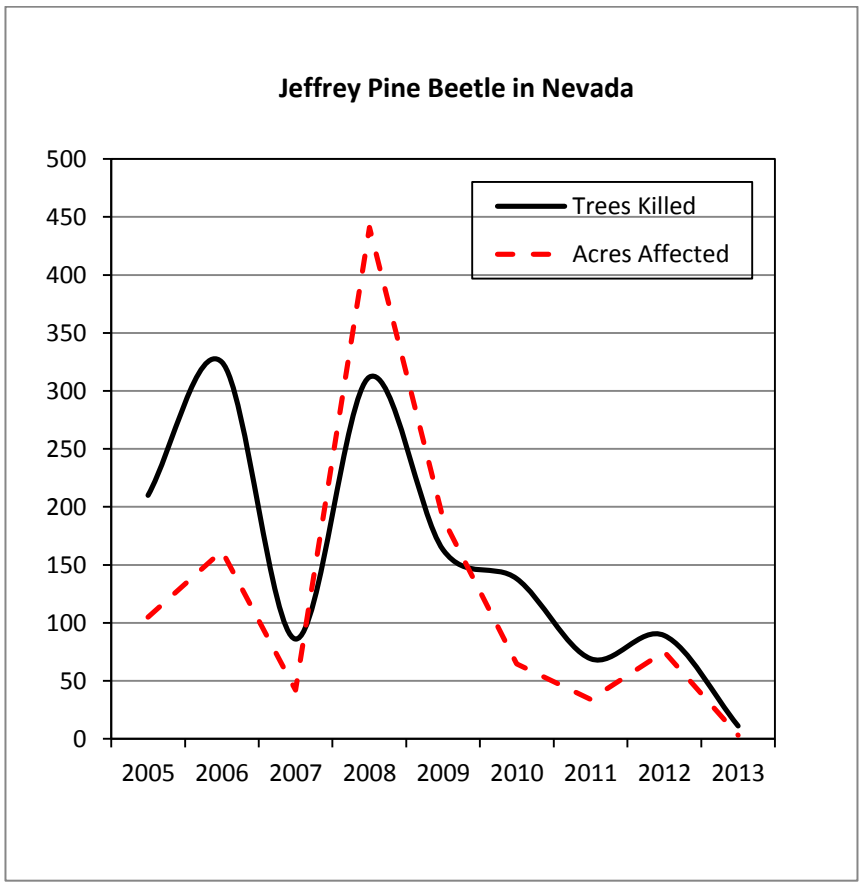


Figure 15 - Jeffrey pine beetle-caused tree mortality in Nevada 2005 – 2013.

Figure 16 - Jeffrey pine beetle-caused tree mortality in Alpine county in California along Highway 88. (Photo: Sheri Smith)

In 2013, Jeffery pine beetle-caused tree mortality increased 87%, affecting 11 trees on 3 acres in Nevada (Figure 15). In Nevada, the mortality was in Washoe and Carson City County (Figure 17).

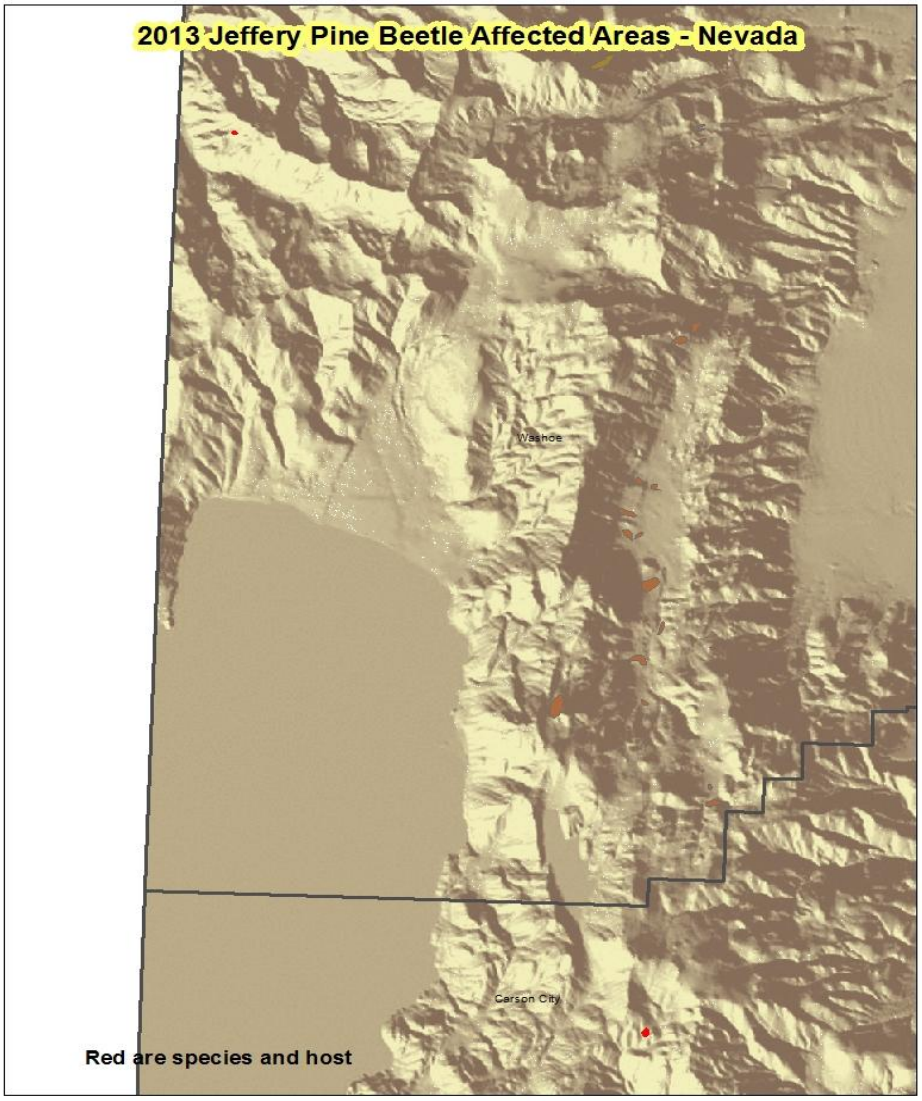


Figure 17 – Jeffrey Pine Beetle mortality in 2013 in western Nevada.

Carson City County – 2013 mortality increased to 8 trees killed on 2 acres compared to the 3 trees killed on 3 acres in 2012. The mortality occurred in3 locations southeast of Marlette Lake.
Washoe County –In 2013, mortality decreased to 3 trees on 1 acre versus 51 trees killed on 48 acres in 2012.

Mountain Pine Beetle
Dendroctonus ponderosae

Hosts: whitebark, 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 . 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 2013, MPB-caused tree mortality in Nevada continued to decrease in all species with the exception of lodgepole pine. Lodgepole pine tree mortality increased by 282%. Limber, whitebark, and western white pine MPB-caused tree mortality decreased 49% in 2013 (Figure 18). Most of the 2013 Nevada mortality occurred in Humboldt, Washoe, and White Pine counties.

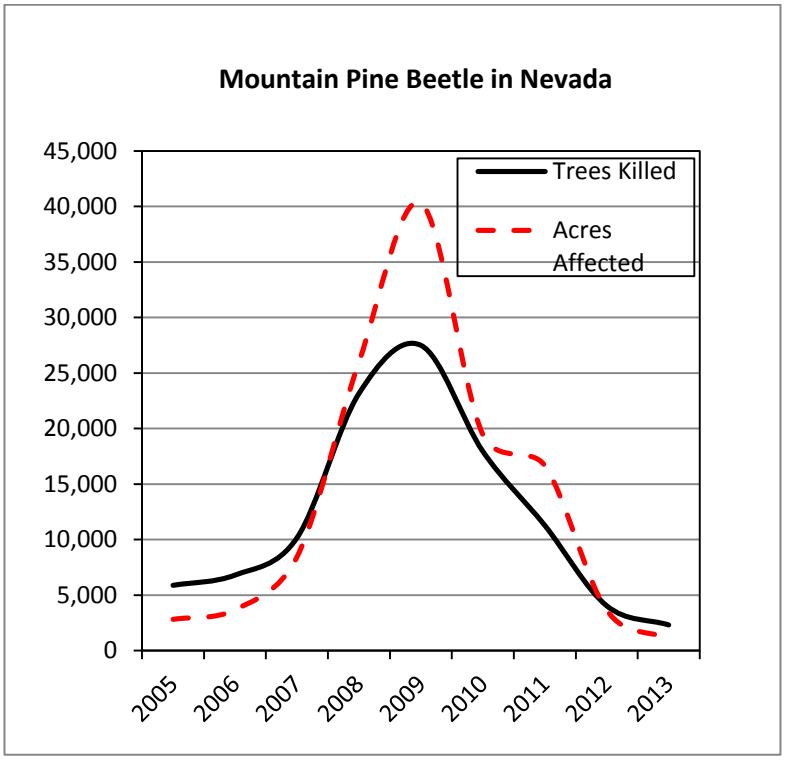


Figure 18 - Number of whitebark, limber, western white, and lodgepole pine trees killed and acres affected by mountain pine beetle in Nevada from 2005-2013.

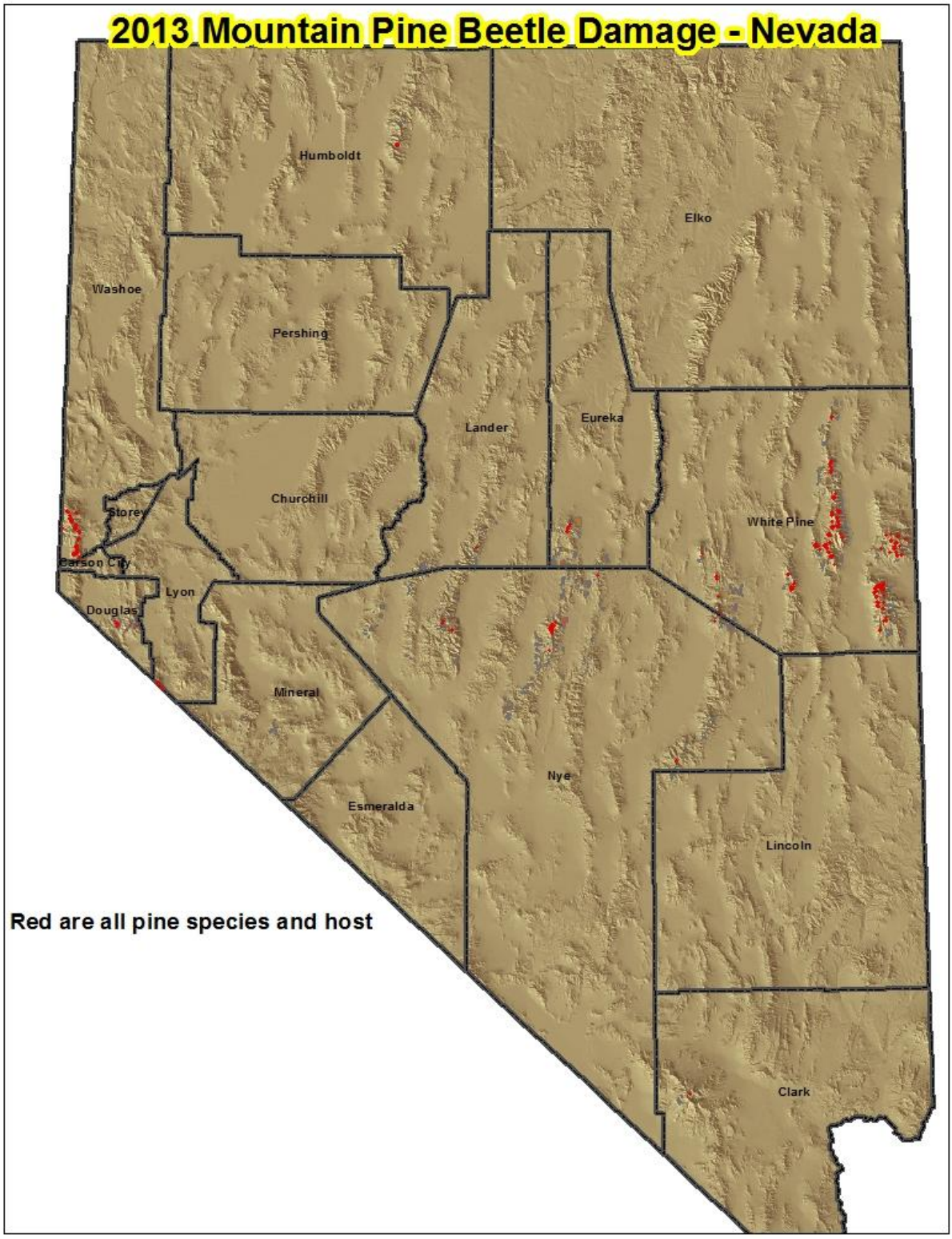


Figure 19 – Aerial Detection Surveys of Nevada and eastern California mountain pine beetle-caused tree mortality in 2013.

Mountain Pine Beetle – Limber, Whitebark, and Western white pine

In 2013, mortality of limber, whitebark, and western white pines caused by MPB decreased to 1,968 trees on 968 acres, which is 69% of the 2012 acreage and 43% of the 2012 tree mortality (in the above three host types). Most of the mortality occurred as small groups of trees on high mountain ridges, and on the tops of the mountain ranges surveyed.

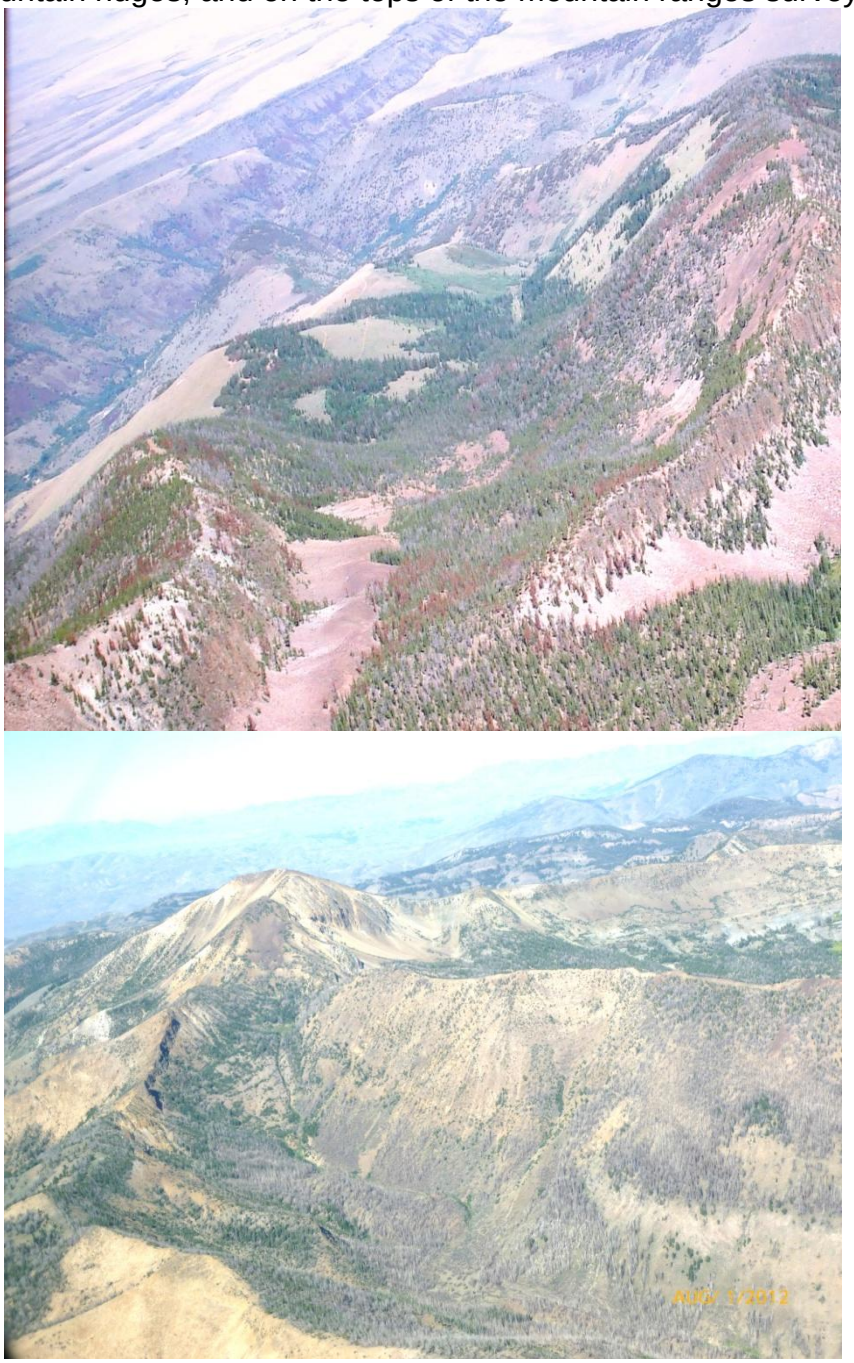


Figure 20. Mountain pine beetle-caused tree mortality, in the Jarbidge Mountains, captured moving down slope toward the town of Jarbidge, NV. Photo taken in August 2010 (top) and August 2012 (bottom) illustrating the expanses of dead pine hosts in 2012. (Photos: Gail Durham)

Clark County – Surveyors mapped 5 MPB-killed limber pine trees on 2 acres.
Eureka County – Surveyors mapped 54 MPB-killed limber pine trees on 26 acres.
Humboldt County – There were 71 MPB-killed whitebark pine trees detected on 36 acres scattered throughout the Santa Rosa Mountains.
Lander County - Three limber pine trees were mapped on 1 acre (decreased 92%) in scattered patches along the upper elevations of the Toiyabe Range.
Lyon County – Ten whitebark pine trees were mapped on 1 acre in two small pockets around the Middle Sister Mountain in the Sweetwater Mountains. **Nye County** – Surveyors detected128 MPB-killed western white pine trees on 64 acres. This is a 100% increase in mortality in this host type in comparison to 2012. Most mortality was found in several small to medium-sized, high elevation groups in the Toiyabe, and Monitor Ranges, with the majority of the affected areas in the Arc Dome, and Table Mountain Wilderness Areas.
Washoe County – There were 137 western white and whitebark pine trees on 98 acres mapped in 2013, representing a 63% decrease from 2012. The 2012 survey mapped MPB-killed trees in bristlecone pine in addition to western white and whitebark pine tree hosts. Small, scattered, high-elevation pockets were found in the Carson Range, mostly northwest of Mount Rose. Mortality was also found in 4 scattered pockets just east of Mount Rose.
White Pine County – A total of 1,561 western white and whitebark pine trees were mapped on 739 acres. This represents an 11% decrease in MPB-caused tree mortality in 2013.. Scattered, small pockets were found in the White Pine and Egan ranges. Mortality was observed throughout the Snake and Schell Creek ranges.

Mountain Pine Beetle in Lodgepole Pine

Washoe County –340 trees on137 acres were observed in small scattered areas throughout the Carson Range from north of Marlette Lake into the Mt Rose Wilderness area and east into Little Valley. One new pocket was identified south of Hobart Reservoir as well.

Below is a table of the trapping data from Mt. Rose in the summer of 2013.

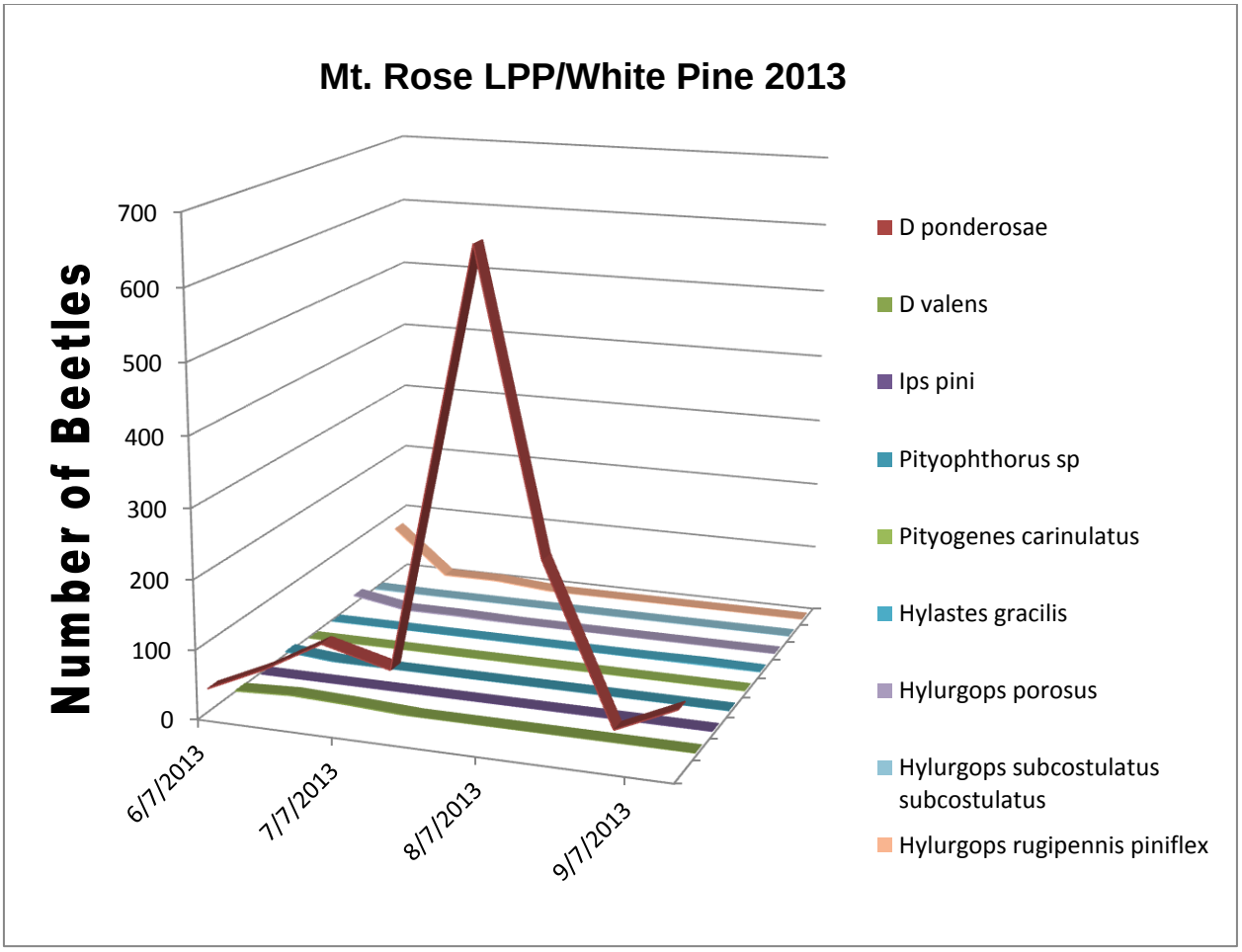


Figure 21 - Mt Rose Ski Area bark beetle trap catch data for summer 2013 with peak MPB catches from early-August to mid- September.

Western Pine Beetle (WPB) in Ponderosa Pine

In 2013, ponderosa pine mortality attributed to western pine beetle was found in Clark and White Counties.

Clark County – In 2013, there were 76 WPB-killed ponderosa pine trees on 80 acres in Clark County; WPB activity (40 limber pine trees on 20 acres was attributed to MPB in 2012). Below are graphs showing the results from trapping in Kyle and Lee Canyons for various bark beetles. Most of the catches were small twig beetles due to the installation of trap covers to prevent the trapping of rare butterflies: Monitoring traps are installed again for the 2014 field season to monitor any changes in beetle populations.

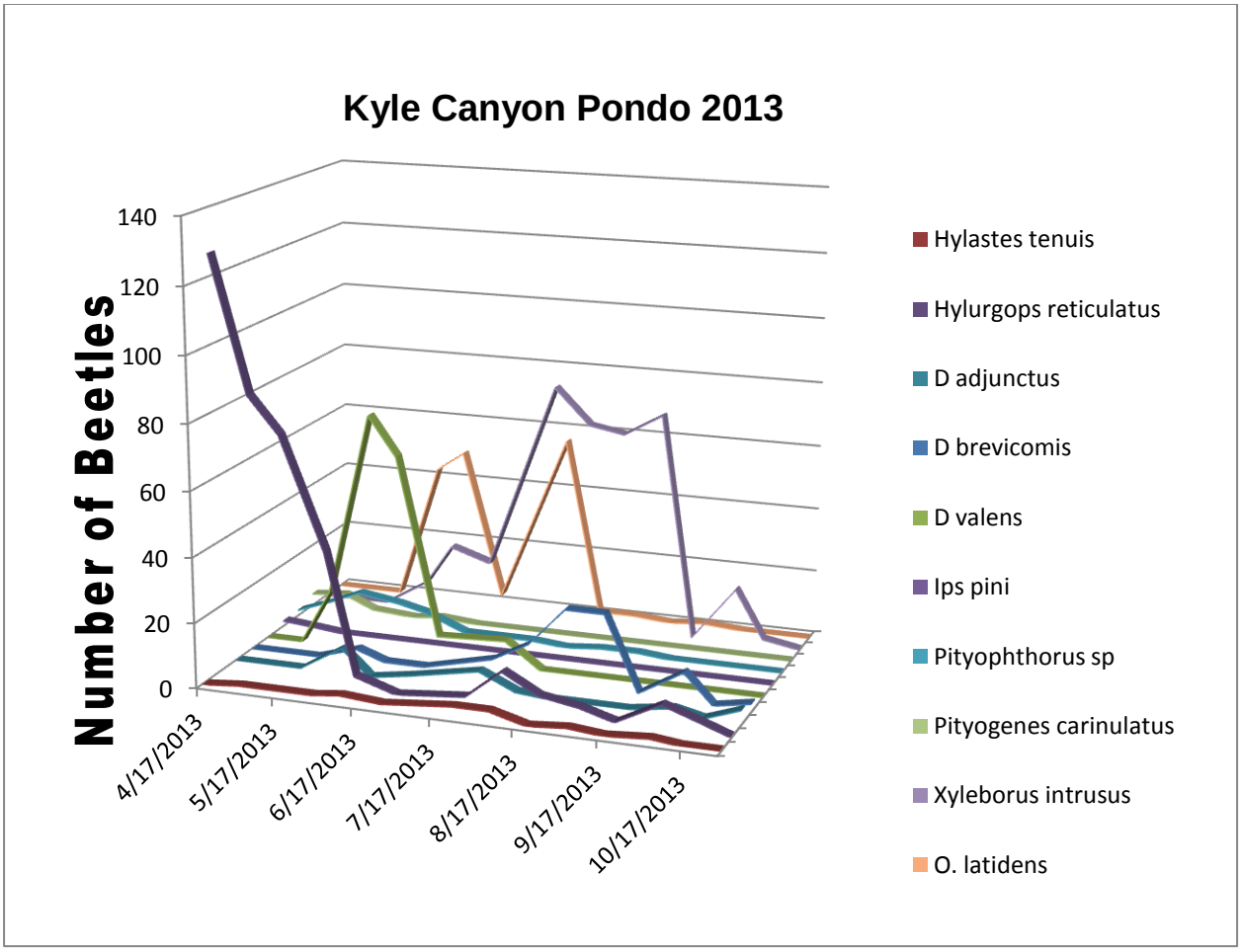


Figure 22- Kyle Canyon trap catches for the summer 2013 showing the dominance of *Ips pini* in the mid-summer and dominance of Hylurgops in the early summer and very little *Dendroctonus* capture.

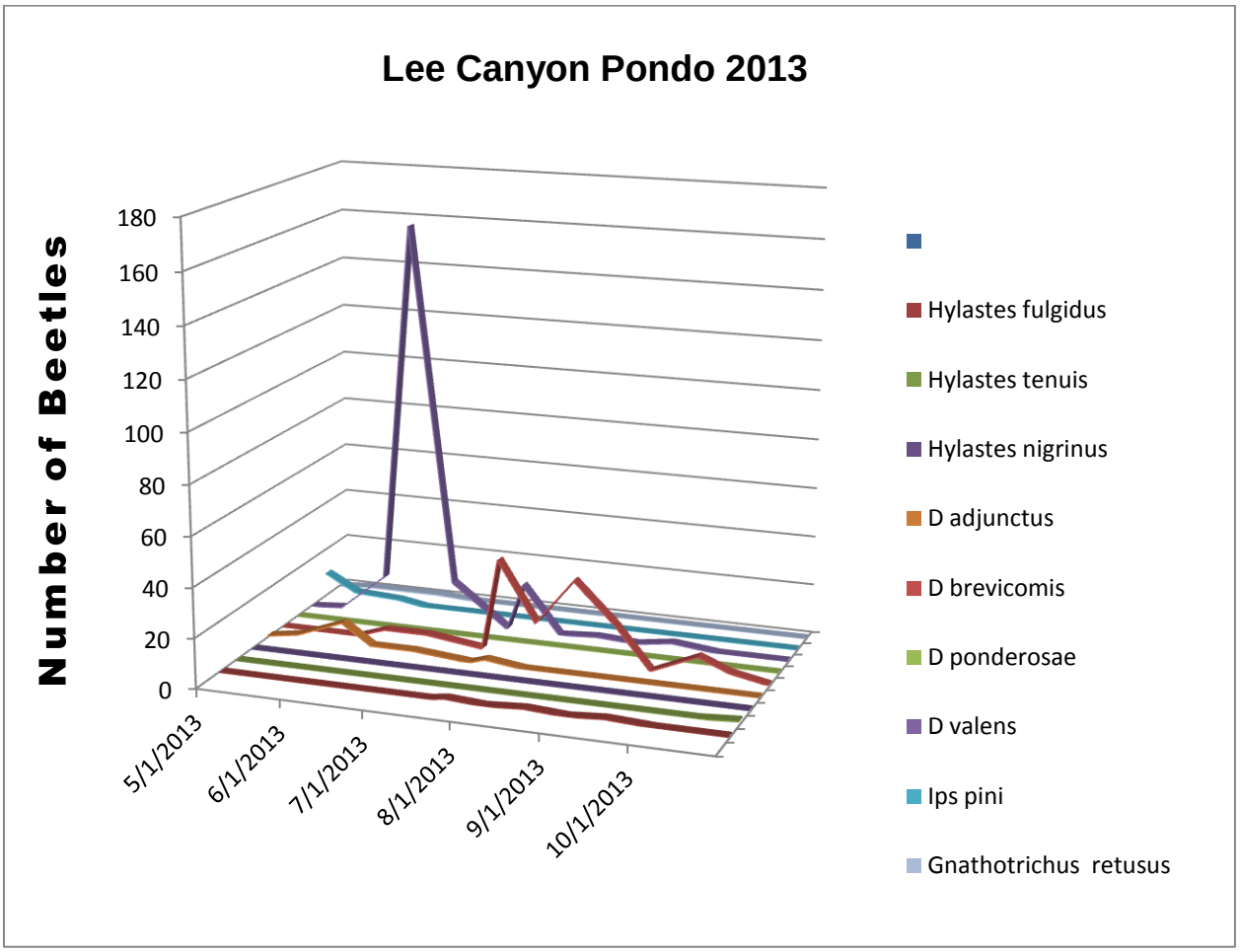


Figure 23 - Lee Canyon trap catches summer of 2013 showing the dominance of D. valens in early to mid-summer and WPB in mid-summer.

Nye County – No mortality was mapped in Nye County in 2013.
White Pine County – Surveyors mapped 76 WPB-killed ponderosa pine trees on 81 acres in 2013. This is over a two-fold increase in tree mortality detected in 2012 (25 trees affected on 12 acres). Activity was centered in the headwaters of Snake Creek of the Wheeler Peak Scenic Area, and the southwest corner of Miller Basin in the Snake Range.

Pinyon Engraver Beetle / Pinyon *Ips*
Ips confusus
Host: single leaf pinyon

The pinyon engraver beetle (PEB) 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.

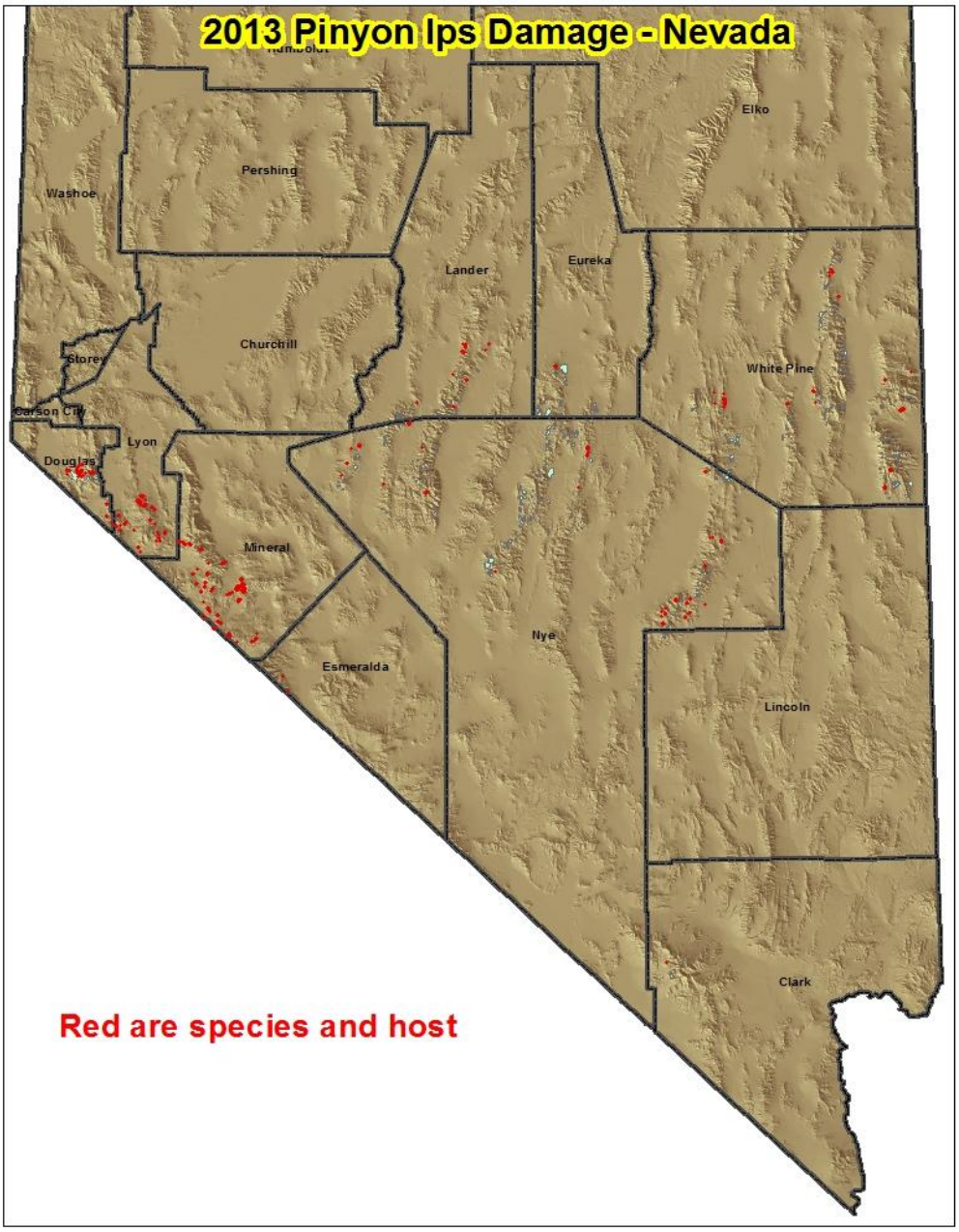


Figure 24 – Tree mortality caused by the pinyon engraver beetle in 2012 in Nevada.

Prior to 2003, pinyon pine was not frequently surveyed. In response to increasing concern about 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 increased again. In 2005, 2006 and 2007, a dramatic decrease of pinyon mortality was seen within the surveyed area. Although this mortality increased in 2009 over 2006 levels, it did not represent a significant increase. In 2010 and 2011 it decreased back down to near 2008 endemic levels (Figure 25).

In 2013, 7,025 trees were infested by pinyon *Ips*, over 2,500 acres, a 41% decrease (Figure 25). In 2013, nine counties had recorded mortality from pinyon ips. Douglas, Lyon and Mineral counties had 80% of the mortality. Most of this mortality is associated with the ongoing effects of drought and the large pinyon needle scale and pinyon sawfly outbreaks across the state.

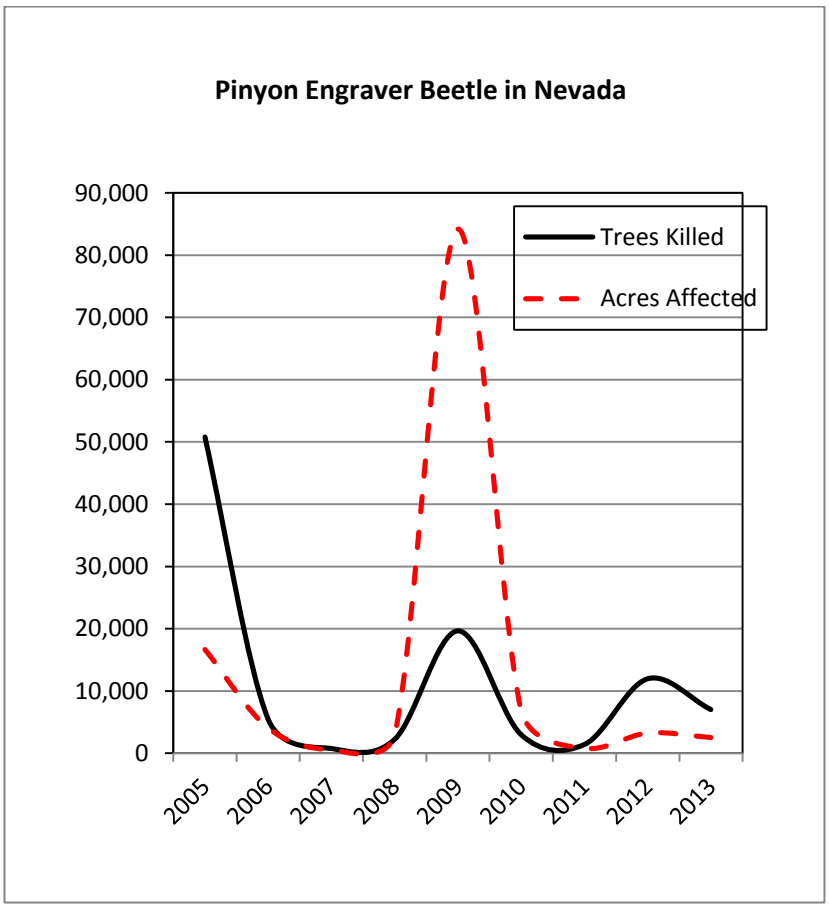


Figure 25 - Number of pinyon pine killed and acres affected by pinyon engraver beetle/pinyon *Ips* in Nevada and from 2005-2013.

Carson City County – Pinyon pine mortality decreased to 0 in 2013.
Clark County – Surveyors detected 2 pinyon *Ips*-killed pinyon pine trees in 2013, compared to 5 trees mapped in 2012. Traps were set up in the mid-elevational pinyon juniper woodland in Clark Canyon.
Douglas County – In 2013, surveyors detected 775 pinyon *Ips*-killed pinyon pine on 228 acres. This represents a roughly 90% decrease in mapped tree mortality and 81% decrease in acres affected.Mortality was scattered throughout the southern Pine Nut Mountain Range north of Holbrook Junction and into the eastern portion of Lyon County.
Elko County – In 2013, there was no mapped mortality in Elko County. This is a decrease from the 5 trees previously mapped on 3 acres in a small spot mostly on the eastern Ruby Mountains above Rock House in 2012.
Esmeralda County –There were 6 pinyon *Ips*-killed pinyon pine trees mapped on 3 acres in 2013. This County was not surveyed in 2012. Scattered pockets of mortality were surveyed northeast of Davis Mountain.
Eureka County – There was 75% decrease in mapped tree mortality in 2013,and an 81% decrease in affected acres mapped. In 2013, surveyors detected 20 trees on 10 acres in comparison to the 79 trees on 54 acres detected in 2012. Mortality continues to occur in scattered, small pockets at the lower elevations of the Monitor Range, especially in the areas heavily hit by pinyon needle sawfly.
Lander County – In 2013, there was a 59% decrease in mapped mortality and a 58% decrease in acres affected by pinyon *Ips*. Approximately, 96 trees on 48 acres were detected in 2013, in comparison to 235 trees were mapped on 114 acres in 2012. Mortality occurred in scattered pockets in the northwest Shoshones, and northern Toiyabe Ranges.
Lincoln County – There was no pinyon *Ips* activity detected in Lincoln County in 2013. This is a 100 % decrease from the 2012 ADS data, which mapped 95 trees on 48 acres in scattered spots in the northwest Shoshones, northern Toiyabes and north Toquima Ranges.
Lyon County –The number of detected pinyon *Ips*-killed pinyon pine decreased by 5% in 2013 (from 1,183 trees in 2012 to 1,124 trees in 2013). The amount of affected acres, however, rose 122% - from 166 acres in 2012 to 369 acres in 2013. Scattered pockets of mortality were identified in the northern and eastern portions of the Pine Grove Hills.
Mineral County – There was no pinyon Ips caused tree mortality mapped in 2012; however, 4,283 pinyon Ips-killed pinyon pine trees were detected on1,482 acres in 2013. Mortality is primarily located in the Wassuk range and the Excelsior mountains
Nye County – There was a 67% decrease in pinyon Ips caused pinyon pine mortality in 2013, from 1,082 trees to 351 trees. In 2013, 227 acres were identified in scattered pockets in the Grant and Quinn Canyon Range, Hot Creek, Monitor, Toquima, southern Toiyabe and Shoshone Mountains.
White Pine County – In 2013, ADS surveyors mapped 368 trees on187 acres, representing a 79% decrease in tree mortality and 82% decrease in acres affected when compared to 2012 ADS data (1,019 acres with 1,733 trees killed). Much of the

mortality was associated with older pinyon needle scale in the eastern White Pine Range. Mortality was also observed in scattered pockets on the Ward Mountain area, Egan, Snake and Schell Creek Mountains.

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 27). The rust and borer are found extensively across the state but are not mapped by ADS.

Figure 27 - 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 through 2011, this insect was found commonly in the areas with 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 28). 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 2011.

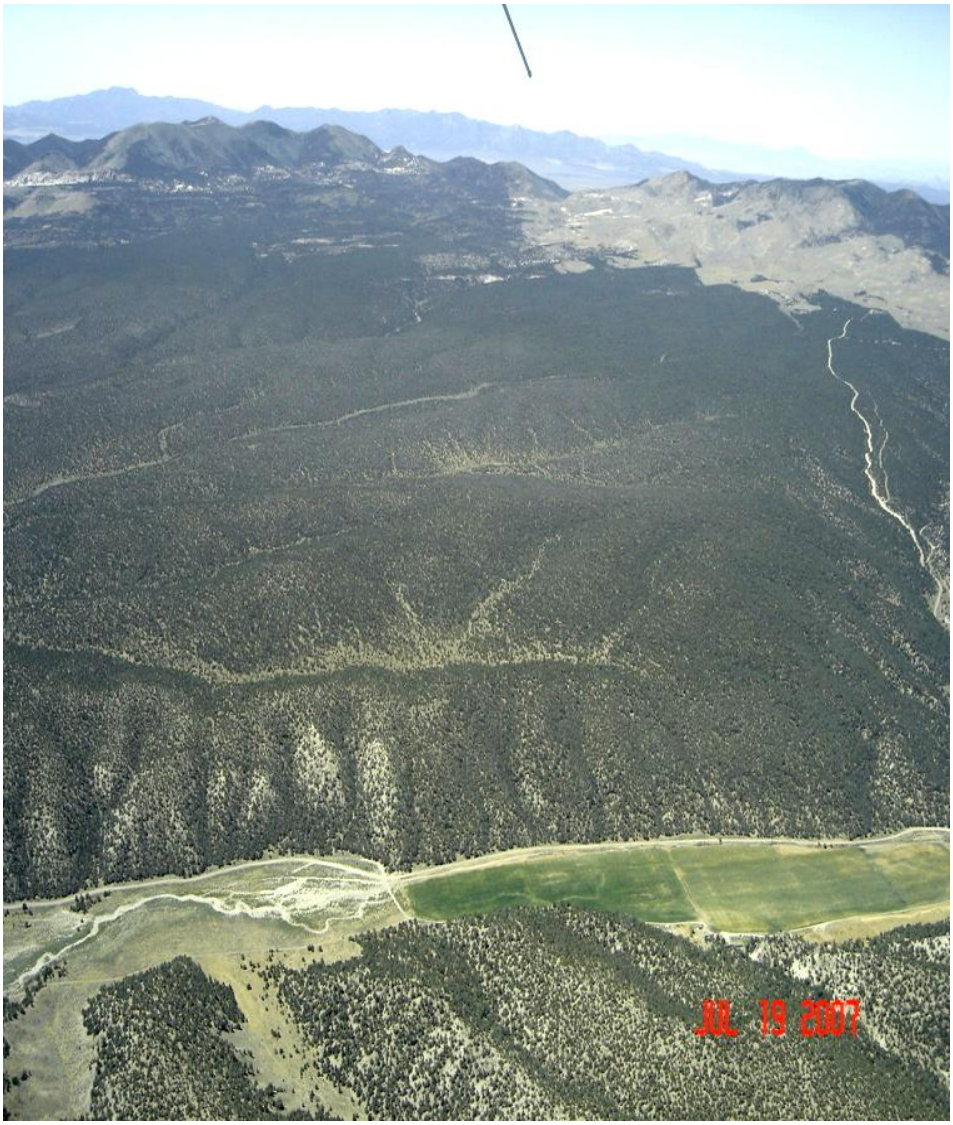


Figure 28 –The gray hazy appearance of pinyon tip moth damage as seen from the air (throughout bottom photo) and on the ground (top photo) on the west side of Camp Valley Creek south of Pine Creek in 2007.

INSECTS: NON-NATIVE

White Satin Moth
Leucoma salicis (L.)

Hosts: aspen, willows, cottonwoods, and other deciduous species

The white satin moth (WSM) is a non- native defoliator of aspen in the family of tussock moths (*Lymantriidae*). WSM is native to Europe and Asia. This is the same family as gypsy moth and Douglas fir tussock moth. It was introduced into North America in British Columbia (BC) in 1920. It is currently distributed from Newfoundland through eastern Canada, northeastern US and from BC to northern California. In 2004 the insect was found in southwest Wyoming. It is now been found in spots throughout Northern Nevada. Overwintering takes place as a second-instar larvae which seek out hibernation sites on the trunk or branches of a host tree and molt after spinning silken coverings (hibernacula). Hibernacula are difficult to detect because they are covered with bark, mosses and other detritus. When they emerge in May they feed on the young new leaves. This feeding continues until late June to early July and the larvae go through five to 6 instars until they are approximately 3.5 – 4.5 cm long. The caterpillar,the most often seen life stage, is mostly grayish brown with a dark head and back, with one distinctive row of large oblong white to pale-yellow patches down the middle of the back and two yellow lines sub-dorsally. The two lateral and sub-dorsal rows of orange tubercles have tufts of long brown hairs attached. These larvae spin pupal cocoons in the leavesand produce shiny black, 1.5 to 2.2 cm long pupae with tufts of yellow hair. In July and August the adult moths emerge. The white adult moth about 2 - 4 cm long have no markings on the wings; the bodies are black and covered with white silky hairs that only allow glimpses of black beneath. See Figure 29 photos below:

Figure 29 – White satin moth larvae (top left); female white satin moth (top right); egg mass (bottom left); and complete defoliation of aspen in North Canyon, Spooner State Park, NV 2012 (bottom right). Photos by Jeff Knight, State of Nevada Entomologist, NV Dept. of Agriculture.

In 2013, 34 acres of WSM defoliation were detected. This is a 59% decrease from the 2012 ADS data. Carson City and Washoe Counties had 4 and 30 acres, respectively, of detectable WSM activity. There defoliation was noted in urban areas along Hwy 395 and some stands near Spooner Summit and Spooner State Park. In 2012, the area of WSM defoliation in Nevada mapped was approximately 70 acres in Washoe County in North Canyon of Spooner State Park and in Little Valley just west of and above Washoe Valley.

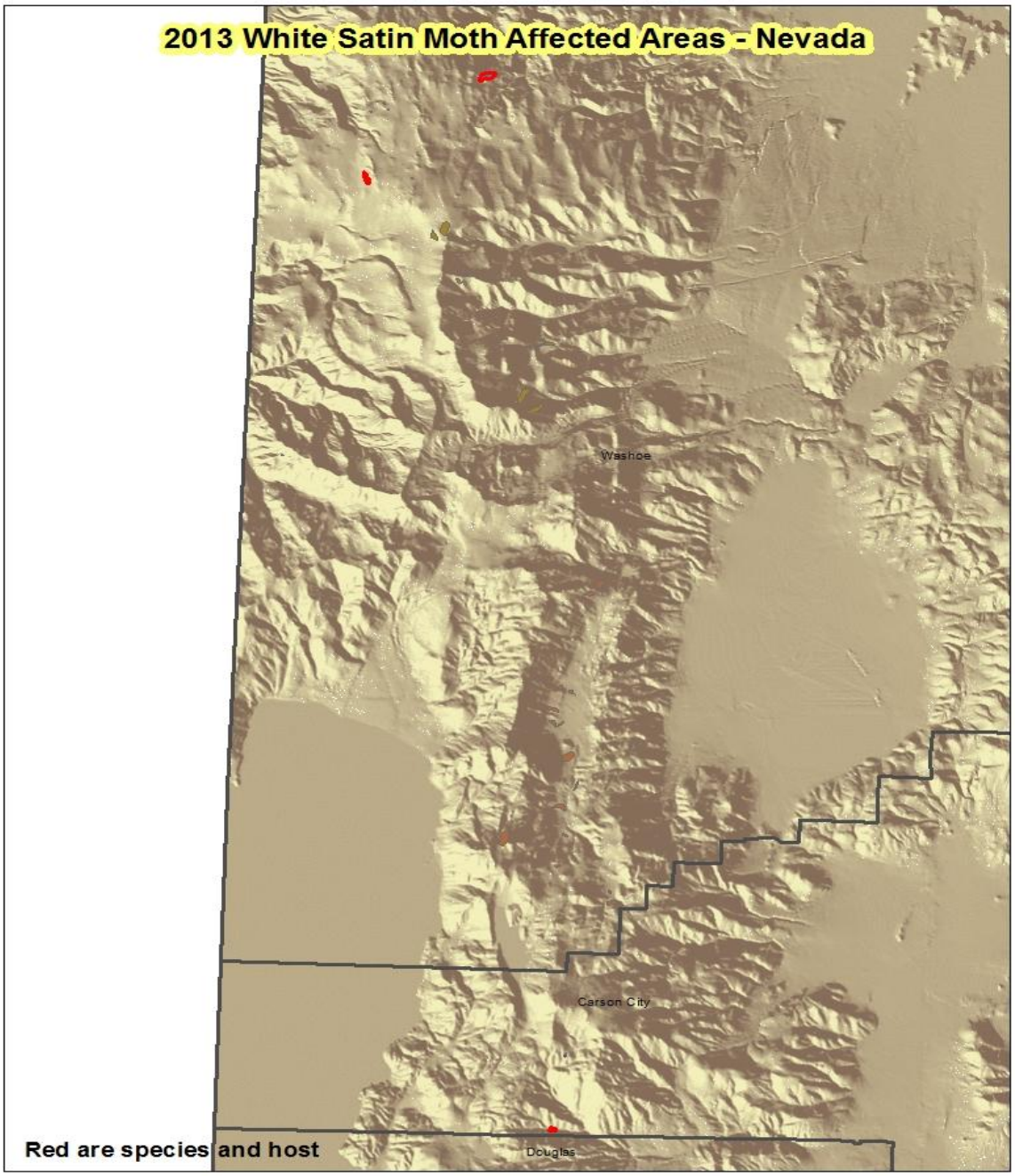


Figure 30 – Tree mortality caused by the White Satin Moth in 2013 in Nevada.

European Gypsy Moth
Lymantria dispar

Hosts: various deciduous species

In 2013, gypsy moth was surveyed by Nevada Department of Agriculture (NDOA). Trapping was conducted from May 3rd to November 16th. In all 697 traps were placed in 16 counties; all traps were negative. The last identified adult male was discovered in an RV park in Winnemucca in 1999. No moths were trapped in 2013.

Figure 31 - Adult gypsy moths; female above; male below, Photo: USDA APHIS PPQ archive, 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 using a modified bucket trap baited with pheromone and fermenting fruit. In all, 12 traps were placed in Clark County, but the traps did not detect these insects.

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 and five Colossus traps in Washoe and Lincoln counties. These traps are designed to detect various wood borers, MPE, and RPBB. . All trap results were negative, and none of these insects 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 2011, The Nevada Department of Agriculture NDOA conducted funnel trapping for exotic wood borers using EDRR style trapping methods (30 traps total) in 6 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. Nine representatiative sites close to a possible introduction pathway were selected . Over 4,700 specimens were screened by the State Entomologist. Results show three new state records of scolytidsincluding 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 appear to be several new state records for cerambycids, buprestids and other beetles that have yet to be confirmed.

In 2011, 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 3rd to November 16th. One hundred and five traps were placed in 3 counties; all traps were negative.

European Pine Shoot Moth (EPSM)
Rhyaclonia buoliana

In 2007, NDOA 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. There was no activity in 2013.

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 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. Dwarf mistletoe infests trees of all ages, and infection may exist in secondary growth and regeneration, as well as mature and overmature tree stands. Dwarf mistletoes spread fastest and are most problematic when an infected overstory exists over new regeneration. Severe 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,

Conversely, dwarf mistletoes may be beneficial to wildlife habitat in some cases, depending on the type of wildlife habitat desired.
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. In the spring of 2013, after two consecutive drought years, some of the dwarf mistletoe-weakened trees have succumbed to pinyon engraver beetle attacks.

Currently, fuel reduction activities are being undertaken in heavily DMT infested stands of pinyon pine in western Nevada. The treatments are intended to create a buffer between non-infected stands and infected stands to prevent the spread of this disease (Figure 31).

This type of treatment can be effective, due to the primarily short range spread mechanism of dwarf mistletoes.

Ponderosa and Jeffrey pines are often found heavily infected with western dwarf mistletoe (*A. campylopodum*) 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 trees infected with dwarf mistletoe are commonly attacked by fir engraver beetle, or experience branch dieback due to *Cytospora* canker. In 2011, limber pine dwarf mistletoe (*A. cyanocarpum*) was found infecting whitebark and limber pines on the East Humboldt and Ruby Mountains predisposing them to attack by mountain pine beetle in those areas.

Figure 33 – A. cyanocarpum infecting whitebark pine in Lamoille Canyon in the Ruby Mountains and on limber pine at Angel Lake in the Eastern East Humboldts. These trees were subsequently killed by mountain pine beetle.

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 common throughout the state. It attacks and kills small trees (Figure 32) and causes branch flagging on larger more 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 34- Single leaf pinyon pine 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 was collected in 2011. In 2013, there was an erroneous report of a single white pine blister rust infested limber pine tree at Great Basin National Park.

Sudden Oak Death
Phytophthora ramorum

Sudden Oak Death (SOD), an exotic 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, potentially infected nursery stock was released into all 50 states from a single California nursery, prompting NDOA officials to contract with the USFS to conduct surveys. Both forest areas and areas near nurseries were surveyed, but showed no SOD. SOD has been detected for all regions surveyed to date.

ROOT DISEASES

Annosum Root Disease
Heterobasidion irregulare

Heterobasidion occidentale

Hosts: Lodgepole pine, Jeffrey pine, ponderosa pine (*H. irregulare*), spruce, true firs, and incense cedar (*H. occidentale*)

H. occidentale 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. *H. irregulare* can be found in mature pine 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 35 - Annosum root disease conk at the base of a tree.

Armillaria Root Disease
Armillaria spp.

Hosts: All trees

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.


Figure 36 - Armillaria mushrooms, photo: Gail Durham

Black Stain Root Disease
Ophiostoma wageneri

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

Figure 37 - Black stain root disease on pinyon pine in Storey County, NV, 2011

Black stain root disease is an important disease of several hosts. It is found mainly in pinyon pine, but it can infest both Jeffery and Ponderosa Pine which has been found in small areas of the eastern Carson Range. 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, but pockets were found in the Virginia Highlands in Storey County in 2011 after ground disturbing mastication activities (see Figure 35).

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 water stress 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.

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

Figure 38 - Symptoms of aspen leaf spot disease.

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 2013, mortality attributed to subalpine fir mortality complex was <1% of 2012 mortality and resulted in the death of 5 trees (Figure 37). The acreage affected in 2013 was 2 acres. Previously mapped (2012 ADS) activity in Elko County was not detectable in 2013.

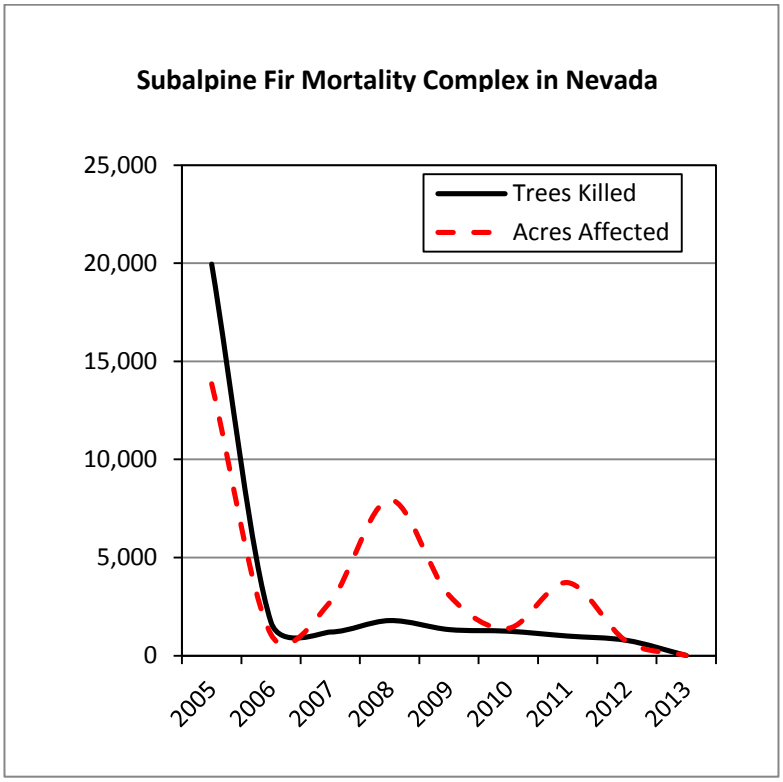


Figure 39- Trees and acres of subalpine fir affected in Nevada from 2005-2013.

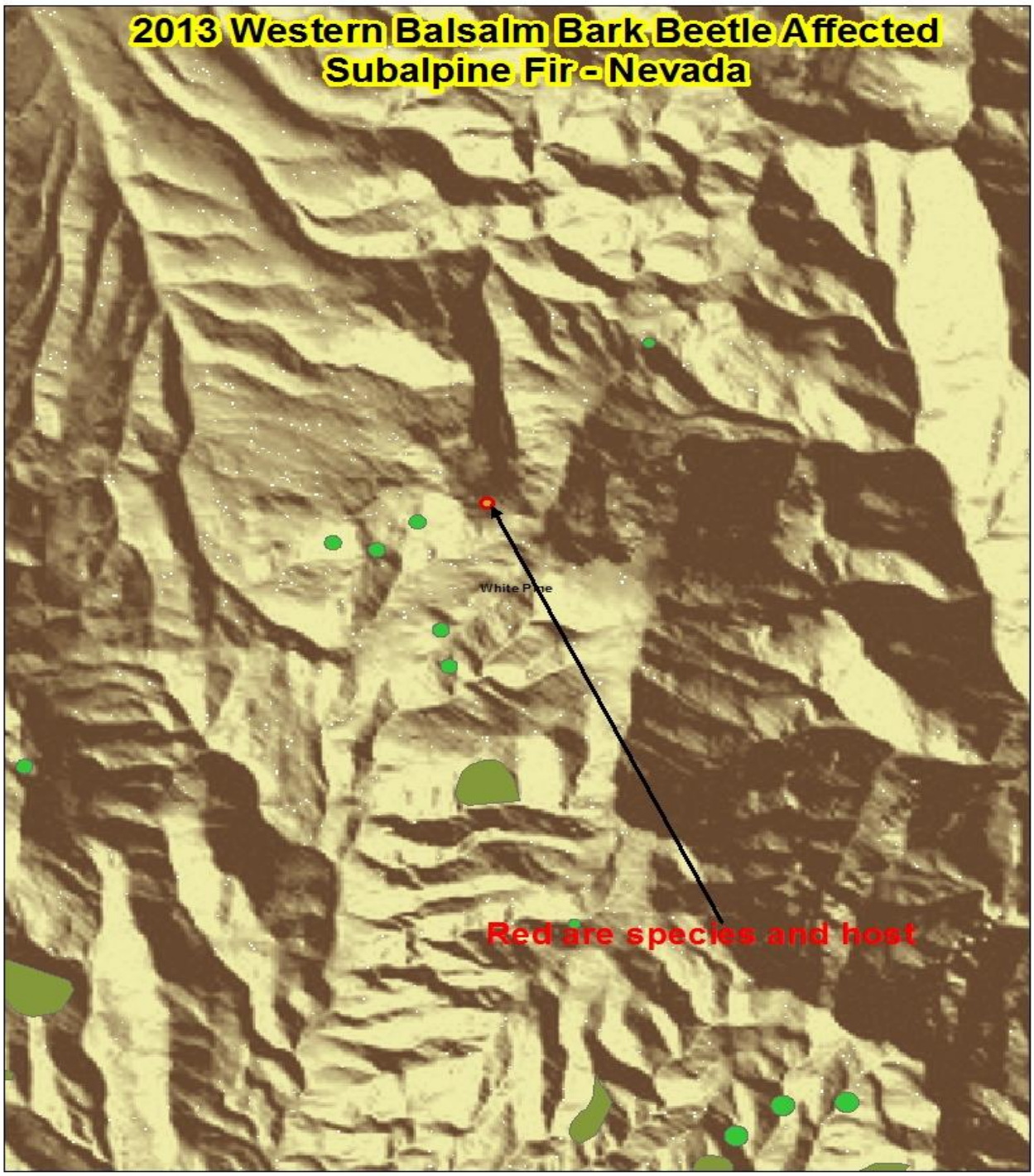


Figure 40 - Subalpine fir mortality 2012 in Elko County, NV.

White Pine County – Approximately, 5 trees on 2 acres were detected in 2013. This small infestation is located approximately 2 miles northeast of Success Summit in the Schell Creek Range.

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. Research across North America has revealed mostly canker diseases and insect borers are causing the decline in which drought stress is the largest contributing factor to decline and dieback.

In 2013, 1,139 acres of aspen dieback / decline was mapped in Eureka, Humboldt, Lander, Nye, and White Pine Counties. This is an 82% decrease from 2012 ADS data (6,295 acres). There was, however, a slight increase in total acres of aspen decline mapped in 2013 (up from 538 acres to 591 acres).

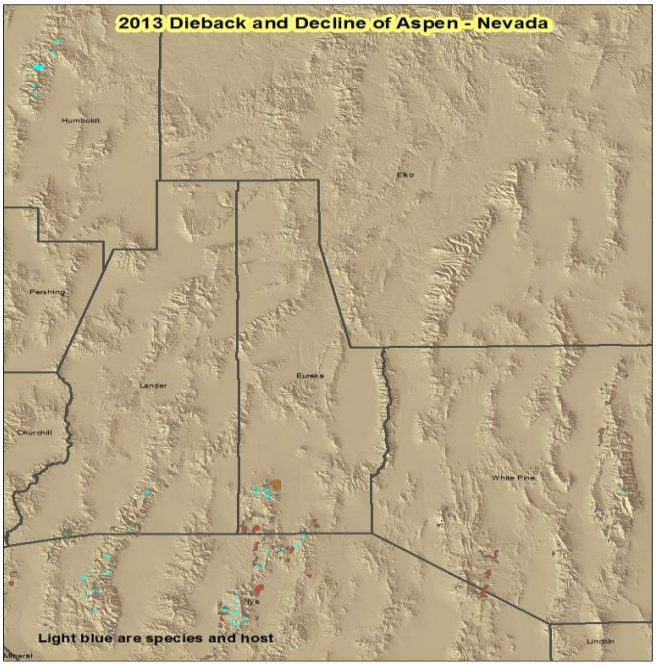


Figure 41 – Dieback & Decline of Aspen in Nevada 2013

Elko County – In 2013, there was no detectable aspen decline/dieback in Elko County. This is a sharp decline from the 4,077 acres of dieback/decline mapped in 2012.

Humboldt County – There was a 42% increase in acres of aspen dieback mapped in 2013. Overall, there was a 19% increase in aspen decline and dieback detected in Humboldt County. A total of 495 acres were originally mapped in 2012 compared to 591 acres in 2013. Aspen dieback occurred in scattered small pockets throughout the Santa Rosa Range.

Lander County – 2013 ADS detected 41 acres of aspen decline/dieback compared to 194 acres in 2012. This presents a 79% decrease of aspen dieback/decline in Lander County. Aspen dieback occurred in a number of small pockets on the north end of the Toiyabe Range just south of Austin Summit heading toward the Lander/Nye County line.

Nye Counties – In 2013, surveyors detected 442 acres of aspen decline/dieback in Nye County. This is a 61% decrease from the 1,128 acres mapped in 2012. Dieback is found in pockets in the southern Toiyabe Range as well as areas throughout the Monitor and Antelope Ranges.

Washoe County – There was no detectable aspen decline / dieback mapped in 2013. This is a decrease from the 2012 ADS, which mapped 17 acres in one spot near Mogul Peak.

White Pine County – In 2013, detectable acres of aspen decline/dieback decreased 97%. A total of 4 acres were mapped in 2013, compared to the 148 acres detected in 2012

Eureka County – Scattered pockets were found at the mid-to-high elevation ranges in the northern Monitor Range.

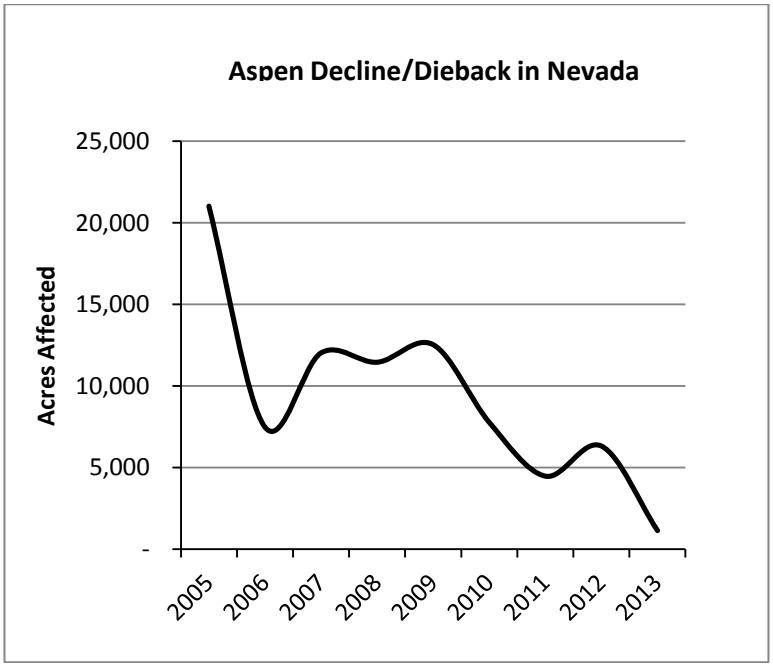


Figure 42 –Graph of Nevada aspen decline/dieback from 2005-2013.

ABIOTIC DAMAGE

Drought Damage

Host: curlleaf mountain mahogany

Extensive yellowing and loss of curlleaf mountain mahogany (*Cercocarpus ledifolius* Nutt. Ex Torr. & Gray) foliage was seen from 2007 through 2011 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 42). In 2011, the mahogany appeared to recuperate, although many stands have dead centers. The amount of decline decreased in 2011 again (Figure 42).

In 2013, the statewide affected acreage (16,237) increased to 136% of the 2012 affected acreage (6,881 acres) (Figure 42). In 2012, the number of counties affected decreased from six in 2012 to four in 2013. Nye County had the majority of damage followed by White Pine, Lander, and Eureka Counties. The below average precipitation of 2012 was most likely the reason for the increased defoliation of mountain mahogany this year

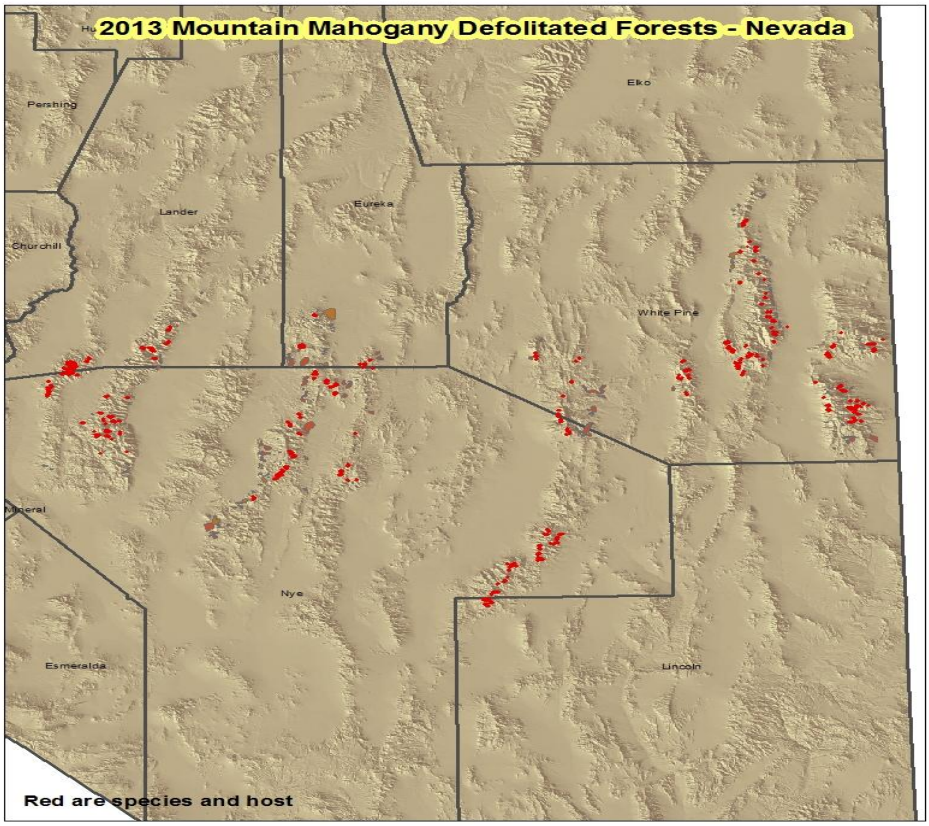


Figure 43 – Mountain Mahogany defoliation in Nevada 2013

Eureka County – Surveyors detected 712 acres of decline in 2013; this represents a 63% increase from the previously mapped 437 acres (2012 ADS data). Three pockets in the north end of the Monitor Range, and scattered pockets in the Antelope Range were mapped.

Lander County – There was a sharp increase in mountain mahogany decline mapped in 2013 in Lander County, up to 2,550 acres from 208 acres previously detected in 2012. Decline was observed in the Shoshone and Toiyabe Mountains south of the highway to the Lander County line.

Lyon County – There was no detectable mountain mahogany decline mapped in 2013. 2012 ADS data mapped 61 acres of decline in two patches in the headwaters of Sheep Creek in the Sweetwater Mountains.

Nye County – There was an 82% increase in detectable acres of decline in 2013 (up to 6,691 from 3,681 acres mapped in 2012). Decline was mapped in scattered pockets throughout the Shoshone, Toiyabe, Monitor, Hot Creek, Grant, and Quinn Canyon Ranges.

Washoe County – There was no detectable mountain mahogany decline mapped in 2013. 2012 ADS data mapped 41 acres of decline in small patches along the Carson Range south of Thomas Creek in southwestern Reno.

White Pine County – White Pine County experienced the second highest rate of increase in detectable acres – an increase up to 5,776 acres in 2013 from 2,453 acres in 2012. Decline was mostly detected in small patches in the lower elevations of the White Pine, one small pocket south of Silver Canyon in the Schell Creek Range, two small pockets in the northern Snake, and multiple large pockets in the Great Basin National Park on the southern end of the Snake Range at the headwaters of Big Spring Wash. These pockets also include the White Pine, Duck Creek, and Schell Creek Ranges.

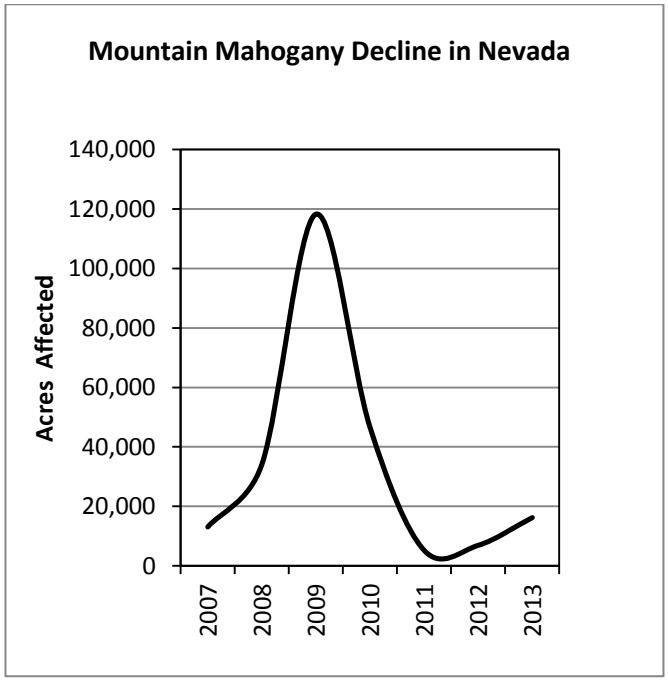


Figure 44 – The 2013 acreage of mountain mahogany decline from 2007 - 2013.

Wind damage / 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 Nevada in 2013.

Wildfire Damage

In 2013, wildfire damage caused the highest amount of tree mortality statewide (54,835 trees). In Nevada, fires burned thousands of acres of pinyon pine and Jeffrey pine. The Bison fire burned 644 trees on 64 acres in Lyon County and 54,191 trees on 7,381 acres in the Pine Nut Range in Douglas County. Additionally, the Carpenter 1 wildfire in the Spring Mountains burned 27,000 acres of ponderosa pine and other forest types. No official count was made during mapping. Full effects of wildfire damage will be more readily apparent with the 2014 aerial survey.

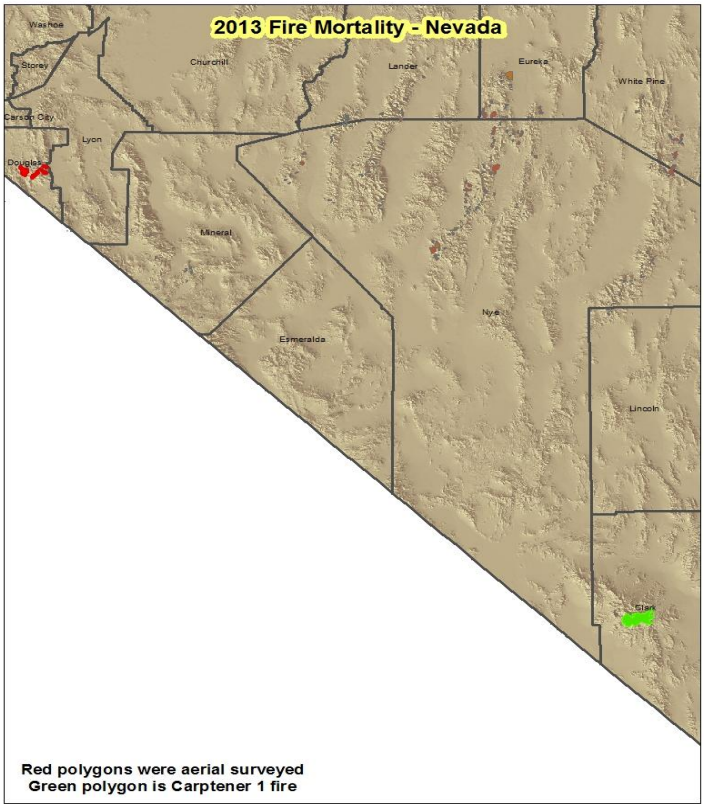


Figure 45 - Mapped fire damaged forest areas in Nevada in 2012

Frost Damage

There was no frost damage detected in 2013 in Nevada. 2012 ADS detected aspen damage due to frost throughout the mountain ranges of Nevada including the Snake, Schell Creek, Egan, Quinn Canyon, White Pine, Toiyabe, Shoshone, Santa Rosa, Pinenut, Sweetwater and Carson Ranges. Most of this re-foliated after the early summer damage, but it was not a full re-foliation and the stands appeared partially defoliated from the air.

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 had hired a Weed Geographic Information System Mapping Coordinator, Kim Williams, who 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 three-tier State List go to:

http://www.agri.nv.gov/PLANT_NoxWeeds_index.htm

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.

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.