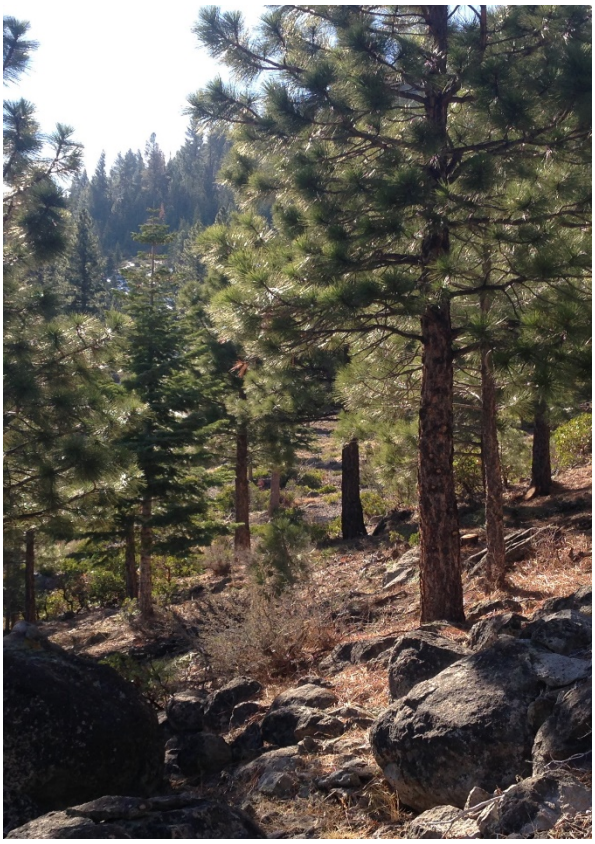
United States
Department
Of Agriculture
Forest Service
State and Private
Forestry
Forest Health Protection
Intermountain Region
R4-OFO-PR 17-02
State of Nevada

Nevada
Division of Forestry
Department of
Conservation and Natural
Resources

2016 Forest Pest Conditions In Nevada



Treated Jeffrey Pine-Mistletoe Pruning
Mt. Rose Area, Carson Range, Nevada
(Photo: Gene Phillips)

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
Robert Cruz, Acting Group Leader
Email: rcruz@fs.fed.us
Darren Blackford, Entomologist
Email: dblackford@fs.fed.us
Danielle Malesky, Entomologist
Email: dmalesky@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

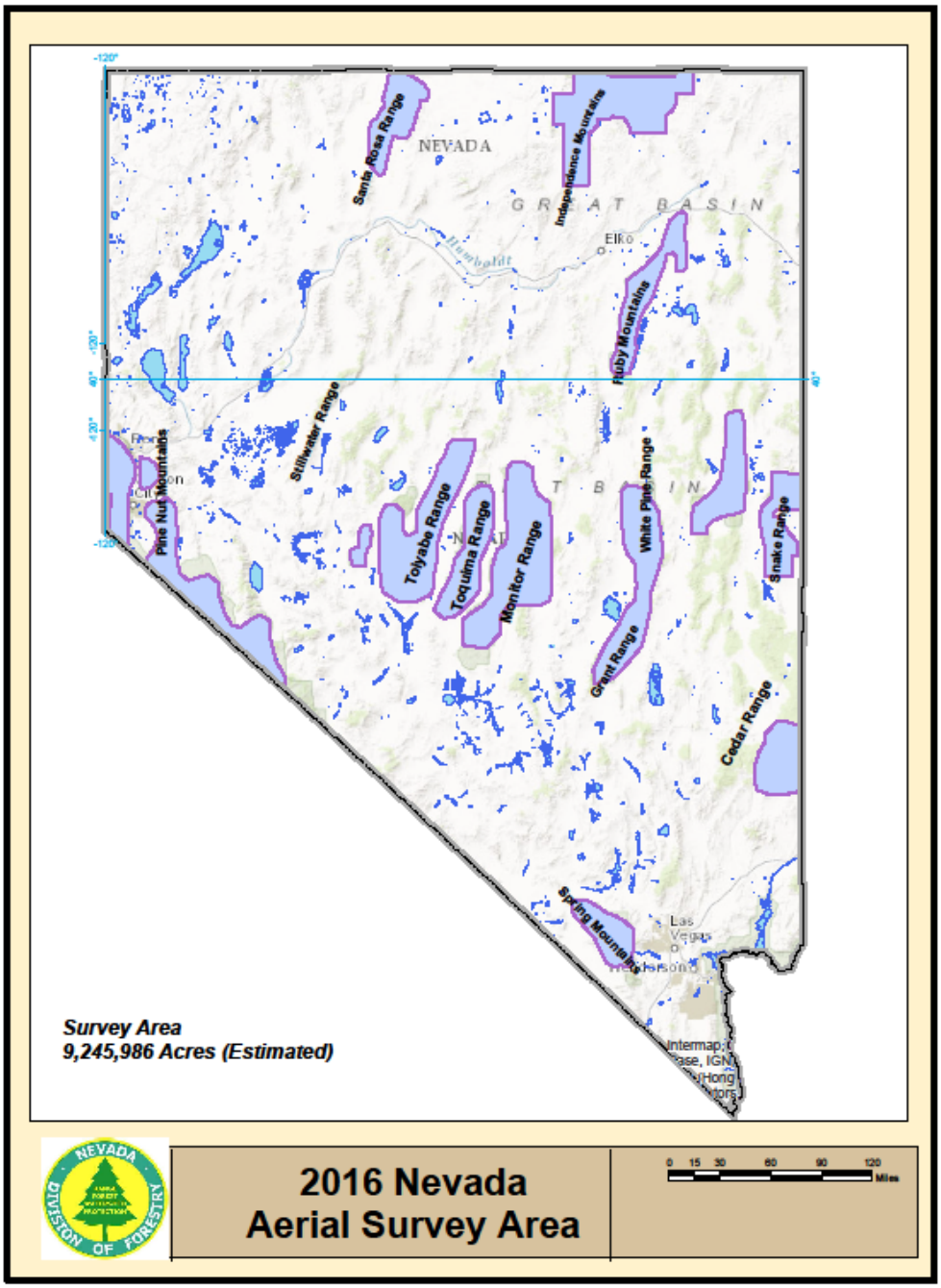
Department of Conservation
and Natural Resources
State Headquarters
2478 Fairview Dr.
Carson City, NV 89701
Gene Phillips, Forest Health Specialist
Email: gphillips@forestry.nv.gov
Phone: 775-849-2500 Ext..241

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

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

With Contributions from:
John Guyon II, USFS FHP Pathologist
Jeff Knight, Nevada State Entomologist

April, 2017



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. 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).

TABLE1. TOTAL NUMBER OF ACRES SURVEYED IN EACH OF THE OWNERSHIP CATEGORIES FOR THE YEARS 2009 TO 2016

Table 1. Total number of acres surveyed in each of the ownership categories for the years 2009-2016.

Land Ownership/ Year	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
NF H-T (NV)	3,998,170	4,340,053	4,008,334	4,011,229	3,340,095	4,429,990	4,916,969	5,329,221
NF H-T (CA)	551,238	595,850	582,933	582,933	685,252	595,007	625,488	570,641
BLM	2,074,498	2,299,901	1,937,082	1,892,996	1,013,172	1,483,353	1,597,815	2,742,127
Private (NV)	540,760	360,865	519,280	306,606	148,504	391,378	397,047	921,482
Private (CA within NF)	28,071	32,335	41,528	29,846	60,155	70,501	32,977	32,830
Great Basin NP	77,005	76,890	75,604	75,604	76,959	77,021	77,078	77,099
Other Federal*	38,530	1,007	33,228	33,228	6,466	5,124	3,719	80,120
NV State Lands	22,113	20,579	20,105	17,163	148,504	21,848	19,889	20,470
TOTAL	7,330,385	7,727,480	7,218,094	6,949,605	5,479,107	7,074,222	7,670,982	9,773,990

*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. However, the discussions of activity for individual insect and disease agents detected in 2016 are Nevada only and summarized on a county basis. The total number of acres in each county and the percentage of acres surveyed during 2016 are provided in Table 2.

TABLE 2 NUMBER AND PERCENTAGES OF ACRES SURVEYED IN NEVADA COUNTIES IN 2015

COUNTY	COUNTY ACRES	ACRES SURVEYED	PERCENT SURVEYED
Carson City	**103,569**	**67,853**	**65.5**
Churchill	3,215,911	0	0.0
Clark	5,176,177	311,330	6
Douglas	478,351	315,443	65.9
Elko	10,979,963	1,362,169	14.9
Esmeralda	2,294,165	0	0.0
Eureka	2,663,738	283,197	10.6
Humboldt	6,219,557	460,918	7.4
Lander	3,534,543	444,418	12.6
Lincoln	6,782,623	107,523	1.6
Lyon	1,310,315	289,847	22.1
Mineral	2,462,989	268,809	10.9
Nye	11,686,348	2,899,598	24.8
Storey	167,774	78,345	46.7
Washoe	4,234,009	248,817	5.9
White Pine	5,676,727	1,837,718	32.4
Total	66,986,759	9,245,986	13.0

In 2016, FHP changed the quantification methodology from “trees per acre” to “percent of trees affected” for polygons with insect and disease damage. Small areas are still recorded as points. A five level classification system is used to describe damage levels. Damage is recorded as a point, polygon, or grid cell feature and one causal agent is assigned to each feature. Depending upon feature type, the intensity of the damage is recorded differently. For point data, trees affected are classified into one of 5 levels that correspond to the number of trees killed associated with each point. For a polygon or grid cell data, the percentage of trees affected within each polygon or grid cell is classified into one of 5 levels for each polygon or grid cell associated with all trees within the polygon or grid cell data as estimated by the observer.

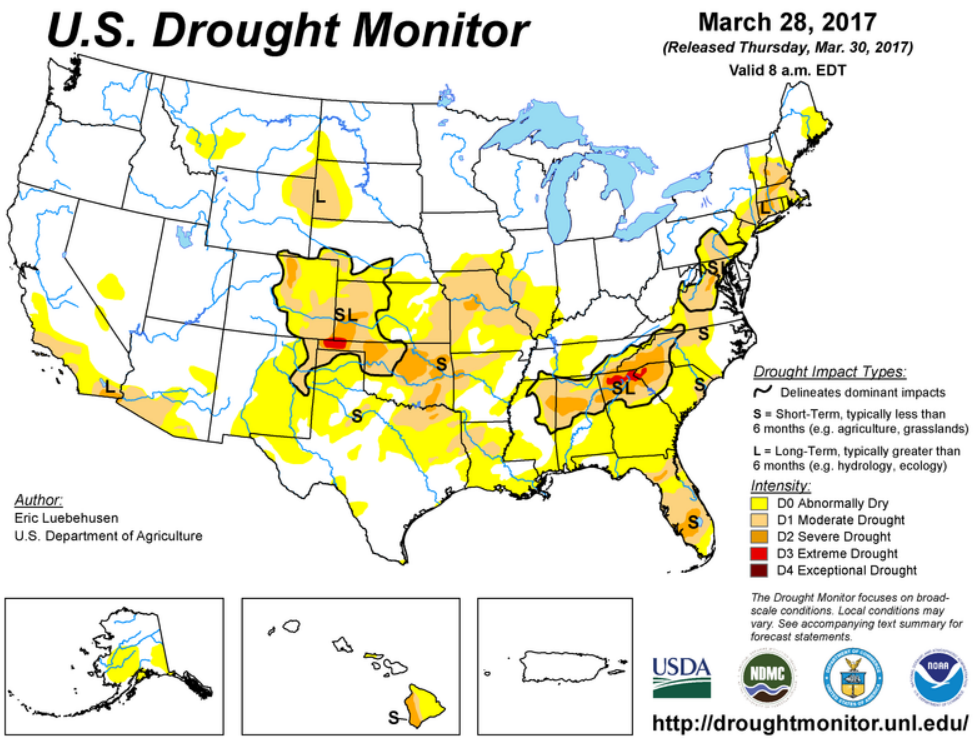
TABLE 3 THE 5 LEVEL CLASSIFICATION SYSTEM USED TO DESCRIBE DAMAGE LEVELS IN 2016

Point Class	Trees Affected		Polygon or Grid Cell Class	Percent Trees Affected
1	1		1	1 to 3%
2	2 to 5		2	4 to 10%
3	6 to 15		3	11 to 20%
4	16 to 30		4	21 to 50%
5	>30		5	>50%

In the winter of 2015-2016, in Nevada showed much improvement with about normal winter precipitation throughout the state. The winter of 2016-2017 has been excellent with above normal precipitation statewide with heavy snow loads and flooding. Drought conditions have been removed

from the entire state, with only some abnormally dry conditions being present in the south portion of the state (Figure 1). The palmer Drought Stress Index shows Nevada being out of historic levels of drought, and conditions continue to improve as of the time of writing this reports and looks to improve through the spring of 2017 (Figure 2).

Figure 1 US Drought Monitor Map for March 28, 2017



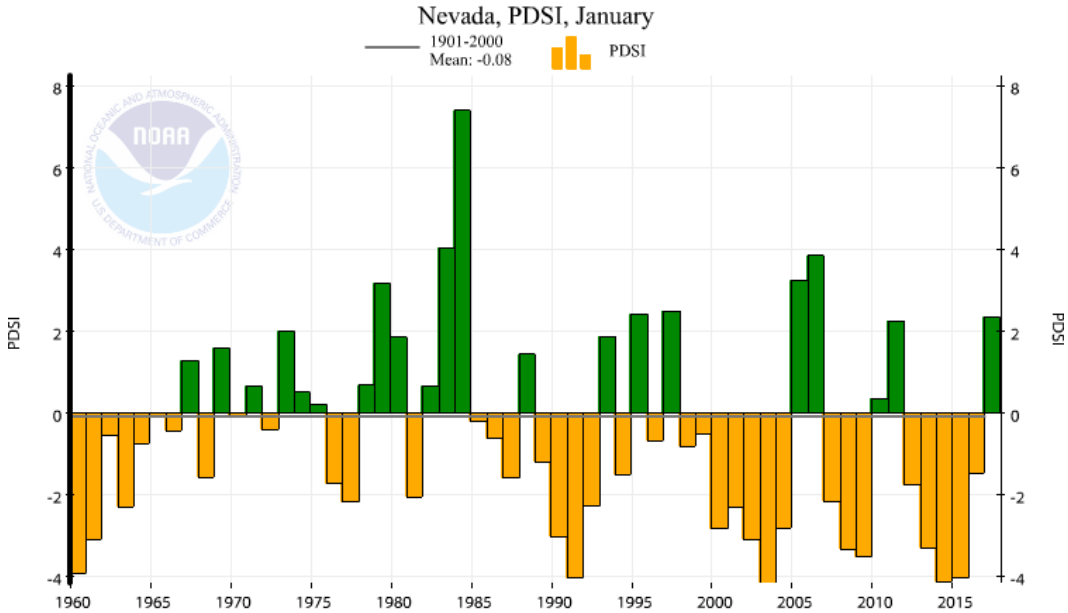


Figure 2 - National Oceanic and Atmospheric Administration (NOAA) Nevada Palmer Drought Severity Index – January - December Precipitation from 1955-2017 (National Climate Data Center).

In 2016, the amount of insect and disease caused mortality decreased. This decrease in insect and disease related mortality may be attributed to several factors. Factors include, but are not limited to, the natural population trends of insects over the course of time given the increase in predatory and secondary insect post outbreaks. Additional factors likely exist that explain this trend.
Most of the tree mortality noted in 2016 is attributed to aspen decline/dieback and to insect activity. Acres affected were largely dominated by pinyon engraver & mountain pine beetle, followed by Jeffrey pine beetle and pine engraver beetle. 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, 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.

In 2016, Nevada tree mortality caused by most insects and diseases (number of trees killed) decreased from 2014 for the third year in a row. Mountain pine beetle in lodgepole, whitebark, white, and limber pine decreased to 1,007 acres. Fir engraver beetle mortality, decreased to only 431 acres down from 600 acres in 2015.

In 2016, acres affected by defoliators decreased. Pinyon needle scale decreased in 2016 with 68 acres damaged, down from a total of 2,827 acres in 2015. Pinyon sawfly, and Douglas-fir tussock moth were not detected in 2016 with no damaged acres recorded. Forest tent caterpillar was not detected in 2016. White satin moth infestations were noted in the north and west portions of the state with 72 acres mapped, and has been recorded in Carson City, Douglas, Elko, and Washoe counties.

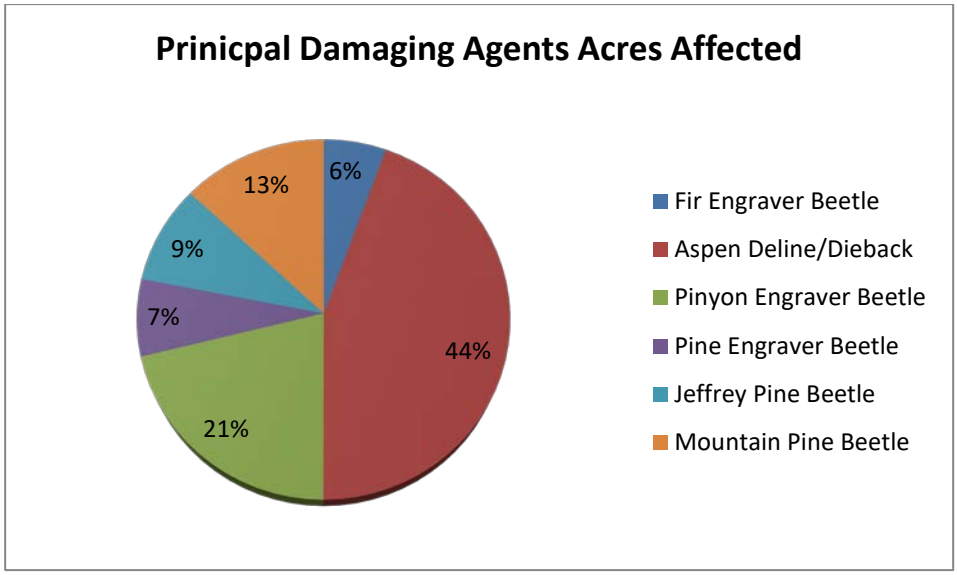


Figure 3 – Grahpic representation of the acres affected in Nevada by the main mortality and defoliation agents aerially mapped in 2016.

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

http://foresthealth.fs.usda.gov/portal
and
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: Table 3.

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

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.

No DFTM defoliation detected during aerial surveys in 2016 and no moths were trapped in 2016.

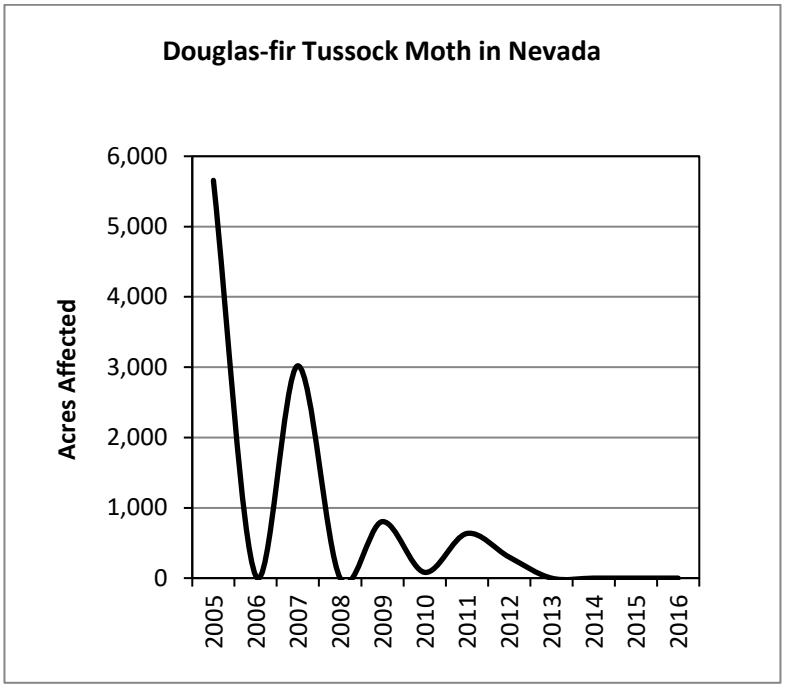


Figure 4 - Acres with Douglas-fir tussock moth defoliation in Nevada from 2005-2016.

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 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 2016, outbreaks were very minimal and a small amount of damage was verified in Great Basin National Park. No sawfly damage was detected in the aerial detection survey. That does not mean that isolated outbreaks did not occur, they were just not captured during the annual survey. Defoliator activity is cyclical in nature and will likely pick back up in the future.

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 1,161,000 acres of the approximately 9,950,000 acres of pinyon in Nevada were mapped as scale-defoliated. At this point, PNS was affecting trees in the mid-elevation range. This represented 11.6% of Nevada's pinyon forest. 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 of

predator/parasites, such as lady bugs and an unknown virus. The re-foliation significantly improved the condition of the trees in the higher elevation areas. Most of the 2011 damage was the lower elevation areas of 2010. In 2016 only 68 acres of pinyon scale infestation were mapped in NV. This minimal amount of damage is likely due to pinyon being re-foliated due to better winter and spring moisture in 2016. Much of the mapped area was also affected by a combination of insects such as twig beetles (*Pityophthorus spp., Pityogenes spp*.). From the air, the damage caused by these other insects is similar in appearance to that of PNS 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 therefore are all mapped as PNS.

A .

B .

C .

Figure 5 – (A) Top left photo of Berlin ichthyosaur State Park in 2007 before PNS infested the single leaf pinyon as shown on the top right photo of same general area in 2011 (note the see-through appearance of the foliage); (B) nearly epicormic re-growth exhibited on the defoliated pinyon in the spring 2011; (C) mature pinyon with heavy PNS infestation in 2012 in central NV.

White Pine County – 68 acres were detected throughout all elevations of the Egan, duck Creek and Snake Ranges.

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 2016, no FTC defoliation was observed during on the ground or aerial surveys.

INSECTS NATIVE

Bark Beetles

Fir Engraver Beetle

Scolytus ventralis

Hosts: true firs

Tree mortality due to fir-engraver beetle (FEB) has begun to increase due to the ongoing drought conditions. In 2016 mortality decreased to 431 acres down from 690 acres in 2015. This is a decrease of 38% in acres detected in 2015. However, many areas in the Lake Tahoe Basin are showing increased activity of FEB in stands heavily dominated by true firs. Since drought conditions have been alleviated it will be important to observe how populations respond in 2017.

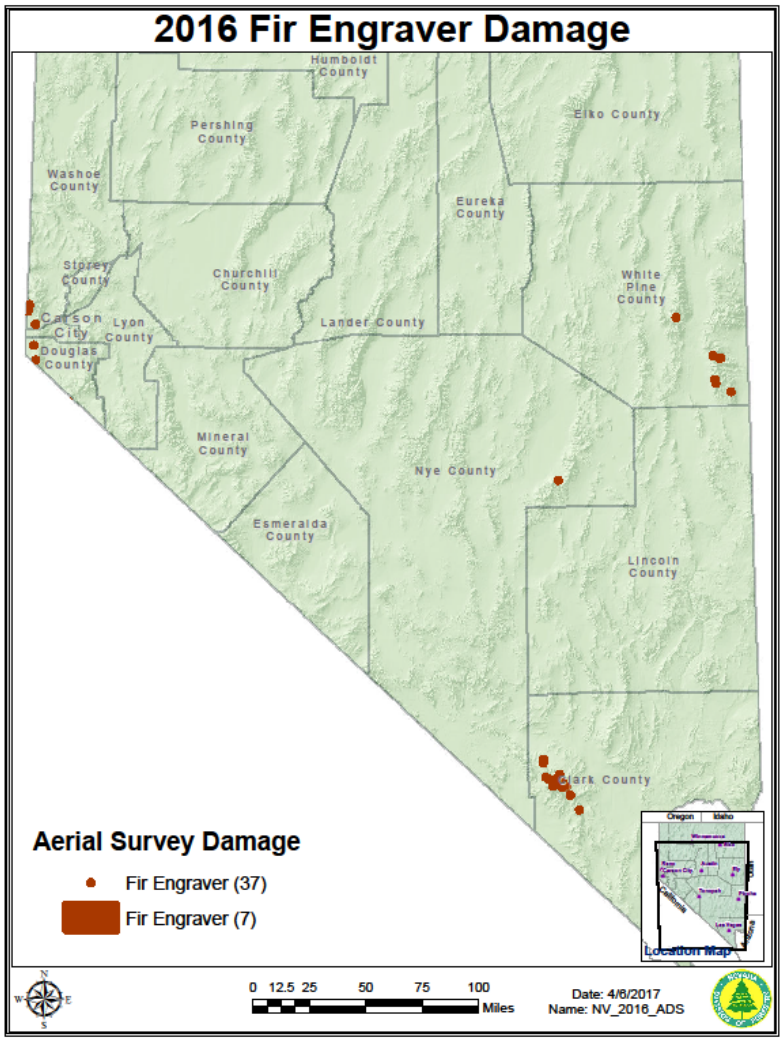


Figure 6 – Areas of mortality caused by the fir engraver beetle in Nevada in 2016.

Clark County- 2016 mortality was observed on 240 acres. The area mapped was found in Lee and Kyle Canyon which is north and east of Mount Charleston.
Douglas County – Mortality in 2016; 8 acres located mainly in the Carson Range within the county.
Elko County – Mortality; 4 acres located in the Jarbridge Mountains.
Nye County – Mortality occurred 10 acres located mainly in the Hot Creek and Granite Ranges.
Washoe County – Mortality occurred on 18 acres. This is a decrease from 2016. Damage is located all along the Sierra Front Range in white fir stands.
White Pine County – Mortality in White Pine County decreased as well to 151 acres down from 488 acres in 2015. Mapped activity is found in pockets in the White Pine, Schell Creek, Egan, and Snake Ranges.

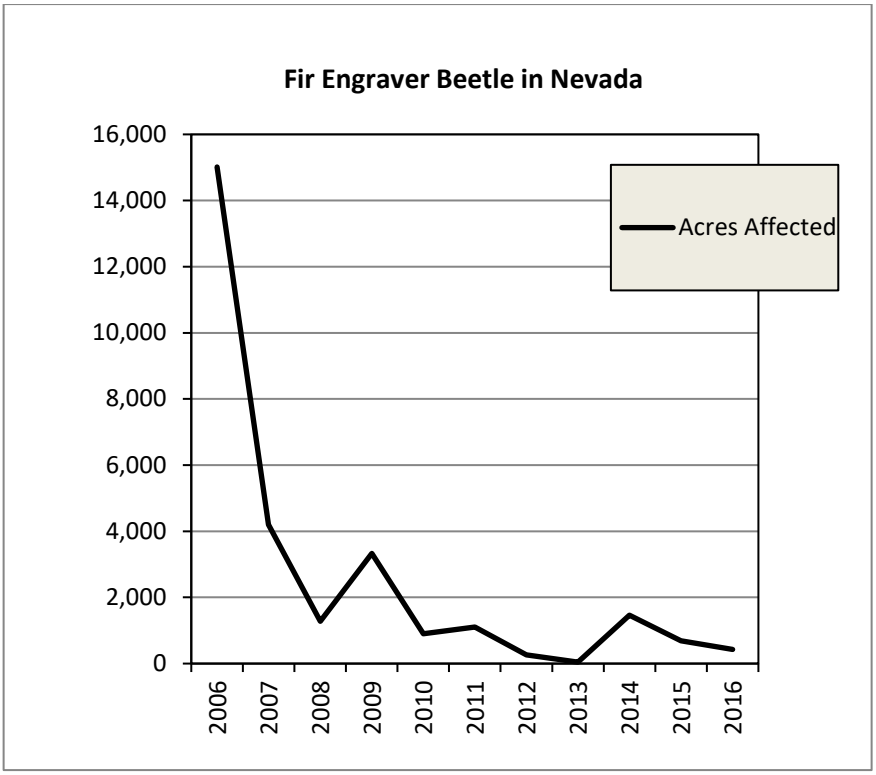


Figure 7 - Fir engraver mortality in Nevada 2006 - 2016

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. Mortality increased in 2016 due to the long term drought finally causing impacts. The area northwest of Incline Village, north of Crystal Bay had large pockets of the beetle, and this is due not only the drought but some untreated slash piles on federal land. 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 8 - Jeffrey pine beetle-caused tree mortality in Alpine county in California along Highway 88. (Photo: Sheri Smith)

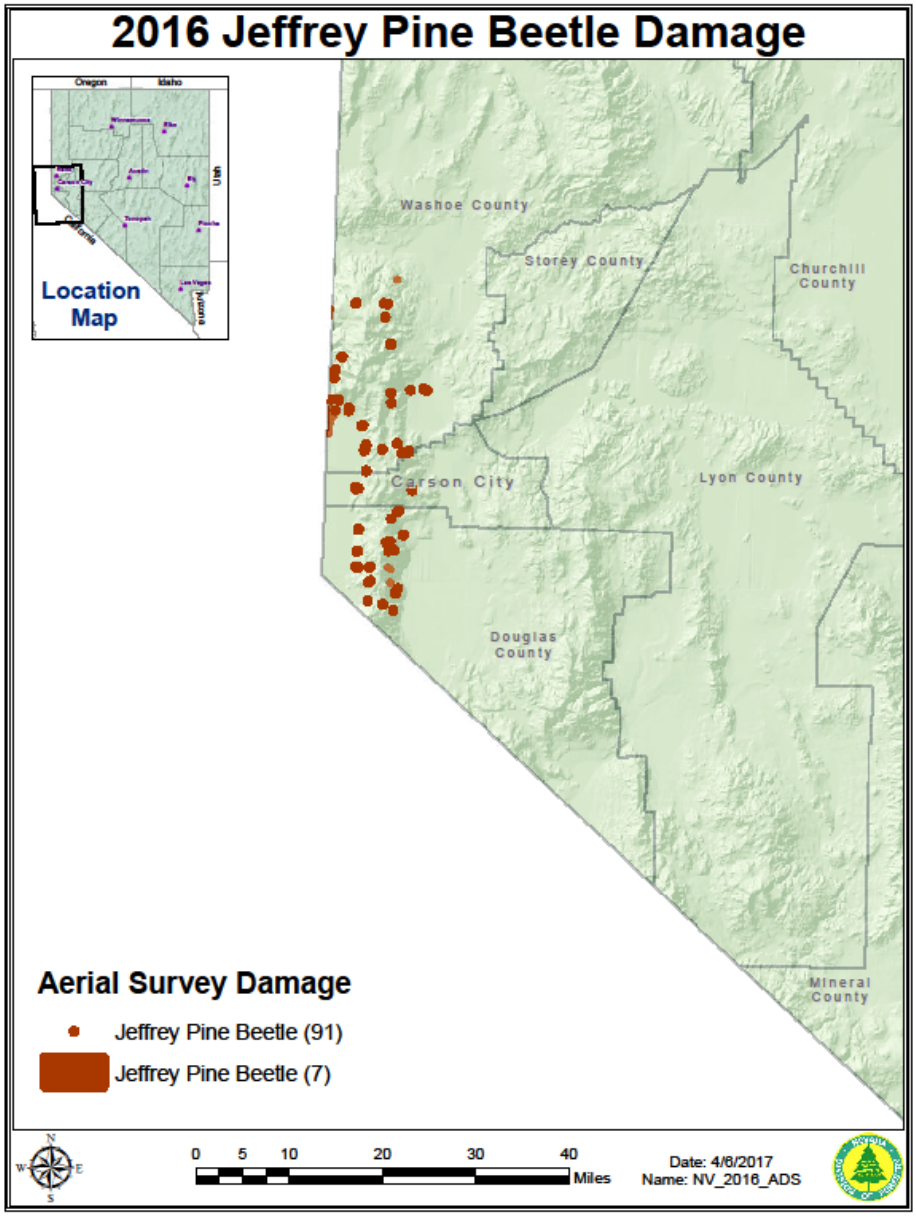


Figure 9 – Jeffrey Pine Beetle mortality in 2016 in western Nevada.

Carson County – Mortality was observed on 26 acres mainly located in the headwaters of Clear Creek, and north or Spooner Summit north of state Highway 50.
Douglas County – Mortality was observed on 72 acres located within the Carson Range within the county.
Washoe County – Mapped mortality, in 2016, increased 588 acres compared to 19 acres in 2015. Mapped activity is found in large pockets northwest of Incline Village. Additional scattered pockets are found on the east shore of Lake Tahoe.

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 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 2016, MPB-caused tree mortality in Nevada decreased in all species with the biggest decreases in whitebark and limber pine. Mortality decreased by 25% with a total of 955 acres mapped as compared to 1,269 acres mapped in 2015. Most of the 2016 Nevada mortality occurred in Elko, Nye, Washoe, and White Pine counties.

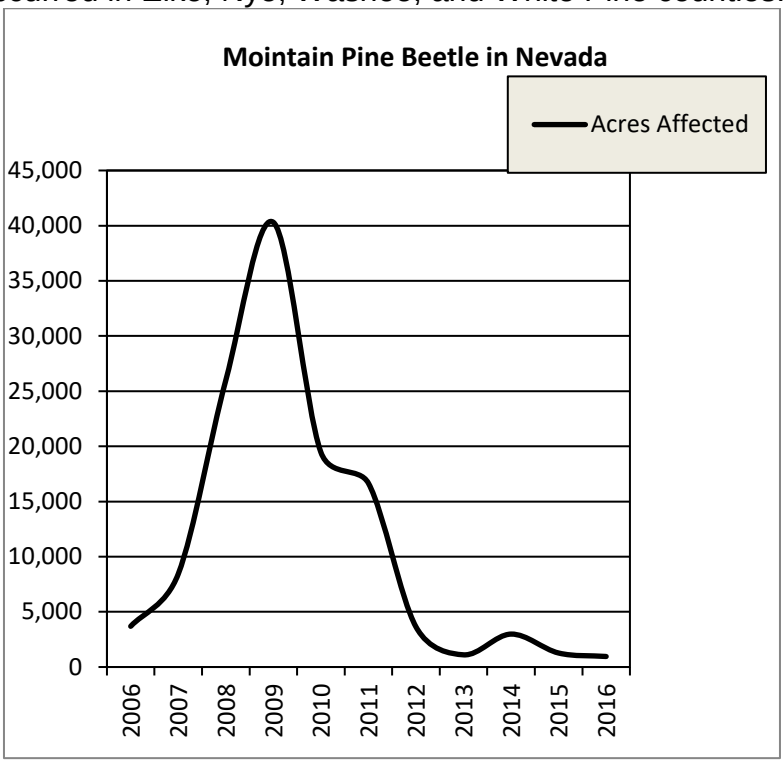


Figure 10 - Number of whitebark, limber, western white, and lodgepole pine acres affected by mountain pine beetle in Nevada from 2006-2016.

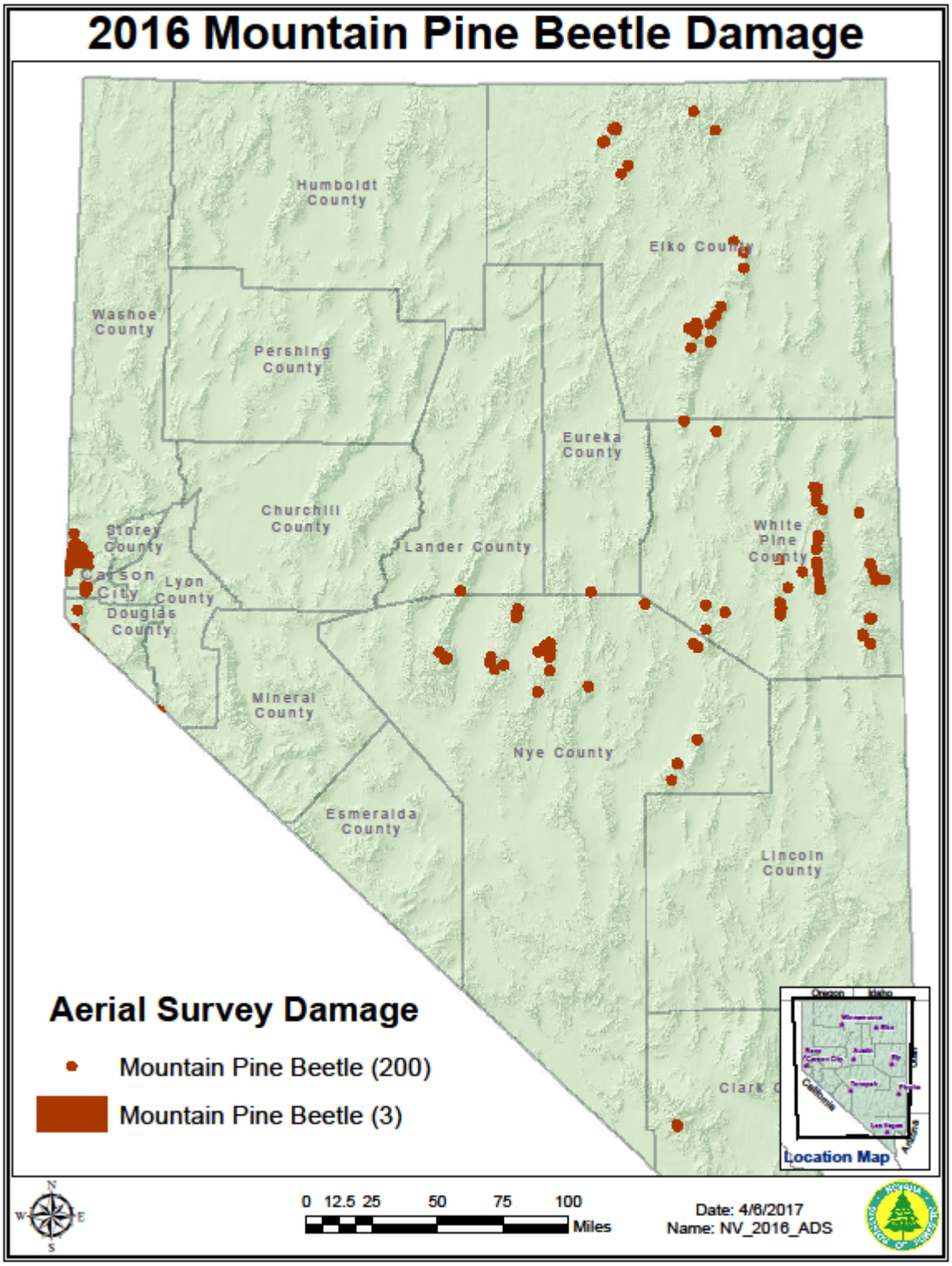


Figure 11 – Mountain pine beetle caused tree mortality in 2016.

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

In 2016, mortality of limber, whitebark, and western white pines caused by MPB increased to 767 acres as compared to 230 acres in 2015. This increased mortality occurred in small groups of trees on high mountain ridges, but was more widespread at slightly lower elevations surveyed. This is good news to the sensitive and important nature of these species especially whitebark pine.

Figure 12. Mountain pine beetle-caused tree mortality, in the Jarbridge Mountains, moving down slope toward the town of Jarbridge, NV (Photos-Gail Durham)

Elko County – Surveyors mapped 84 acres of MPB killed whitebark and limber pine trees, and 16 acres of western white pine trees. The majority of this mortality occurred in the Ruby Mountains

Eureka County – Surveyors mapped MPB-killed western white pine trees on 36 acres.

Lander County – Scattered pockets on 18 acres were mapped of MPB killed western white pine trees, along the upper elevations of the Toiyabe Range.

Mineral County – Surveyors mapped MPB killed whitebark pine trees on 9 acres.

Nye County – Surveyors mapped 197 acres of MPB killed western western white pine trees.

Washoe County – Surveyors mapped 91 acres of MPB killed western white and whitebark pine trees in 2016. This is a slight increase of 10 acres as compared to 81 acres mapped in 2015. The 2016 survey mapped MPB-killed trees in bristlecone pine in addition to western white and whitebark pine tree hosts. Scattered pockets were surveyed throughout the higher elevations of the Carson Range, mostly northwest of Mount Rose.

Mountain Pine Beetle in Lodgepole Pine

Carson City, Elko, Nye, Washoe, and White Pine Counties represented most of the mortality noted statewide. A total of 238 acres was observed and recorded. The damage was very scattered to isolated pockets of less than 5 acres statewide**.** Below is the trapping data from Mt. Rose for 2016.

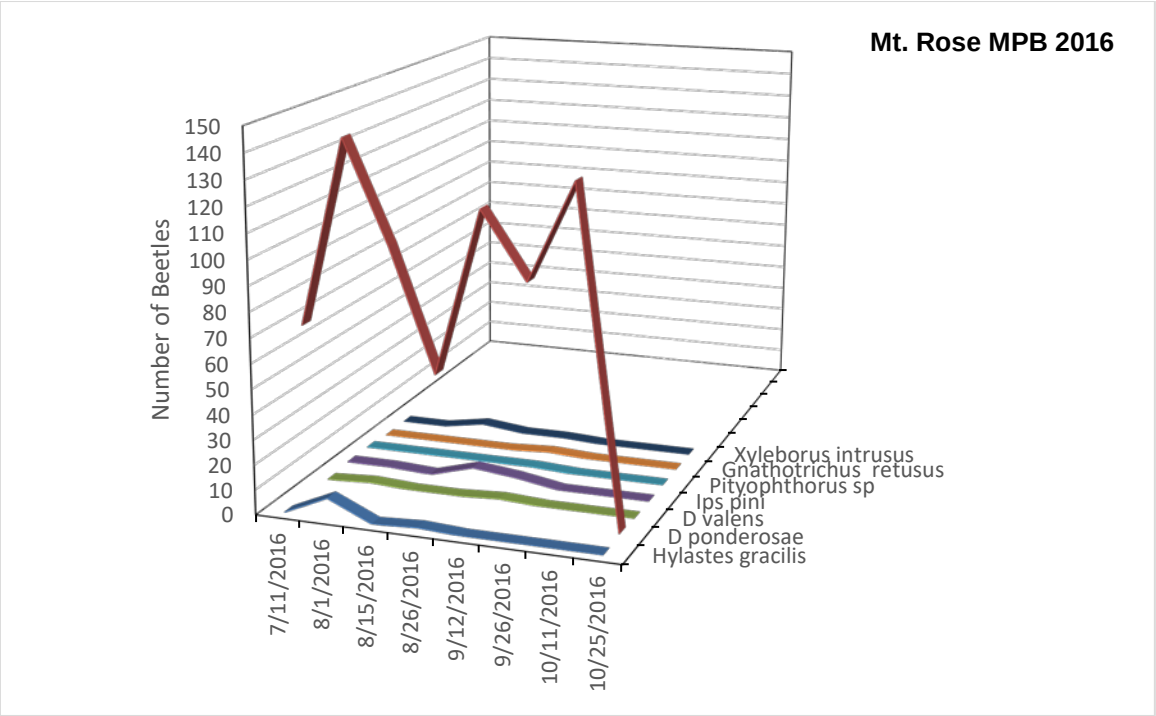


Figure 13 - Mt Rose Ski Area MPB trap catch data for summer 2016 with peak MPB catches from mid-August, mid-September, and mid-October which covered 3 flights during the season. This data is mainly to track population trends of MPB and does not compare this activity to other beetles trapped. However, there are secondary beetle being trapped which can indicate increased bark beetle activity.

Western Pine Beetle (WPB) in Ponderosa Pine

In 2016, ponderosa pine mortality was attributed to western pine beetle in four counties within the state of Nevada. See Figure 14 for trapping data.

Clark County – In 2016, there were WPB-killed ponderosa pine trees mapped on only 58 acres in Clark County. This is a substantial decrease in WPB damage and activity. Damage decreased from 487 acres in 2015 to 58 acres in 2016 observed. The majority of the WPB damage is along the Kyle Canyon corridor along Highway 157 where salt damage is occurring from winter time road salting thus stressing the ponderosa pine within the road right-of-way. Below is a graph showing the results

from trapping in Kyle Canyon for various bark beetles. Monitoring traps are installed again for the 2016 field season to monitor any changes in beetle populations.
Other Counties – The remainder of the state's counties accounted for only 10 more acres and was very scattered. Douglas, Mineral & Washoe County observed, 4, 2, and 4 acres respectively.

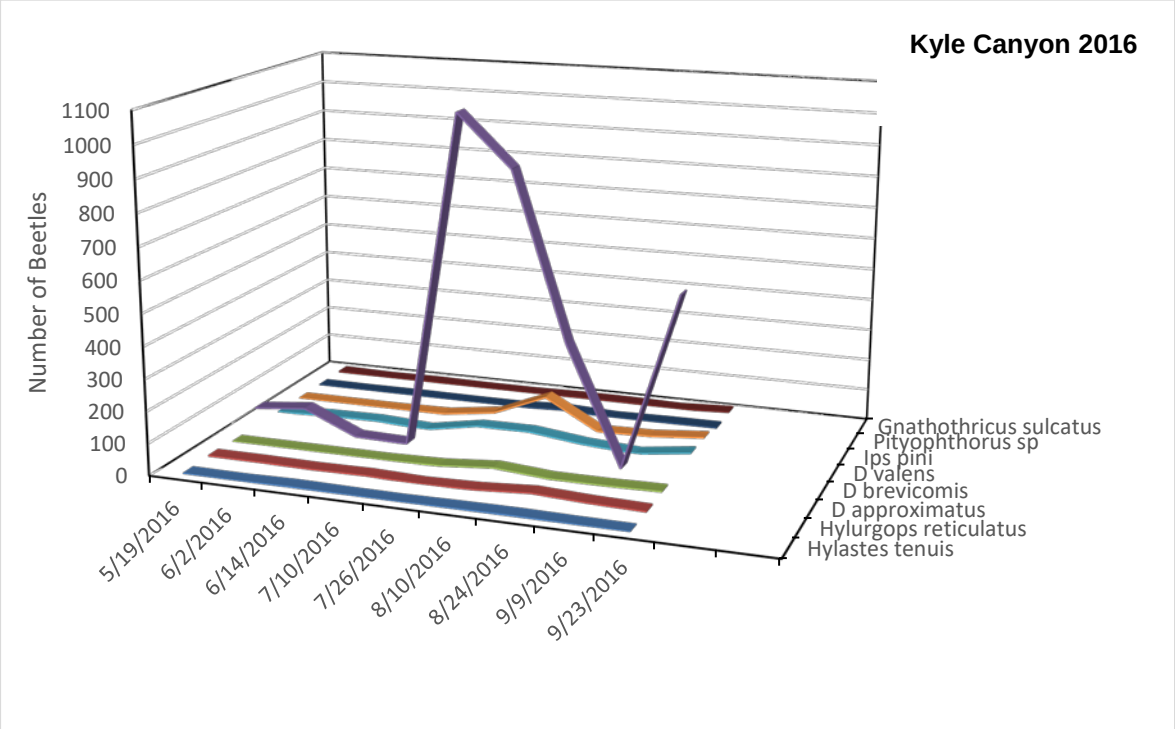


Figure 14 – Kyle Canyon trap catches summer of 2016 showing the dominance of D. brevicomis in mid-summer through early fall. This data is mainly to track secondary beetles which can indicate increased bark beetle activity.

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.

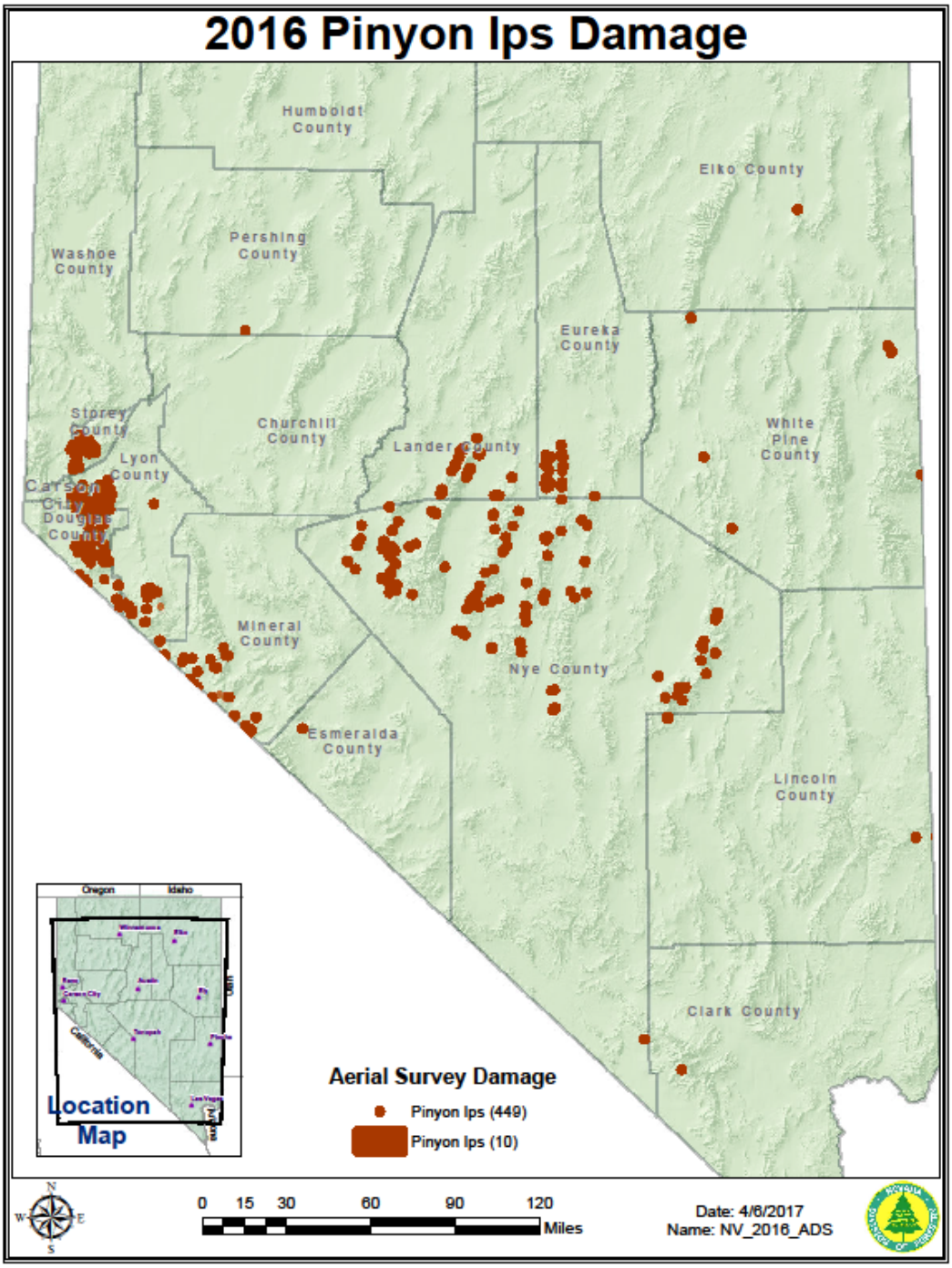


Figure 15 – Tree mortality caused by the pinyon engraver beetle in 2016 in Nevada.

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 from 2010 to 2013. It decreased back down to near 2008 endemic levels (Figure 16).

In 2016, recorded mortality increased to 1,632 acres mapped as compared to 1,199 acres in 2015. This is a 36% increase, however it is very slight statewide (Figure 16). In 2016, fourteen counties had recorded mortality from pinyon *Ips*. Lander and Nye counties had the greatest number acres recorded in aerial surveys which represents 62% of the state total.

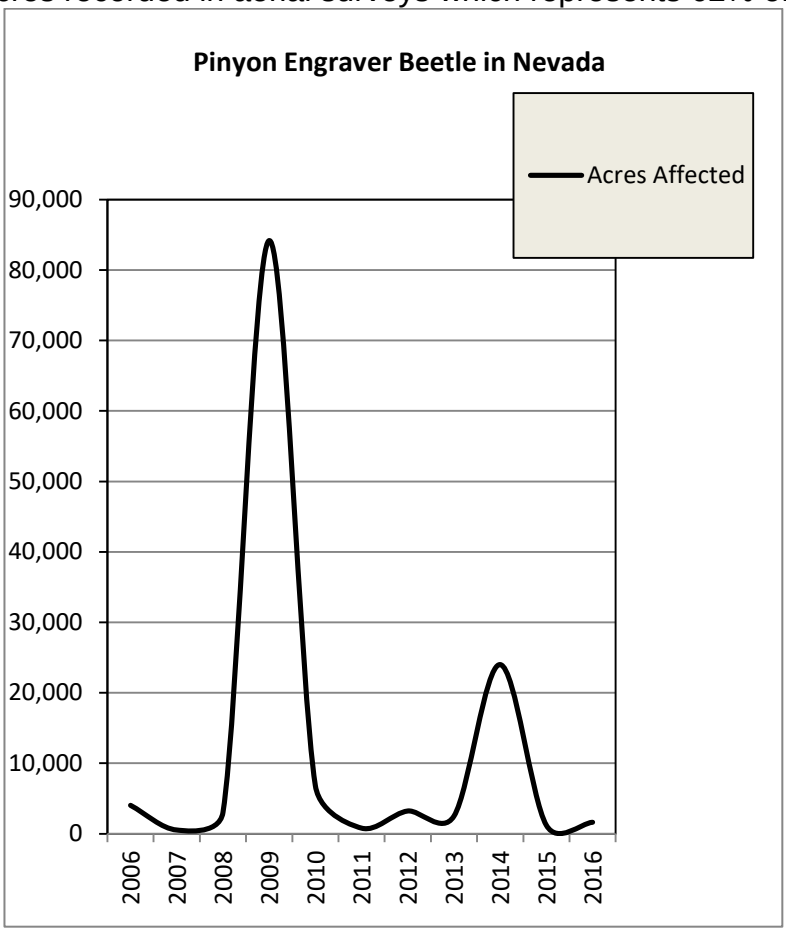


Figure 16 - Number of pinyon pine acres affected by pinyon engraver beetle/pinyon *Ips* in Nevada and from 2006-2016.

Carson City County – In 2016, surveyor's mapped pinyon *Ips*-killed pinyon pines on 18 acres.
Clark County – Surveyors detected pinyon *Ips*-killed pinyon pine trees on 2 acres in 2016.
Douglas County – In 2016, surveyor's mapped 163 acres pinyon *Ips*-killed pinyon pines as compared to 113 acres mapped in 2015. This represents a small increase in mapped tree mortality. Damage is located in many scattered spots throughout the Pine Nut Mountain Range and north of Holbrook Junction.
Elko County – In 2016, surveyor's mapped pinyon *Ips*-killed pinyon pines on 15 acres.
Esmeralda County – In 2016, surveyor's mapped pinyon *Ips*-killed pinyon pines on 2 acres.
Eureka County - In 2016, surveyor's mapped pinyon *Ips*-killed pinyon pines on 106 acres. The majority of the mapped mortality was immediately south and east of the town of Eureka, Nevada.
Lander County – In 2016 surveyors mapped mortality on 246 acres. Damage is found in scattered pockets in the northwest Shoshones, and northern Toquima Ranges.
Lincoln County - In 2016, surveyor's mapped pinyon *Ips*-killed pinyon pines on 4 acres.
Lyon County –The number of detected pinyon *Ips*-killed pinyon pine was mapped on 103 acres. This is a slight increase from 2015 where 39 acres were mapped. Mortality was identified in southern end of the Pine Nut Mountains.
Mineral County – In 2016, surveyor's mapped pinyon Ips-killed pinyon pine trees on 85 acres. Mortality is primarily located in the Excelsior Mountains
Nye County – Surveyors mapped pinyon *Ips*-killed mortality on 761 acres as compared to 260 acres mapped in 2015. This minor increase is not deemed as a serious problem. Damage was identified in scattered pockets in the Grant, Hot Creek, Monitor, Toquima, southern Toiyabe Mountain Ranges.
Storey County – In 2016, surveyor's mapped pinyon *Ips*-killed pinyon pines on 48 acres. All the mortality was located in the Virginia Highlands.
Washoe County – In 2016 damage continued to be very light where pinyon *Ips*-killed pinyon pine trees were mapped on 18 acres.
White Pine County – In 2016, pinyon *Ips*-killed pinyon pines were mapped on 33 acres. This is a decrease when compared to 2015 where 124 acres were mapped. 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 White Pine Range and in scattered pockets in the Egan, and Snake Mountain Ranges.

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.

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 gypsy moth and Douglas fir tussock moth are found in. It was introduced into North America in British Columbia in 1920. It is currently distributed from Newfoundland through eastern Canada, northeastern US and from BC to northern California and in 2004 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) which are hard to see

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 more 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, but what stands out is the one 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 cocoons in the leaves to pupate into 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 18 photos below:

Figure 18 – Female White satin moth (top left); egg mass (top right);
complete defoliation (bottom left); cocoons(bottom right). Lime Creek defoliation, Jarbridge Ranger District on the Humboldt Toiyabe Nationla Forest(July, 2015)

In 2016, little defoliation was observed. Approximately 2-5 acres of damage was noted in the Lime Creek drainage on the Jarbridge Ranger District of the HTF. Reports of activity were verified in the Orovada area, as well as Winnemucca, Nevada. The previous infestation and damage in North Canyon, north of Spooner summit has been very sporadic. This infestation west of Carson City showed some early increased activity but dissipated as the summer season ended. Statewide 72 acres were observed being defoliated in Carson City, Douglas, and Washoe Counties. The NDF Forest Health Specialist is monitoring reports, and activity and is verifying them on the ground to obtain better damage estimates statewide.

European Gypsy Moth
Lymantria dispar

Hosts: various deciduous species

In 2016, gypsy moth was surveyed by Nevada Department of Agriculture (NDOA). Trapping was conducted from May to September. In all 220 traps were placed in 14 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 2016.

Figure 19 - 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, 36 traps were placed in Clark County and southern Nye County. All traps were negative.

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 2016, the Nevada Department of Agriculture NDOA conducted funnel trapping for exotic wood borers using EDRR style trapping methods and sites (59 traps total) surveyed in 6 counties. All traps were negative. Emerald Ash Borer (*Agrilus planipennis*) trapping and data collection was performed in the Las Vegas and Reno areas. Trapping was conducted with 31 traps located in 4 counties and all traps were negative.

Mediterranean Pine Engraver

Orthotomicus erosus

Hosts: Pinyon pine. Aleppo Pine

This is a new non-native species identified by the Nevada Department of Agriculture entomologist Jeff Knight in the fall of 2015. This species was identified in pinyon pine west of Las Vegas, in the Blue Diamond area. The Mediterranean Pine Engraver now appears to be established though out the Las Vegas area and into Blue Diamond area west of Las Vegas. Populations at this time appear to be scattered and generally very light. Spring 2017 surveys by the Nevada Department of Agriculture of dead and dying pines did not yield any evidence of the beetle. The beetle does not appear to be the cause of the reported problems on pines in the area. Several specimens were submitted for identification to the NDA. Not all Lindgren traps from 2016 have yet to be completely processed. The NDA is developing information on this species and its possible effects and damage to conifer species in Nevada.

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 over mature 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.

Pinyon engraver beetle-caused mortality was observed in some of the heavy dwarf mistletoe infected pinyon pine stands around the state of Nevada. Continued drought through the fall

of 2016, continues to cause dwarf mistletoe-weakened trees to succumb to bark 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. 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 20 – A. cyanocarpum infecting whitebark pine in Lamoille Canyon in the Ruby Mountains and on limber pine at Angel Lake in the 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 21) 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 21- 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. Continued WPBR infections have been identified in the Lake Tahoe Basin and most recently near Incline Village, Nevada near Crystal Bay. The NDF has purchased blister rust resistant seed from the Sugar Pine Foundation in order to grow blister rust resistant sugar pine. These seedlings can be used in reforestation efforts where natural regeneration is not occurring. This seedling growing effort has just begun so no results available at this time.

At this point in time 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. No new information on these seed collection efforts has been received. In 2013, there was an erroneous report of a single white pine blister rust infested limber pine tree at Great Basin National Park.

Figure 22 – White Pine Blister Rust in sugar Pine
Photo – Jeff Haas

Aerial surveys in 2016 indicated scattered mortality throughout the Lake Tahoe Basin. Approximately 52 acres were observed showing decline or mortality, with the majority being observed in Washoe, Carson, and Douglas Counties.

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.

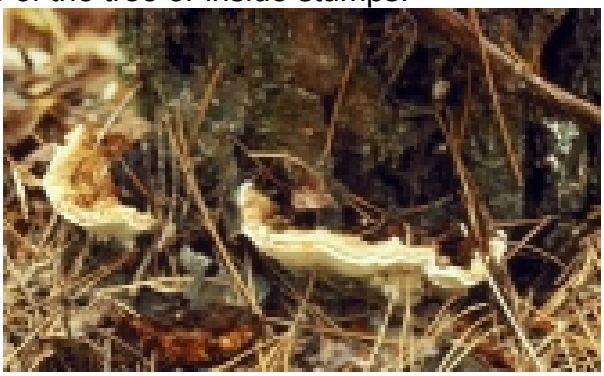


Figure 23 – Conk at base of tree

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 24 - Armillaria mushrooms, photo: Gail Durham

Black Stain Root Disease
Ophiostoma wageneri

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

Figure 25 - Black stain root disease. Photo-Donald Owen

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 2015.

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.

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. In late June through early July, Nevada received heavy amounts of precipitation which caused a significant amount of blight and leaf spot by late summer.

Figure 26 - Symptoms of aspen leaf spot disease.

Approximately 11,074 acres were surveyed as unknown Aspen defoliation. Elko County had 7,278 acres surveyed. Nye, Humboldt, and Lander County had 1,317 acres, 8787 acres and 577 acres surveyed respectively. The majority of the damage included heavy blight and leaf spot causing noticeable leaf discoloration and dieback. Fall color was impacted with trees losing their leaves early or not showing much fall color at all. Since these leaf diseases are cyclical and weather dependent it is not anticipated to be a long term problem. Aspen stands affected in 2015 should leaf out much difficulty in 2016.

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.

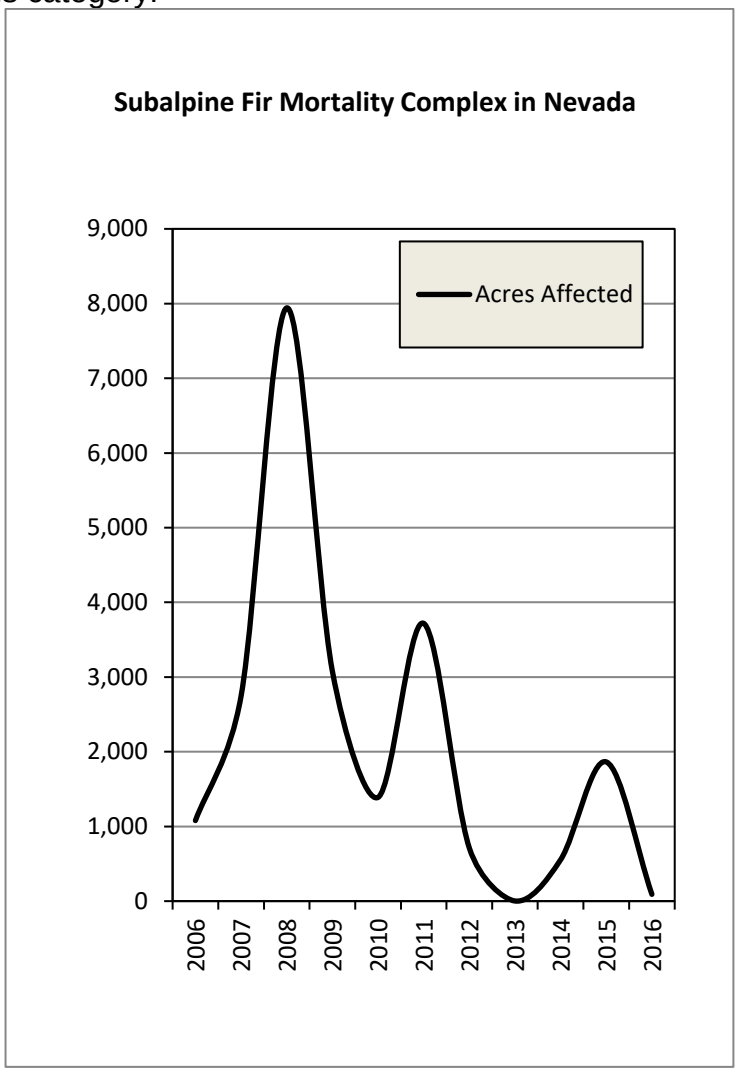


Figure 27 - Subalpine fir mortality complex 2006 - 2016

In 2016, negligible mortality attributed to subalpine fir mortality complex which were very small pockets that did not get coded with any acres. This was noted in aerial surveys as a a minor problem. The majority of the mapped 2016 ADS activity is located in Elko County.

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Elko County – No actual large acreages were recorded with only scattered pockets identified which were less than half an acre in size. These were located Jarbridge Mountains and totaled approximately 91 acres..

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.

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 2016, surveyors mapped approximately 3,434 acres. This increase was related to the Marsonnina affected Aspen from the 2015 event. However, stands may also be showing effects of the long term drought which is now over. Surveyors will observe how stands respond to this winter’s exceptional moisture amounts.

Douglas County – In 2016, 23 acres were observed mainly in the Carson Range
Elko County – In 2016 there was 869 acres of detectable aspen decline/dieback. This located mainly in the Jarbridge Mountains.
Eureka County –Scattered pockets were observed on 42 acres.
Humboldt County –In 2016, mortality and fading stands were observed on 1576 acres located mainly in the Santa Rosa Range. Some of this can be attributed to Marsonnina Blight from 2015.
Lincoln County –Very isolated pockets of damage were ovserved on only 3 acres.
Lyon County – In 2016, 35 acres were observed in very scattered pockets mainly in the southern most portion of the county along the CA/NV border.

Mineral County – In 206 surveyors mapped 64 acres of affected stands in scattered pockets.
Nye County – In 2016, surveyors detected 654 acres of aspen decline/dieback in Nye County. Dieback is found in continuous pockets in the southern Monitor, Toquima and Hot Creek Ranges.
Washoe County – In 2016, surveyors observed damage on 50 acres. This was located mainly in the Mt. rose Wilderness, north of Highway 431.
White Pine County – In 2016, surveyors mapped approximately 17 acres of affected stands, in scattered pockets. This was located mainly in the White Pine Range.

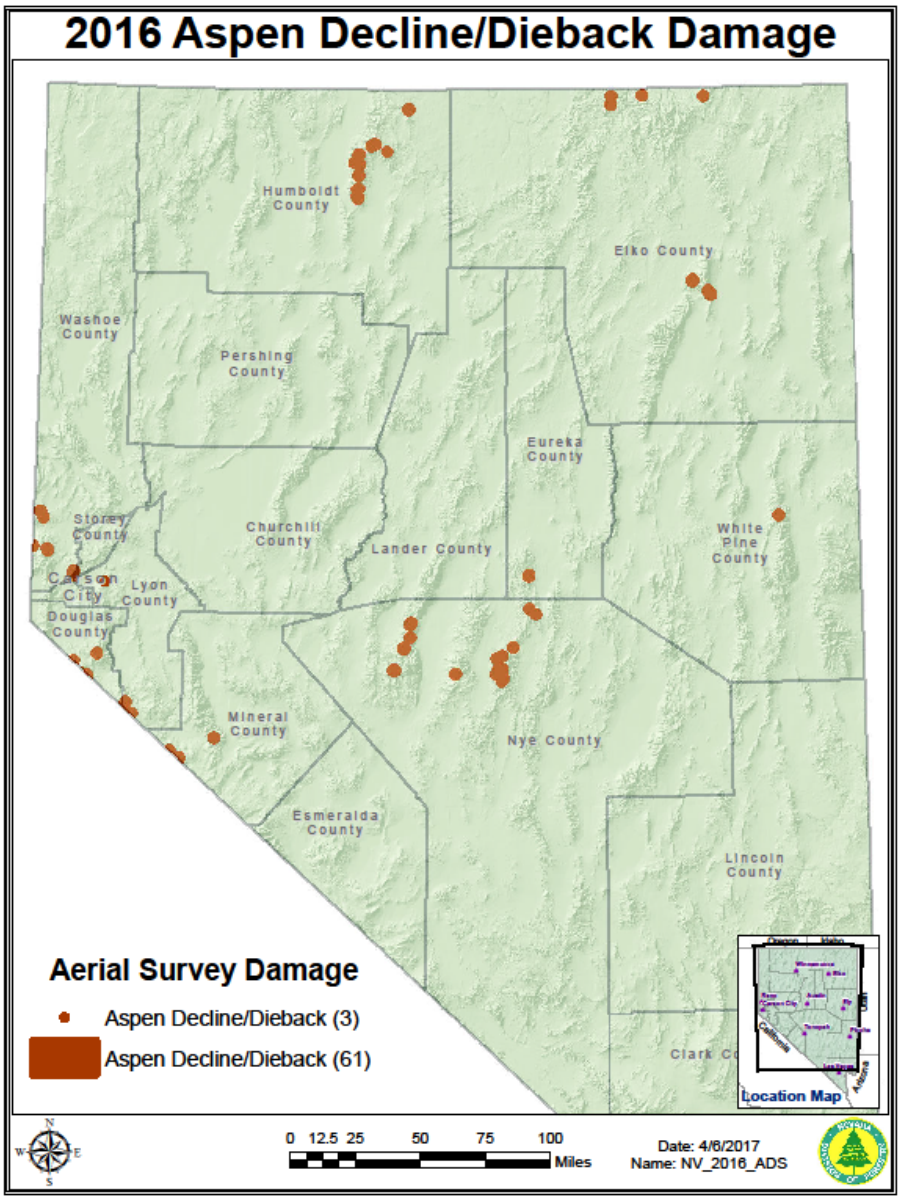

Figure 28 – Dieback & Decline of Aspen in Nevada 2016

ABIOTIC DAMAGE

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 significant blowdown was mapped in Nevada in 2016.

Wildfire Damage

In 2016, wildfire damage was minimal. Although it was a hot dry summer fewer lightning starts or human caused fires occurred. Lightning storms were attributed with moisture last season with fewer than normal starts. Acres burned increased from 42,479 acres in 2015, to 265,156 acres burned in 2016. There was some damage to timber resources in the state located in Great Basin national Park and along the Sierra Front north of Carson City. Minimal damage to the forested resource throughout the rest of the state occurred.

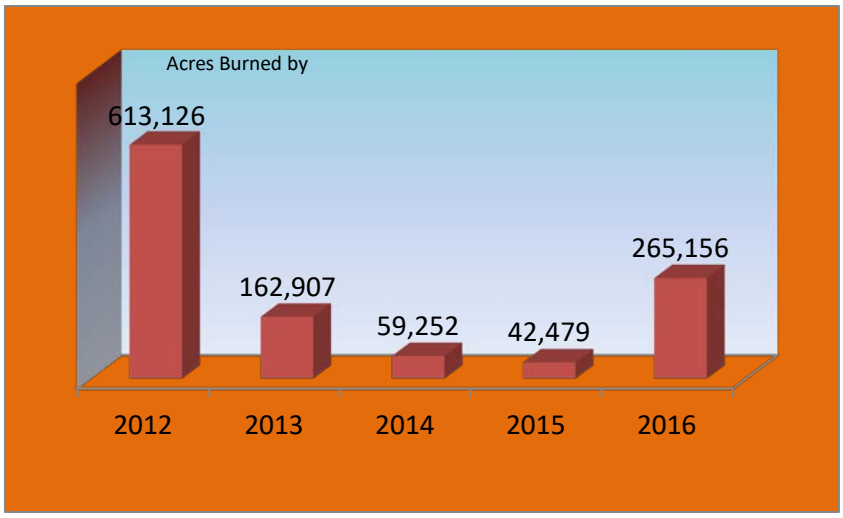

Figure 29 - Acres burned in Nevada 2012 - 2016

Unknown and Frost Damage

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

Approximately 91 acres of unknown or frost damaged aspen was aerially mapped throughout northern Nevada in 2016. Approximately 75 acres of the mapped area is in Elko County. These areas are very inaccessible so the cause of the defoliation was not verified in the field in 2016. Approximately 16 acres were mapped in Lyon and Nye County and was scattered in nature. The majority of the damage is attributed to frost damage.

Appendix A.

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 3 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 tracks weed populations throughout the state. For 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.