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Forest Service

State and Private
Forestry

Forest Health Protection

Intermountain Region

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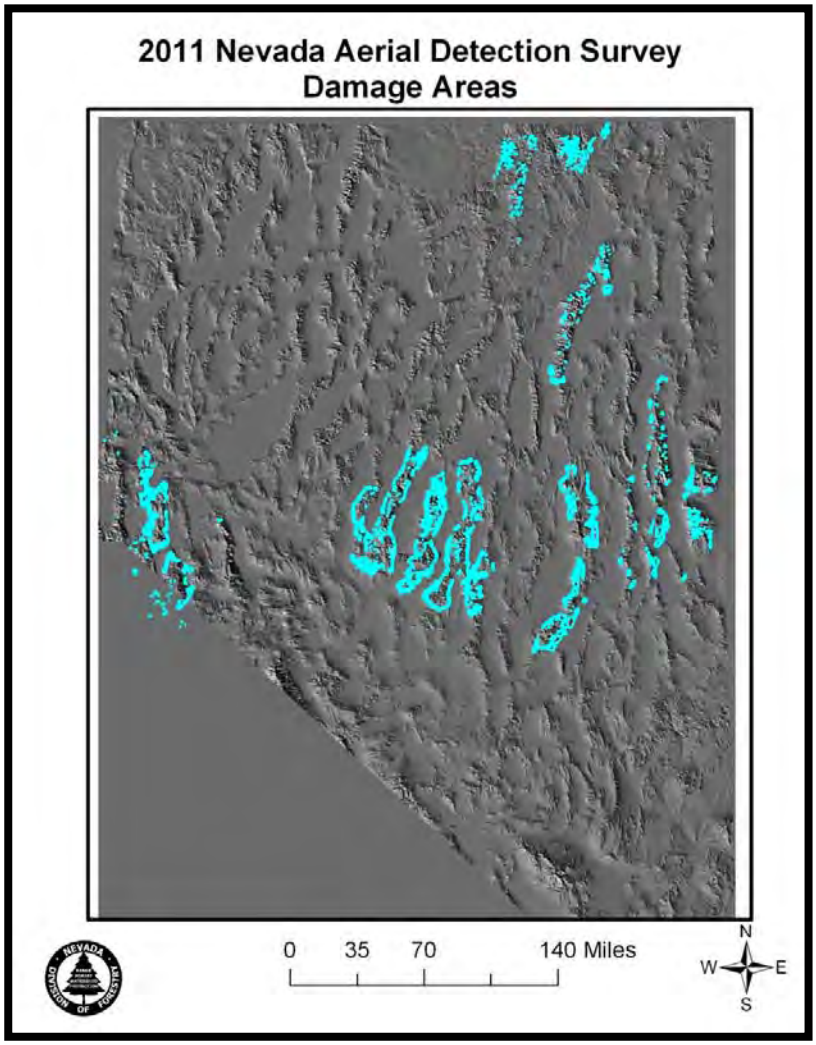
State of Nevada

Division of Forestry

Department of
Conservation and
Natural Resources

Forest Pest Conditions

In Nevada 2011



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INTRODUCTION AND SUMMARY

In an effort to simplify discussions of forest health conditions in Nevada, this report focuses on only insects, diseases, and weather factors that impacted various tree species in the State. Data collected through aerial detection surveys (ADS) conducted by the USDA Forest Service and Nevada Division of Forestry are primarily used to determine mortality trends in the State from year to year. Mortality trends are described in terms of acres affected; however, not all trees on these acres are dead. Thus, an estimate of the number of trees killed is also provided. Not all forested lands are surveyed, and not all of the same acres are surveyed every year. Sometimes, tree mortality may be counted in 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 2011 was comprised of National Forest System (FS) and Bureau of Land Management (BLM) lands in eastern and central Nevada. The ADS data encompasses most of the Humboldt-Toiyabe National Forest including portions of the Bridgeport and Carson Ranger Districts located in California. A smaller percentage of acreage was surveyed to obtain data for Great Basin National Park, other federal lands, State lands, and private lands (Table 1).

Table1. Total number of acres surveyed in each of the ownership categories for the years 2004 to 2011.

Land Ownership/Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
NF H-T (NV)	3924900	3697000	2508400	3739200	4757970	3998170	4340053	4008334
NF-HT (CA)	595000	531600	548000	560700	582000	551238	595850	582933
BLM	1076400	1109000	712300	938600	1924990	2074498	2299901	1937082
private (NV)	298600	344300	153200	381900	440637	540760	360,865	519280
private (CA within NF)	32600	31500	38000	36200	31800	28071	32335	41528
Great Basin NP	76200	76700	77000	76900	75995	77005	76890	75604
Other Federal*	42000	2900	10800	4500	41967	38530	1007	33228
NV State Lands	17800	18000	3000	20100	17073	22113	20579	20105
TOTAL	6063500	5811000	4050700	5758100	7872432	7330385	7727480	7218094

*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 2011 are Nevada only and summarized on a county basis. The total number of acres in each county and the percentage of acres surveyed during 2011 are provided in Table 2.

Table 2. Number and percentages of acres surveyed in Nevada counties in 2011.

COUNTY	Total Acres in County	2011 Acres Surveyed	2011 % Surveyed
Carson City	103,569	58,737	56.7
Clark	5,176,177	187,101	3.6
Douglas	478,351	314,457	65.7
Elko	10,979,963	1,137,703	10.4
Eureka	2,663,738	166,862	6.3
Humboldt	6,219,557	0	0.0
Lander	3,534,543	298,488	8.4
Lincoln	6,782,623	263,561	3.9
Lyon	1,310,315	110,926	8.5
Mineral	2,462,989	2,568	0.1
Nye	11,686,348	2,231,630	19.1
Pershing	3,863,680	0	0.0
Storey	167,774	40,376	24.1
Washoe	4,234,009	175,839	4.2
White Pine	5,676,727	1,584,537	27.9
Total	65,340,363	6,572,785	10.1

In 2011, the amount of insect and disease-caused tree mortality generally decreased. This decrease can be attributed to a general trend of decline over the last few years and above normal moisture in 2011. Adequate precipitation is necessary to maintain tree vigor and resistance to insects and pathogens. The western states, including Nevada, experienced above average precipitation in 2011 (Figure 1).

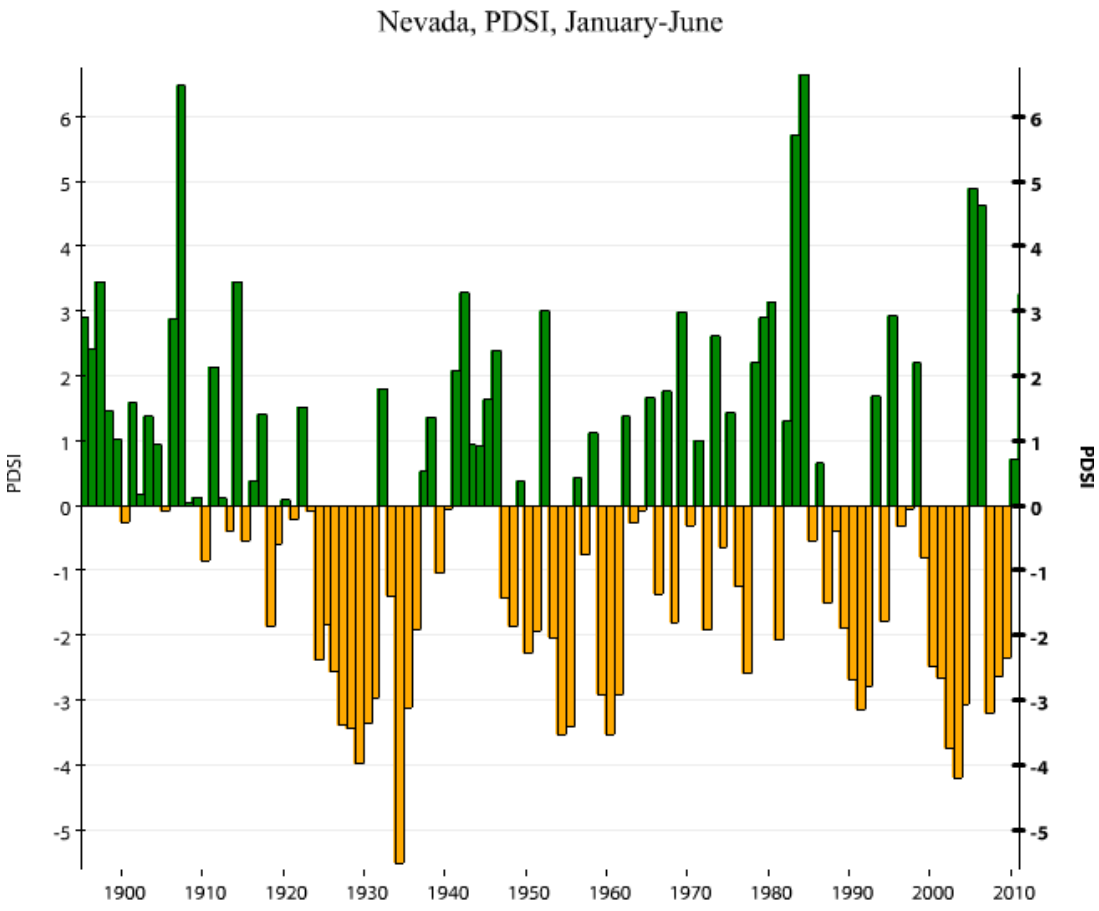

Figure 1 - National Oceanic and Atmospheric Administration (NOAA) Nevada Palmer Drought Severity Index –Z of January -June Precipitation from 1885-2011 (National Climate Data Center).

Most of the tree mortality noted in 2011 is attributed to bark beetle activity and/or past drought effects. Please note that most bark beetle-killed trees are not typically symptomatic (faded foliage) until one year following the year of attack (except pinyon pines attacked by pinyon Ips). Therefore, the numbers of acres affected and trees killed by bark beetles, as recorded during ADS flights, are typically a reflection of the previous year's or earlier attacks. Levels of defoliation, however, may reflect either the activity of an insect or disease during the current year or activity since bud break. Most of the pinyon pine defoliation attributed to pinyon needle scale has likely been occurring for a few years, but was only visible from the air starting in 2009. In 2011, above average precipitation during the winter months caused a re-foliation of the pinyon and a general improvement in overall pinyon health. Aspen and curlleaf mountain mahogany declines are largely attributed to successive years of drought in conjunction with stress/damage induced by other biotic and abiotic factors.

In 2011, Nevada mortality caused by insects and diseases (number of trees killed) decreased from 2010 for the second year in a row. Decreases in tree mortality associated with specific agents in 2011 are as follows. Fir engraver beetle on white fir decreased to 58% of 2010 levels, Jeffrey pine beetle mortality decreased to 50% of 2010 levels, and subalpine fir mortality decreased to 80% of

2010 levels, mountain pine beetle on lodgepole and white pines decreased to about 62% of 2010 levels, and pinyon pine engraver-caused mortality decreased to 47% of 2010 levels (Table 3).

Table 3. Tree mortality attributed to forest pest that was detected in 2011 by county[1]

	Mountain Pine Beetle White Pines[1]		Fir Engraver Beetle		Jeffrey Pine Beetle		Pinyon Engraver Beetle		Subalpine Fir Mortality Complex	
COUNTY	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Carson City	0	0	3	1	4	2	9	4		
Clark	15	13	10	5						
Douglas	3	1	21	10	21	10	175	88		
Elko	4,573	6,031					16	8	995	3,719
Eureka	113	56					203	106		
Humboldt	0	0								
Lander	231	223					80	43		
Lincoln	558	660								
Lyon	38	19					102	52		
Mineral	0	0								
Nye	1,127	682					544	354		
Pershing	0	0								
Storey	0	0					7	3		
Washoe	40	21	15	8	44	22	34	14		
White Pine	4,303	8,616	448	1,084			252	127		
Total	11,001	16,322	497	1,108	69	34	1,422	799	995	3,719

[1] Mountain pine beetle-caused tree mortality occurred in western white, whitebark, bristlecone and limber pines only and does not include lodgepole/ponderosa pine mortality. Mortality in lodgepole included 3 trees on 1 acre, in both Carson City and Douglas Counties each, and 96 trees on 28 acres in Washoe Counties. Mortality in ponderosa included 5 trees on 2acres and 2 trees on 1 acre in Lincoln and Nye Counties respectively, and 75 trees on 37acres in Clark County.

In 2011, most estimates of defoliation and associated decline caused by insect and disease activity or drought in Nevada decreased from 2010 levels. The exceptions were increases in the total number of acres affected by subalpine fir complex, fir engraver beetle, Douglas fir tussock moth on subalpine fir, and forest tent caterpillar on aspen. The total acreage of subalpine fir mortality was 268% of the acreage of 2010, and the fir engraver beetle mortality acreage was 123% of the 2010 acreage, but only 58% of 2010's number of trees killed, and Douglas-fir tussock moth defoliation increased to 774% of 2010 levels, while the acreage of aspen defoliated by the forest tent caterpillar was 129 % of the 2010 acres. Mountain mahogany decline decreased by12% of the 2010 acres damaged. The number of acres with aspen decline were 58% of 2010 totals. The biggest change noted this year was the re-foliation of pinyon pine due to the exceptionally wet year and a decrease in acres of pinyon needle scale and sawfly to nearly half of 2010 levels at 650,329 acres in NV. (See Figure 2 and Table 4).

Table 4. Insect defoliation and associated decline by county in 2011.

	Aspen Decline	Forest Tent Caterpillar on Aspen	Singleleaf Pinyon Pine Defoliation by Needle Scale & Sawfly	Curl leaf Mountain Mahogany Drought Damage
COUNTY	Acres	Acres	Acres	Acres
Carson City			10,552	
Clark			-	
Douglas	10		41,751	323
Elko	2,845	4,130	5,386	125
Eureka	107		18,449	
Humboldt			-	
Lander	143	30	59,709	128
Lincoln			31,727	
Lyon			25,001	
Mineral			1,062	
Nye	1,311	24	324,920	589
Pershing			-	
Storey			9,995	
Washoe	68		1,796	
White Pine			119,981	4,414
Total	4,484	4184	650,329	5,579

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

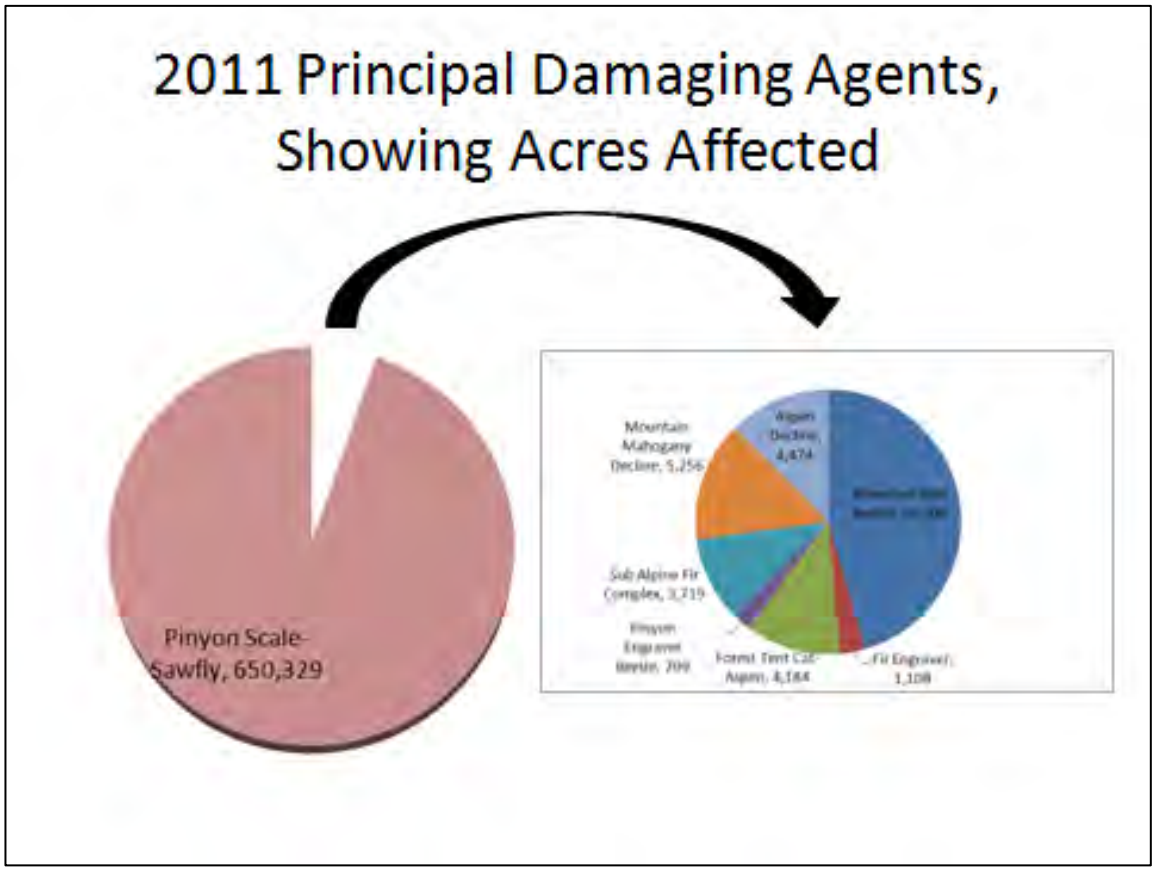

Figure 2- Acres of tree mortality and/or defoliation detected in 2011 attributed to various insects, diseases and drought.

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

http://www.foresthealth.info/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:

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

Figure 3 - Douglas-fir tussock moth larvae. Photo – from http://www.bugwood.org/

Hosts: All true firs and spruce

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

A slight increase of DFTM defoliation was detected during aerial surveys in 2011 in Elko County, Nevada. A total of 635 acres of light defoliation was observed in the headwaters of Mill Ck off Jacks Ck and above the campground in the North fork of the Humboldt River in the Independence Mountains. Other pockets were found in headwaters of the Jarbidge River and Camp Draw in the headwaters of the West Mary's River.

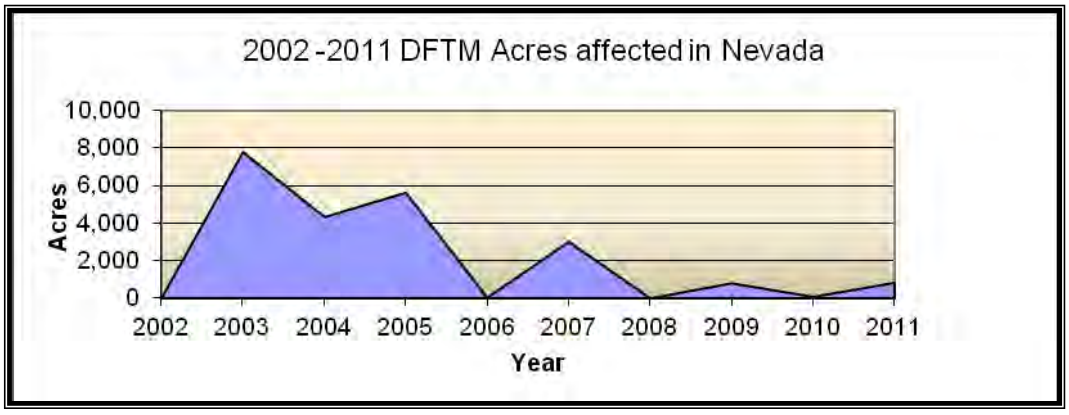

Figure 4 - Acres with Douglas-fir tussock moth defoliation in Nevada from 2002-2011.

Pinyon Sawfly
Neodiprion edulicolus

Host: pinyon pine

The pinyon sawfly is an important native insect capable of causing significant defoliation, but usually goes undetected because it occurs in small numbers and causes little damage. However, heavy defoliation causes reduced growth, stress, and tree mortality. Thin crowns cause a ghostly, transparent appearance of the forest canopy. In some locations, sawfly outbreaks are occurring in conjunction with pinyon needle scale (*Matsucoccus acalyptus)* defoliation.

In 2011, the outbreaks were still active in some of the same areas mapped as in 2010, but some new areas were found in Nye and White Pine Counties. The acreage infested in 2011 dropped in half to 13,240 acres from the 27,245 mapped in 2010. Other previously infested areas of the State are most likely still infested but were not surveyed in 2011. The re-foliation of the pinyon with the above average water year helped to mask some of the damage in some areas, but in other areas that have been repeatedly defoliated; many of the smaller and some of the larger trees are dying.

Figure 5 - Note the gray transparent appearance of pinyon sawfly defoliated areas on the northeast side of the Grant Range in Nye County in eastern Nevada in summer of 2011.

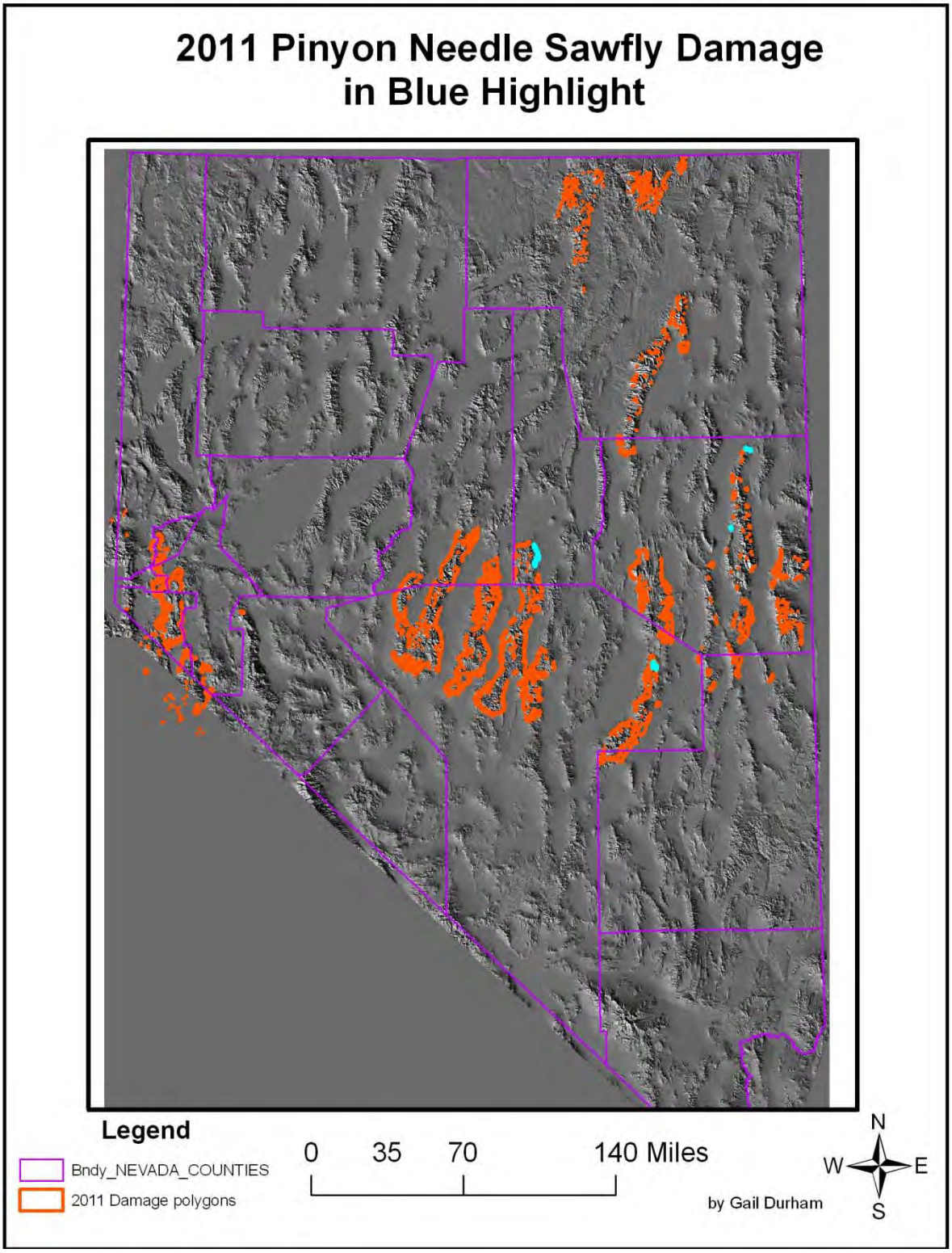

Figure 6- Map showing 2011 Aerial Detection Survey mapped pinyon needle sawfly damage.

Eureka County- 10,824 acres found at the lower elevations in southern Eureka County affecting the northeast end of the Monitor Range. This is only slightly less than 2010.
Nye County – 2,872 acres of heavy defoliation found on the north east end of the Grant Range in 6 small polygons.
White Pine County – 2,743 acres in two large polygons in the Schell Creek Range, one found at the lower elevations on the north end and one on the west side just north of the mouth of the Duck Creek Valley

Pinyon Needle Scale
Matsucoccus acalyptus

Host: pinyon pine

The pinyon needle scale is a sap-sucking insect that feeds on two year old needles. Foliage of infested trees turns yellow then brown. Heavy defoliation causes reduced growth, stress, and tree mortality. Past outbreaks have been recorded since 1959 throughout Nevada, causing localized defoliation and mortality of some trees. Historic outbreaks were noted in 1957-1963 in southeast Nevada and southwest Utah, affecting several hundred thousand acres. During 1969 and 1970, portions of the Humboldt-Toiyabe NF in California and Nevada were defoliated. A mild winter in 1969 was one of the many factors that triggered this severe outbreak. Again, it was mostly the younger trees growing at lower elevations on alluvial fans that were affected. In 2007, a localized outbreak was found on Currant Summit on the border of Nye and White Pine Counties. In 2008, an area of 776 acres was found on the east side of the Schell Creek Mountains, in the low foothills north and south of Cleve Creek and north of Taft Creek in White Pine County. In 2008, more evidence of this infestation was found further south on the east side of Connors Pass on the Schell Creek Mountains.

In 2009, approximately 7% of Nevada's mapped pinyon/juniper forest was affected by this insect with many areas also having very low levels of pinyon mortality attributed to pinyon *Ips* or other causes. Drought and scale defoliation likely exacerbated the pinyon mortality. The most severely affected areas were larger comprised of younger trees and occurred in the lowest areas of alluvial fans and hill slopes. 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 the scale was affecting trees in the mid-elevation range. This represented 11.6% of Nevada's pinyon forest. In 2011, the pinyon scale decreased to approximately half of 2010's acreage 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. Many of the smaller trees in this area have died from severe defoliation and subsequent twig beetle damage (Figure 6). 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. From the air, the damage caused by these other insects is similar in appearance to that of pinyon needle scale infestation, and some areas will be dominated by one or a mixture of these insects. Consequently, differentiating damage attributed to these various causal agents can be extremely difficult, and therefore are all mapped as pinyon-scale.

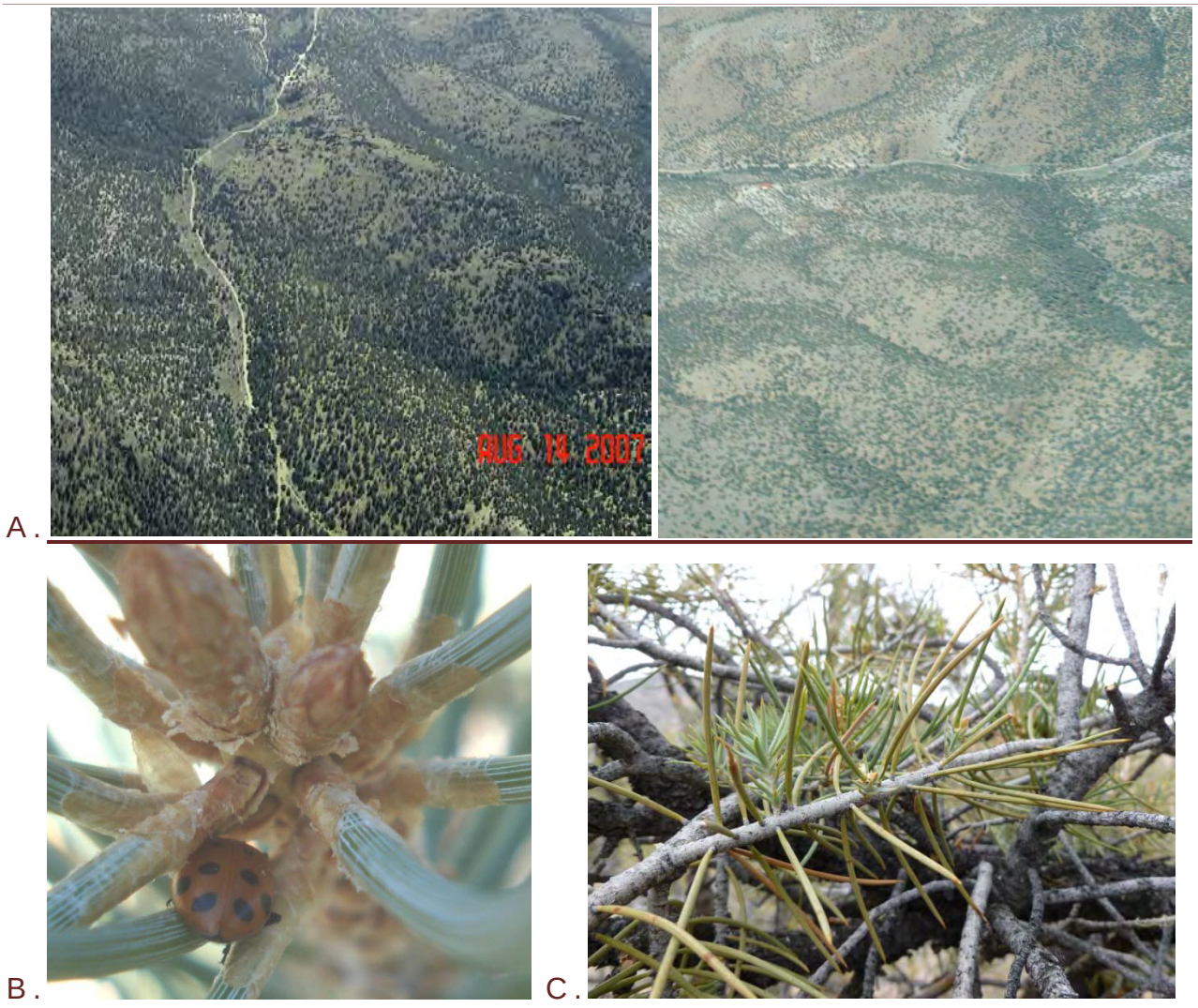

Figure 7 – (A)Top left photo of Berlin ichthyosaur State Park in 2007 before Pinyon pine needle scale infested the singleleaf pinyon as shown on the top right photo of same general area in 2011 (note the see-through appearance of the foliage), and (B) close up of adult lady bugs that have been feeding on scale on larger trees as well as the (C) nearly epicormic re-growth exhibited on the defoliated pinyon in the spring 2011

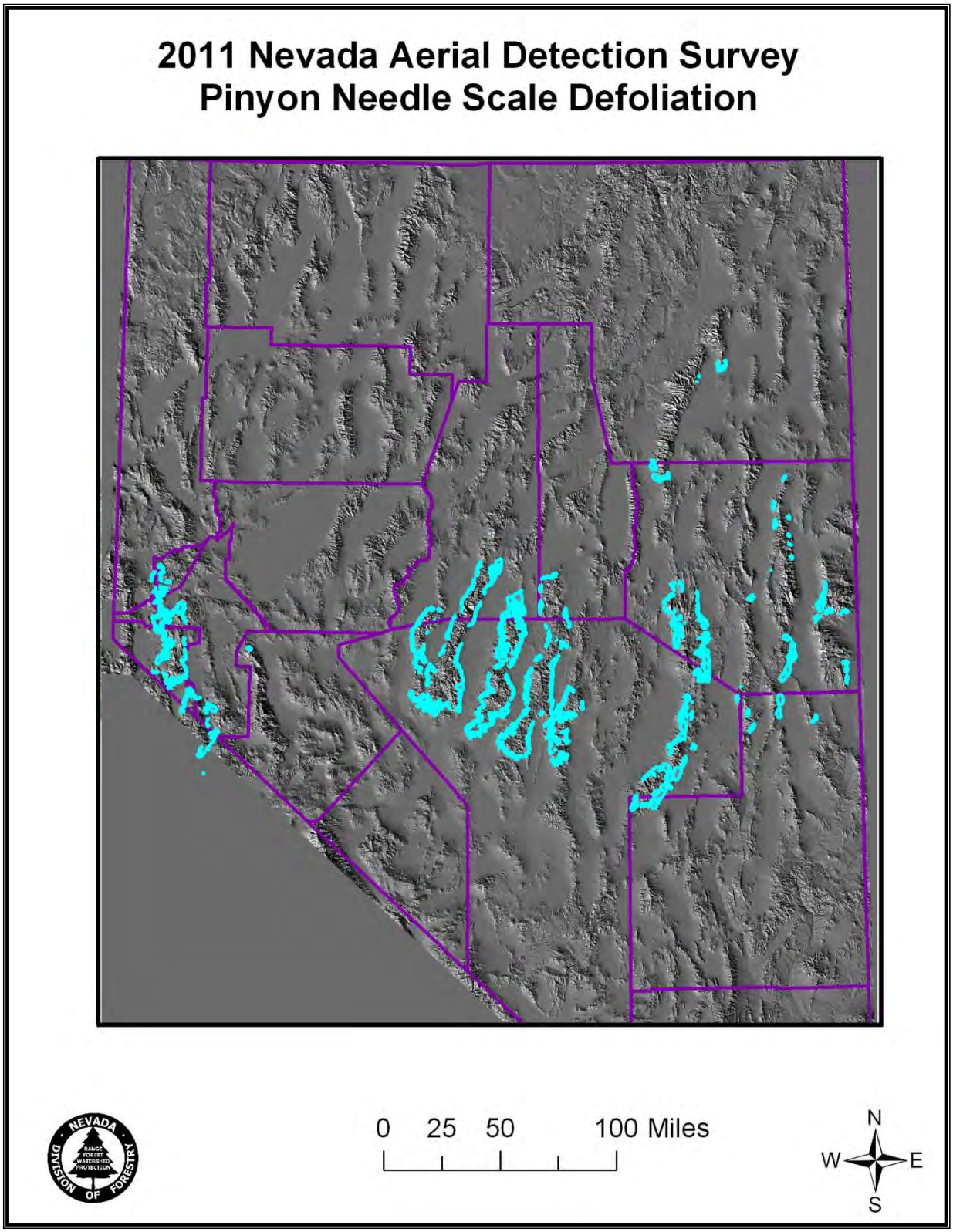

Figure 8- Pinyon needle scale (and other defoliator insect) damage in 2011.

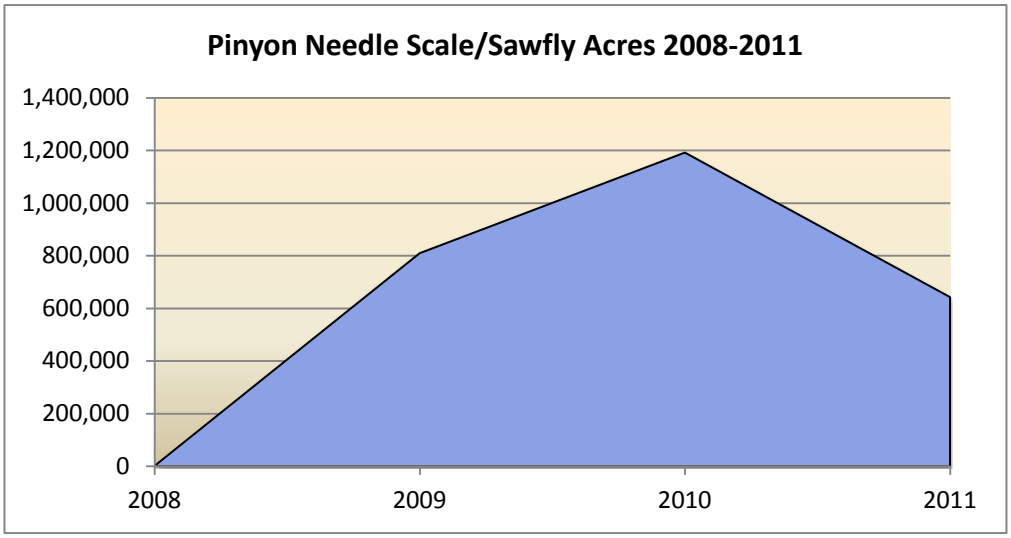

Figure 9 - Acres with pinyon pine needle scale and sawfly in Nevada from 2008-2011.

Carson City – 10,552 acres occupying most of the woodlands on the lower alluvial fans and typically on the smaller trees of the Pinenut Mountain Range.
Douglas County – 41,751 acres of the Pinenut Mountain Range on the lower alluvial fans and hill slopes of all aspects. Most of this defoliation was light to moderate. Many of the smaller trees are succumbing to this fourth year of defoliation and are being killed outright by needle scale, or in combination with other insects. The north end of the Sweetwater Mountains at the lower elevations is also lightly to moderately infested.
Elko County – 5,386 acres found in large patches on the lower elevations of the southern end of the East Humboldt Mountains , a few patches on the northeastern and southernmost Ruby Mountains, the north and west edges of the Cherry Creek Range in southeast Elko County, and one small patch on the southwest end of the Ruby Mountains.
Eureka County- 10,824 acres found in large patches on the northern end of the Monitor Range.
Lander County – 59,709 acres found in large patches at lowest elevations of the Toquima and Toiyabe Ranges. This is a continuation from last year.
Lincoln County –31,727 acres found at the lowest elevations of Quinn River Range on the southeast corner as well as scattered polygons on the south end of the Egan and Fortification ranges. The Wilson Creek range was not surveyed in 2011.
Lyon County – 25,001 acres on the southwest side of the Virginia Range in three large patches, and on the northeast end of the Pinenut Mountains at the lowest elevations. Large stands of the lowest elevation pinyon on the northeast side of the Sweetwater Mountains including Sweetwater Summit area were still moderately infested.

Nye County – 322,048 acres throughout the lower elevations of the Antelope, Hot Creek, Monitor, Toquima, Shoshone, Toiyabe, Grant, Quinn, Horse and White Pine Ranges in large elevational band swaths.
Storey County – 9,995 acres in large patches on the lowest edges of the Flowery Range, on the northeast edges of the Virginia Range.
Washoe County – 1,796 acres in one polygon on the west edges of the Virginia Range.
White Pine County – 117,238 acres in large patches at the lower elevations on the scattered along the west and eastern edges of the Schell Creek Mountains and continuously on the eastern edge of the Schells south of Highway 6, north and south end of the Egan Range, scattered large swaths at the lowest elevations of the Egan Range, much of the lower elevation pinyon on the White Pine Mountains from Hwy 50 south to Currant Summit, and a few large polygons on the south end of the Ruby Mountains. In addition, large patches were mapped on the Snake Range on the west side from Dry Canyon in the north to Dry Gulch in the middle of the range, and on the east side from Lexington Creek south to nearly the south end of the 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 taxonomically identified by Jeff Knight, Nevada State Entomologist in the 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, 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 2011, the area of FTC defoliation increased to 4,184 acres which was 128% of the 3,248 acres mapped in 2010. This mortality was observed in Nye, White Pine, and Eureka Counties. Humboldt County was not mapped in 2011. This includes 4,130 acres in Elko

County in the Bull Run, Independence, East Humboldt, and Ruby Mountains. In Nye County, there was a new spot totaling 24 acres on Table Mountain on Mosquito Creek in the Monitor Range. A new spot, totaling 30 acres, was mapped in Lander County at the north end of the Toiyabe Range south of Highway 50.

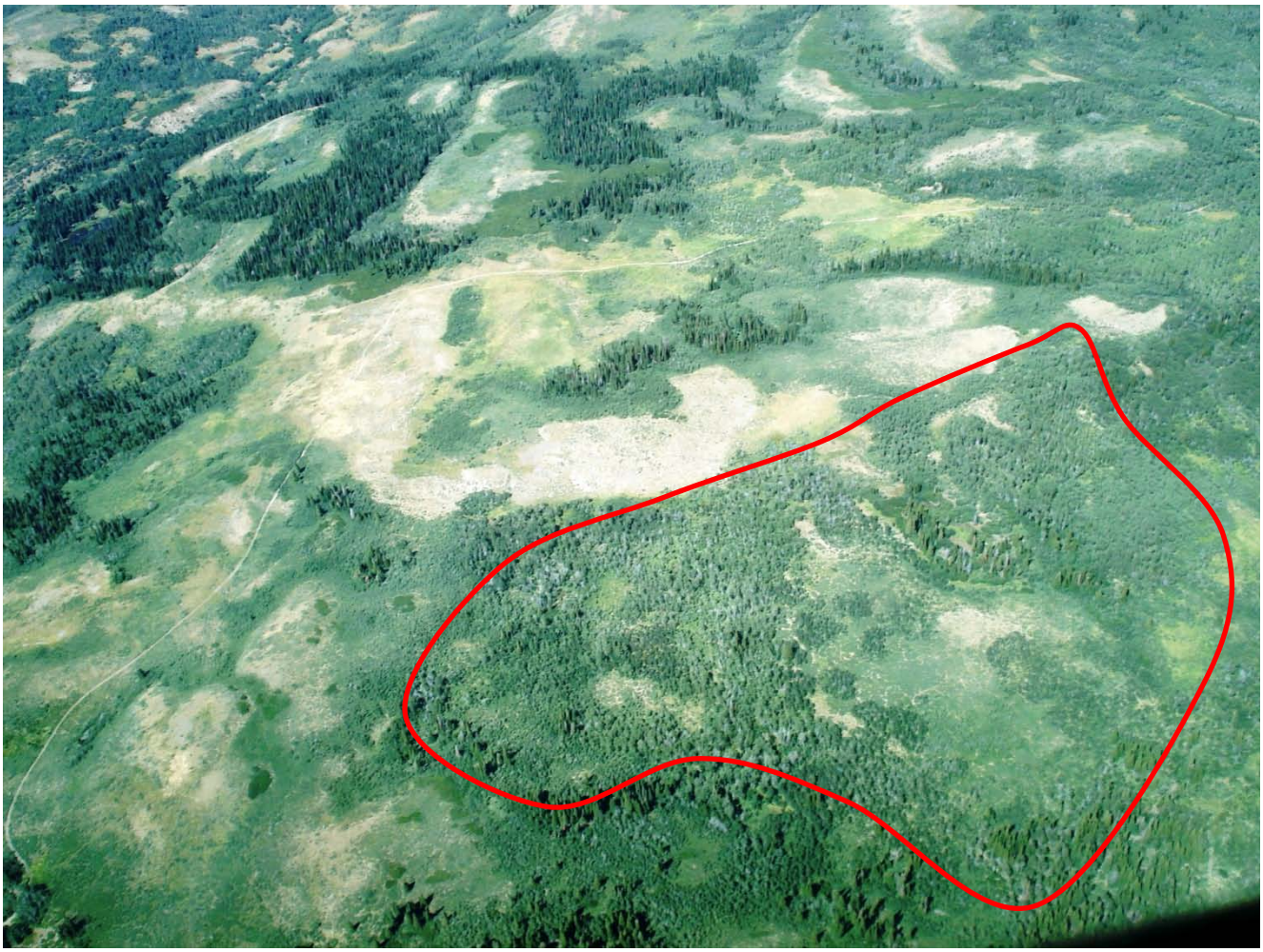

Figure 12– Forest tent caterpillar defoliation on aspen on the south end of the East Humboldt Mountains, NV in 2011.

Bark Beetles

Fir Engraver Beetle
Scolytus ventralis

Hosts: true firs

Figure 13- Primarily older white fir mortality caused by the fir engraver beetle on top of Success Summit in the Schell Creek Mountains, White Pine County, NV, in August 2010.

Tree mortality due to Fir-Engraver Beetle (FEB) continued to decrease in 2011 with beetles killing about 58 % of the number of trees that were killed in 2010. In 2011, 497 trees were killed on 1108 acres (Figure 10).

For the ninth consecutive year, White Pine County had the highest amount of fir mortality with approximately 448 dead trees scattered over about 1,108acres in 2011. This represents

a decrease to 72% of the 2010 mortality levels. Fir mortality remained static in Carson City and Clark counties, but decreased in Douglas, Washoe and White Pine counties in 2011.

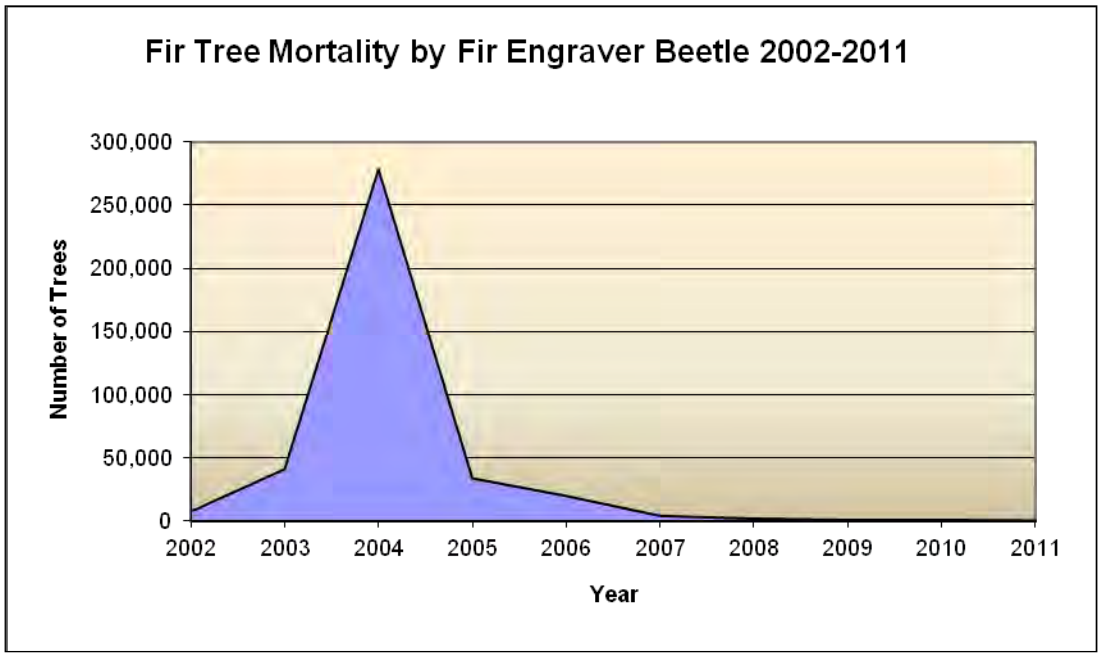

Figure 14 - Number of trees with mortality caused by the fir engraver beetle in Nevada and in Alpine and Mono counties in CA from 2002-2011.

Carson City – There were only 3 trees mapped on one acre in 2011, similar to 2010.
Clark County- Mortality was the same as 2010 at 10 trees were mapped on 5 acres in 2011.
Douglas County – Mortality decreased slightly from the 28trees killed on 14 acres in 2010 to 21 trees killed on 10 acres in 2011.
Washoe County – Approximately 15 trees were mapped on 8 acres in 2011. This is 44% of 2010's mortality.
White Pine County – Most of the mortality in Nevada was found again in this county- 448 trees mapped on 1,084 acres. However, this tree mortality is only about 72% of the number reported in 2010.

Jeffrey Pine Beetle
Dendroctonus jeffreyi

Host: Jeffrey pine

The Jeffrey pine beetle is the most destructive bark beetle of Jeffrey pine. Endemic populations usually attack scattered, slower growing, mature and over-mature trees and trees struck by lightning. In Nevada, Jeffrey pine is only found naturally along the Sierra

Nevada Mountains. Field examinations of some of the mortality mapped in Alpine County, California revealed that some of the Jeffrey pine is also being killed by *Ips pini* in combination with roundhead and flathead woodborers. California Flathead Woodborer is also found as the main mortality agent on Jeffrey pine along the eastern front of the Carson Range in western Nevada.

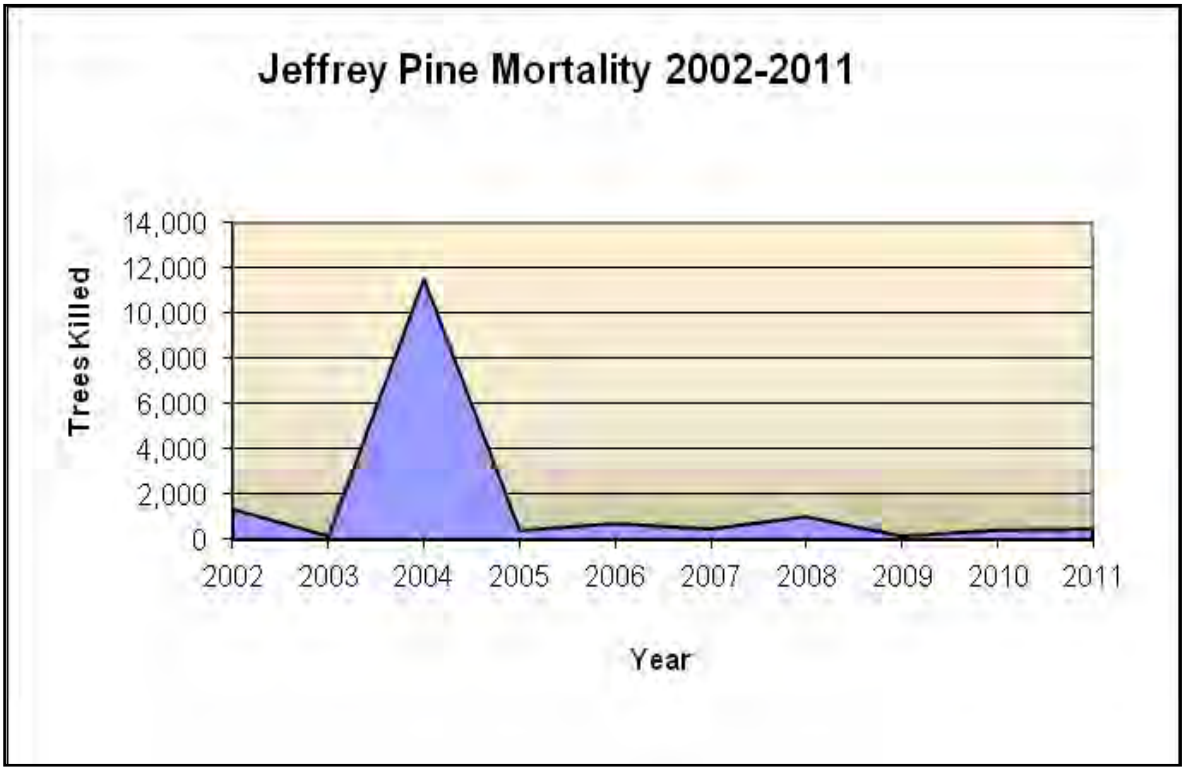

Figure 15 - Jeffrey pine beetle-caused tree mortality in Nevada and Alpine and Mono Counties, CA from 2002-2011

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

In 2011, Jeffery pine beetle-caused tree mortality decreased to 50% of the trees observed in 2010, affecting 69 trees on 34 acres in Nevada (Figure 17). The majority of the Jeffrey pine mortality was in California as depicted in the map below. In Nevada, the mortality was predominantly in Washoe and Douglas counties with a small amount of mortality in Carson City county.

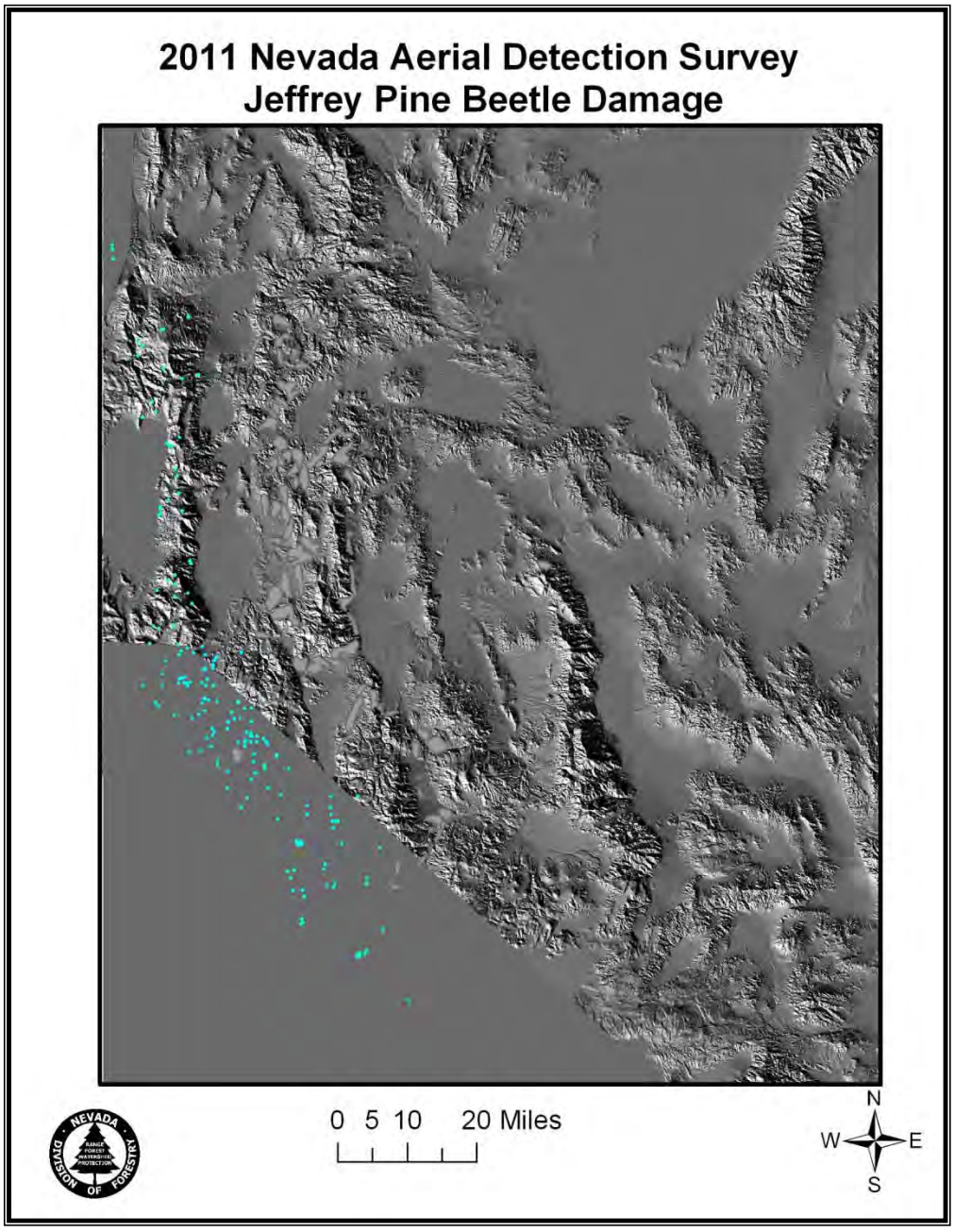

Figure 17 – Jeffrey Pine Beetle mortality in 2011 in Western NV and E. CA.

Carson City County –4 trees killed on 2acres in spots on either side of the North Canyon drainage the Carson Range.

Douglas County –21 trees killed over 10 acres scattered throughout the Carson Range with spots found mostly in the upper-slope elevations and higher. Spots were observed Shakespeare Point, Spooner Summit, South Carson Peak, along Hwy 50 near Cave Rock and Logan Creek, and above Kingsbury Grade, Hwy 207 north of Corsser Creek. Some of these trees are most likely killed by California Flathead Borer

(*Melanophila californica*), especially along the eastern Carson Range front, but it is impossible to differentiate from the air.

Washoe County – 44 trees killed on 22 acres were scattered in small spots at the headwaters of Deep and Bronco Creek and Alum Creek, Galena Creek below Mt Rose Highway, and in small spots in the Incline Village Second Creek drainage and in Sand Harbor State Park and the mountain side east of the Park.

Mountain Pine Beetle
Dendroctonus ponderosae

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

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

In 2011, MPB-caused tree mortality in pines in Nevada generally increased. The exception was lodgepole pine where tree mortality decreased to about half or less of the amount reported in 2010. Limber pine, whitebark and bristlecone pine increased to over 190% of the number of trees reported in 2010. When the Eastern California counties (Mono and Alpine) area added into the totals, the trend is an overall decline in mortality (Figure 18 below). Most of the Nevada mortality occurred in Elko and White Pine counties.

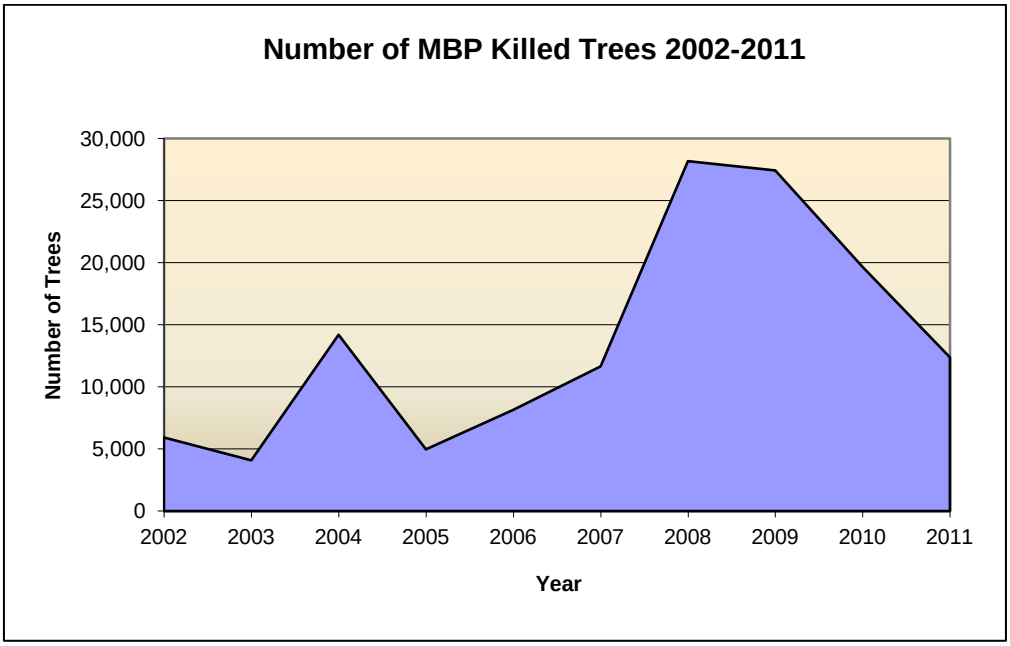

Figure 18 - Number of whitebark, limber, and bristlecone pine trees killed by mountain pine beetle in Nevada and eastern California from 2002-2011.

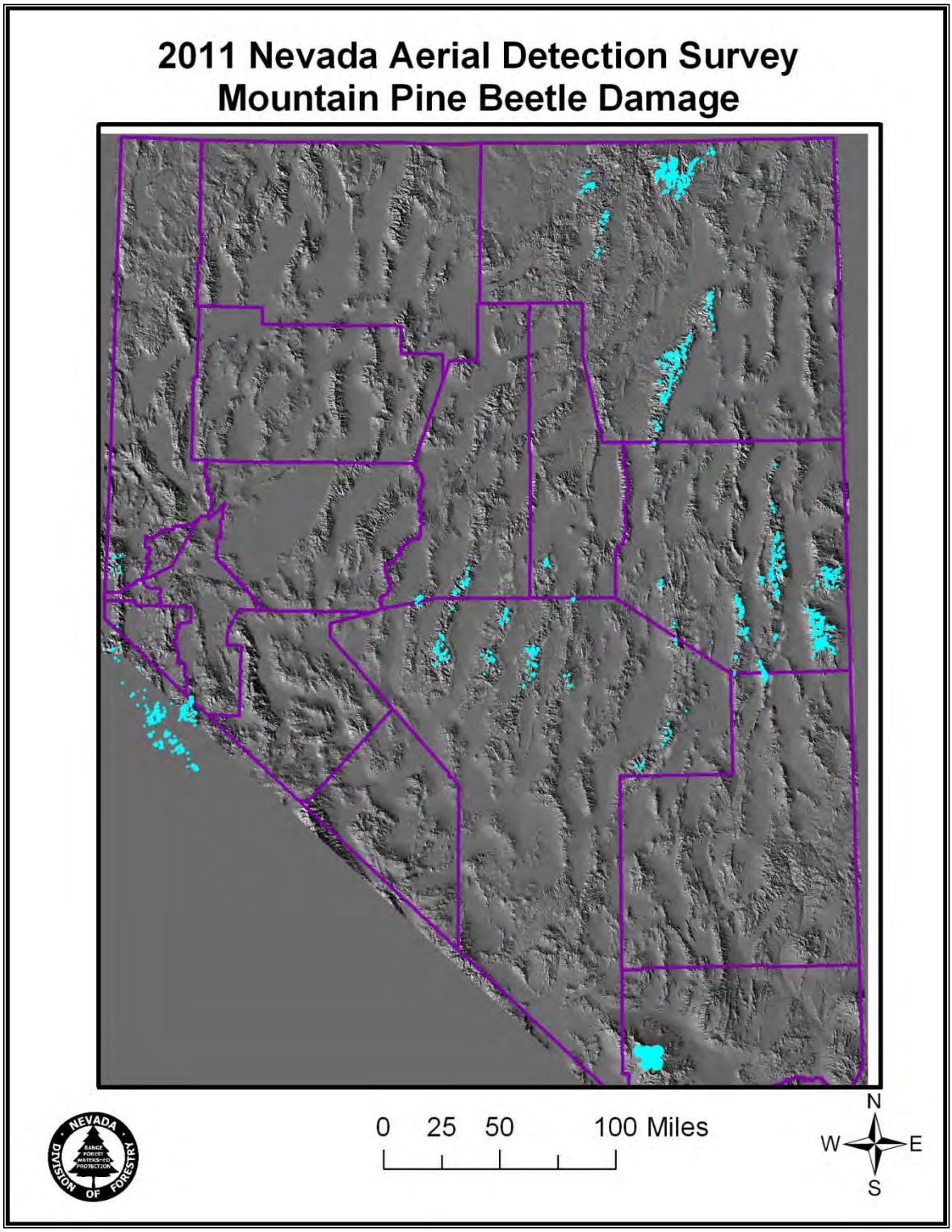

Figure 19 – Nevada and Eastern California Mountain Pine Beetle Mortality 2011 from Aerial Detection Surveys

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

In 2011, mortality of limber, whitebark, bristlecone and western white pines caused by MPB increased to 16,322 acres and 11,001 trees, which is 84% of the 2010 acreage but 198% of the 2010 tree mortality. Most of the mortality occurred as small spots of up to five trees on tops of the mountain ranges surveyed.

Figure 20. Mountain pine beetle-caused tree mortality in the Jarbidge Mountains moving down slope toward the town of Jarbidge, NV in August 2010 (on far left). Photo: Gail Durham

Douglas County – Beetles killed 3 western white pine tree on the north side of East Peak.

Elko County –194 limber pine and 4,379 whitebark pine trees were mapped on 170 acres and on 5,861 acres, respectively, in 2011. The amount of limber and whitebark pine mortality decreased to about 30% of what was mapped in 2010. There were large areas of whitebark pine mortality throughout the higher and mid elevations of the Jarbidge Mountains (Figure 19). Much of the whitebark host material has been killed in the Jarbidges. The band of mortality dropped significantly lower in elevation into limber pine type in the Jarbidge Mountains. There were small spots of whitebark pine mortality throughout the upper elevations of the Elk Mountains. Most of the limber and whitebark pine mortality in southern Elko County was scattered in small pockets at moderate elevations throughout the Ruby Mountains, on the northern end and eastern side of the East Humboldt Mountains with a few large and small spots in the Independence and Bull Run Mountains. The Cherry Creek range was not mapped in 2011.

Eureka County –113 limber pine trees were mapped on 56 acres in small spots at the north end of the Monitor Range around Summit Mountain, similar to 2010.
Lander County - 231 of mostly limber pine trees were mapped on 223 acres (216% of 2010 mortality) in large to small patches along the upper elevations of the Toiyabe and northern Shoshone Ranges.
Lyon County – 38 whitebark pine trees were mapped on19 acres in six small spot around the East Sister Mountain in the Sweetwater Mountains. This is an increase of over 330% from 2010.
Nye County –1,127 dead white pine trees were observed on 682 acres. This is a increase of 130% of the mortality of 2010. Most of it was found in numerous small to medium-sized spots mapped throughout the highest elevations of the Shoshone, Toiyabe, Toquima and Monitor Ranges with the vast majority of the spots in the Arc Dome, Alta Toquima, and Table Mountain Wilderness Areas, and in the Stoneberger Basin in the northern Toquimas. In addition, limber pine mortality was mapped in two spots on the Hot Creek Range north of Mahogany Creek, in two small spots on the south end of the White Pine Range and throughout the higher elevations of the Grant and Quinn Canyon Mountains.
Washoe County –40 whitebark pine trees on 21 acres (42% of 2010 mortality) were scattered throughout the higher elevations of the Carson Range, mostly north of Mount Rose.
White Pine County – 4,303 limber/ pine trees were mapped on 8,616 acres. This represents a 121 and 216% increase in white pine mortality, respectively. Additional new areas were mapped in the southern Egan and Schell Creek ranges this year accounting for most of the additional mortality. Most mortality was observed in small to medium-sized patches that were scattered along the tops of the Egan Range, throughout the Snake Range (including Great Basin National Park and Mt Moriah area), throughout the Schell Creek Range, and in a few spot on the southern Ruby Mountains near Sherman Peak, and on Pogonip Ridge and near the tops of adjacent mountains in the White Pine Range.

Mountain Pine Beetle in Lodgepole Pine

In 2011, MPB activity in lodgepole pine in Nevada decreased by 43% of 2010 mortality figures with 99 dead trees on 29 acres.

Douglas County –3 trees mapped in1 acres in a spot at the top of Clear Creek near Spooner Summit.
Washoe County –96 trees on 28 acres were observed in small spots scattered throughout the Carson Range around Marlette Lake, north and west of Mt Rose Summit in the upper watershed of Galena Creek and along Mt Rose Highway SR 431 and in the upper watershed of Gray and Bronco creeks north of Mt Rose, and on the west side of Little Valley, and the headwaters of Franktown Creek upstream from

Little Valley. Below is a graph showing the trap catches at Mt Rose Ski area for the summer 2011:

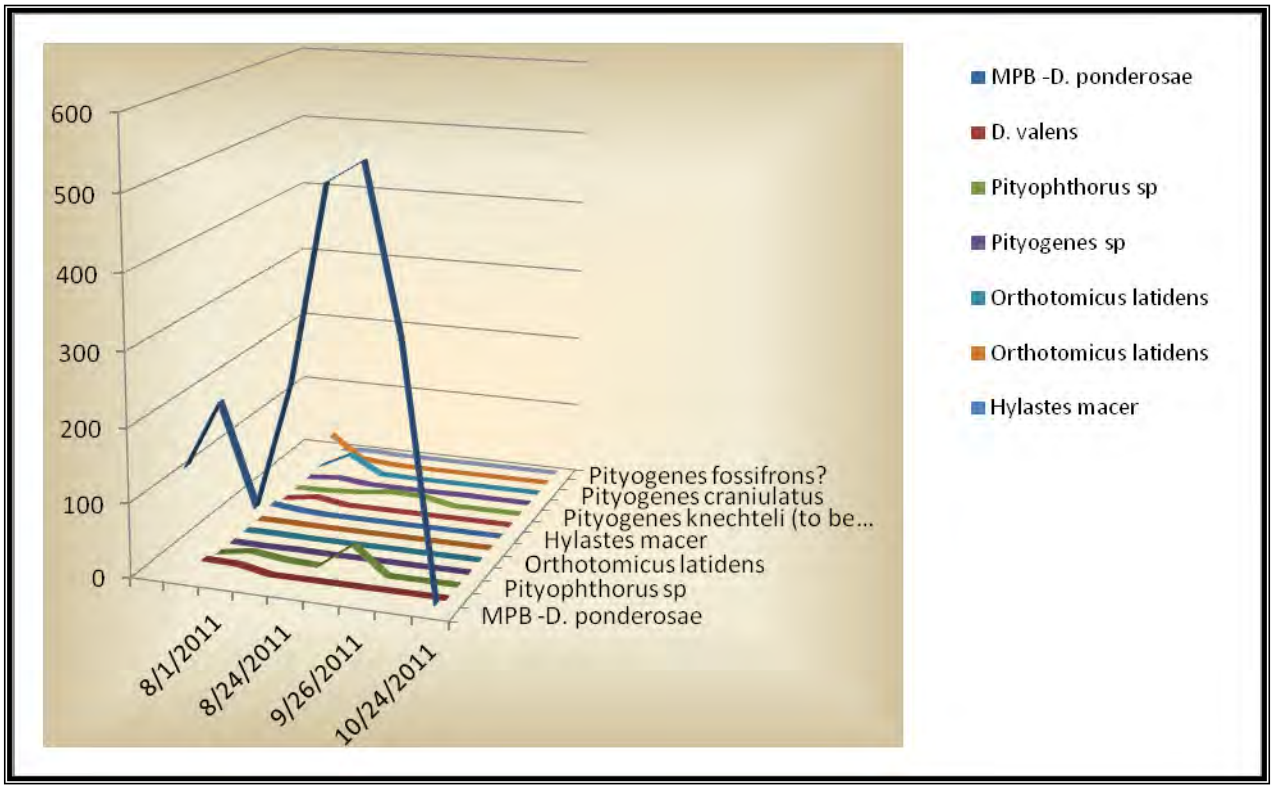

Figure 21 - Mt Rose Ski Area bark beetle trap catch data for summer 2011 with peak MPB catches from mid-August to mid- October.

Mountain Pine Beetle/Western Pine Beetle in Ponderosa Pine

In 2011, ponderosa pine mortality increased almost 9 times over 2010 levels. The mortality was found in four counties killing only 187 trees over 318 acres. Much of this mortality increase can be attributed to surveying new areas in White Pine County.

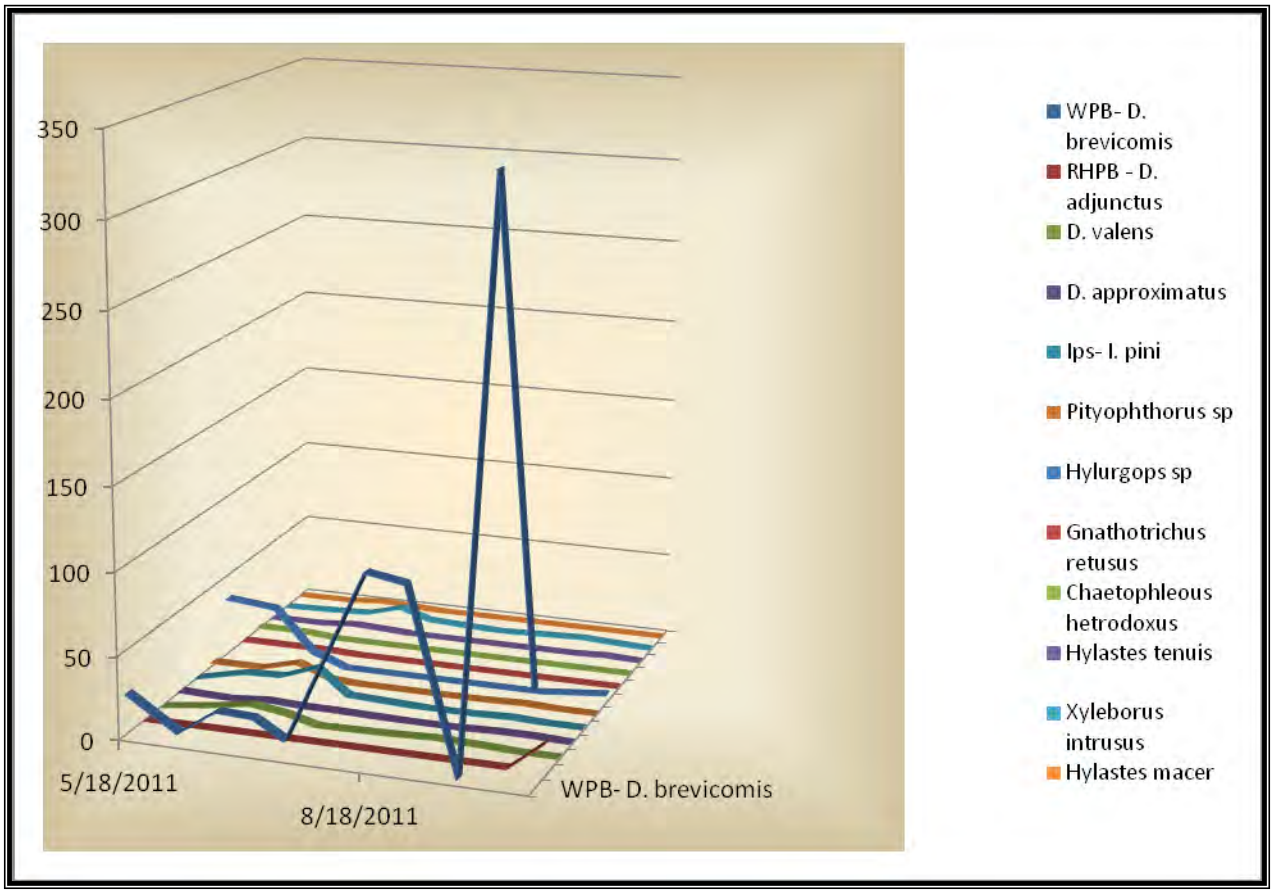

Figure 22- Kyle Canyon trap catches for the summer 2011 showing the dominance of WPB .

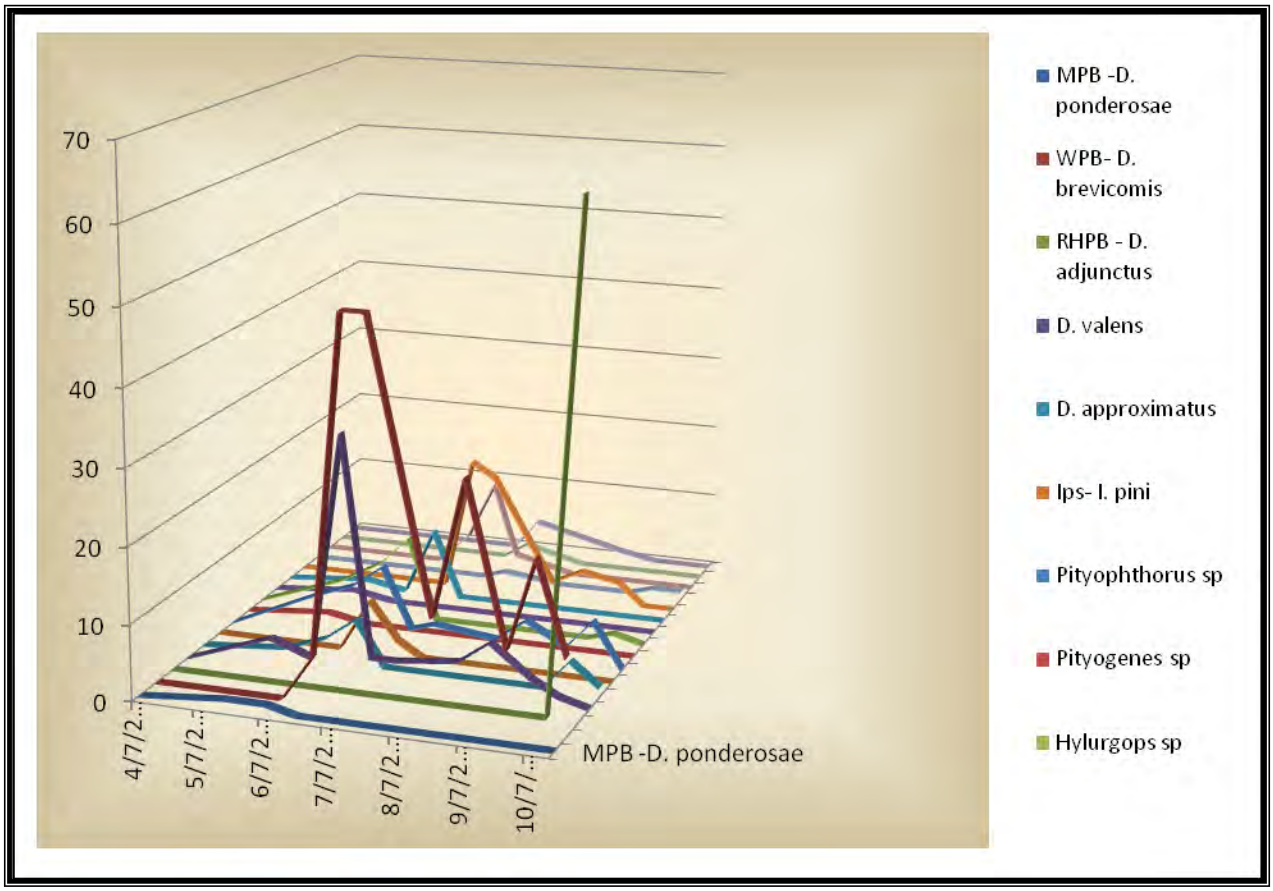

Figure 23 - Lee Canyon trap catches summer of 2011 showing the dominance of WPB and *D. valens* in mid-summer with *Xyleborus intrusus* and *Pitogenes* species dominating late summer and *D. ajunctus* picking up in early October.

Clark County – 75 trees on 37 acres was attributed to MPB in 2011 mapping, much of the mountain pine beetle mapping was probably WPB damage dominated. This is a ten-fold increase over 2010 levels. Below are graphs showing the results from trapping in Kyle and Lee for various bark beetles. Most of the catches were western pine beetle vs. mountain pine beetle:

Lincoln County – 5 trees on 2 acres at the top of Sawmill Canyon in the South Eagan Range.

Nye County – 2 trees were mapped on 1 acre in one spot in the upper watershed of Heath Canyon in the western Grant Range.

White Pine County – 105 trees affected on 278 acres in many drainage on the west side of the Egan Range, in numerous spots up Odgers and Bassett Creek in the Eastern Schell Creek range, in the headwaters of Mill, Lehman , and Snake Creek drainages and in Great Basin National Park and along the lower elevations of Hendrys and Hampton Creeks in the Snake Range.

Pinyon Engraver Beetle

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.

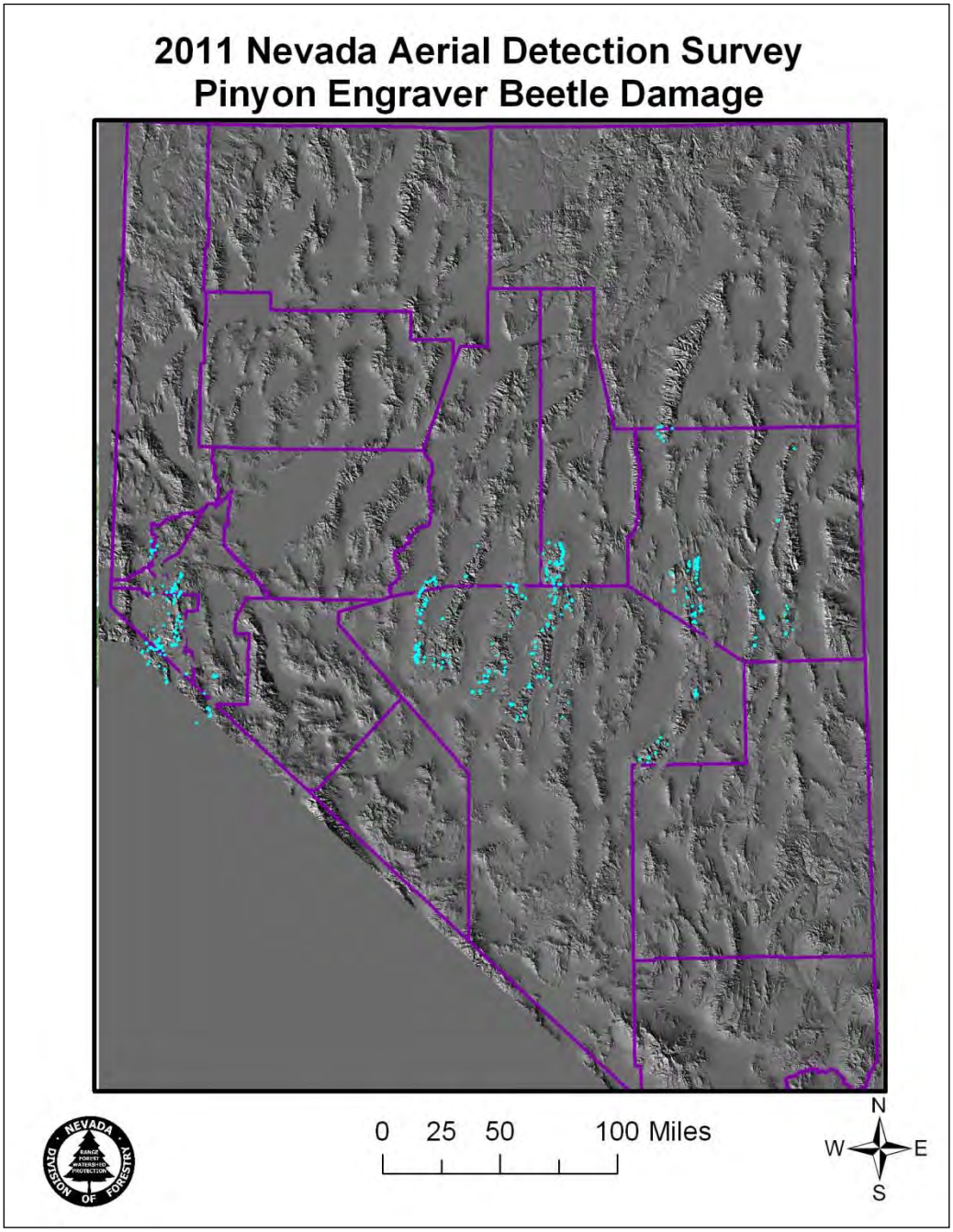

Figure 24 – Tree mortality caused by the pinyon engraver beetle in 2011 in Nevada.

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 and in 2010 and 2011, it decreased back down to near 2008 endemic levels (Figure 21).

In 2011, of the mapped acres, 799 acres were infested by pinyon Ips, affecting over 1,422 trees. This represents 47% of the 2010 pinyon pine mortality figures (Figure 21). In 2011, eleven counties had recorded mortality from pinyon ips. Foresters in Lincoln county reported that the Mount Wilson Range was affected (this range was not surveyed in 2011). Nye county had the greatest number of trees killed (544 trees, 38% of the state total). Most of this new mortality is associated with the affects of the past years of drought and the large pinyon needle scale and pinyon sawfly outbreaks across the state.

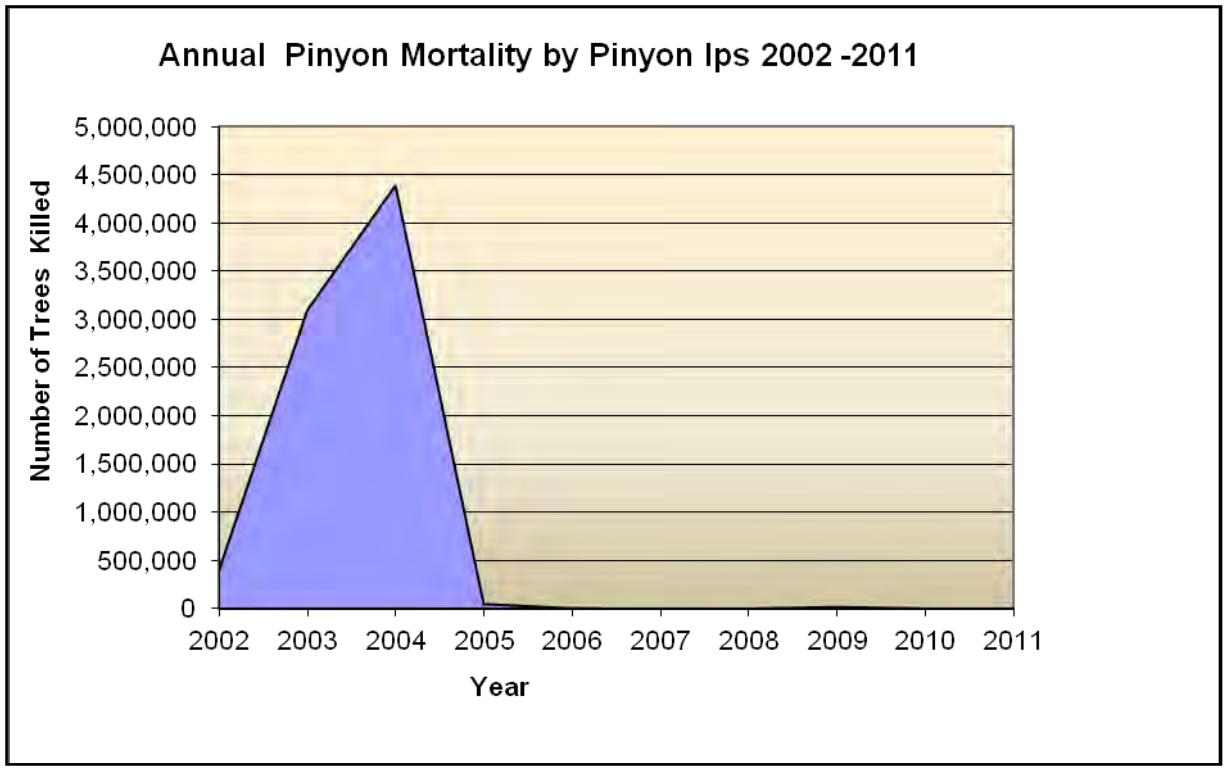

Figure 25 - Number of pinyon pine killed by pinyon engraver beetle in Nevada and two adjacent California counties (Alpine and Mono) from 2002-2011.

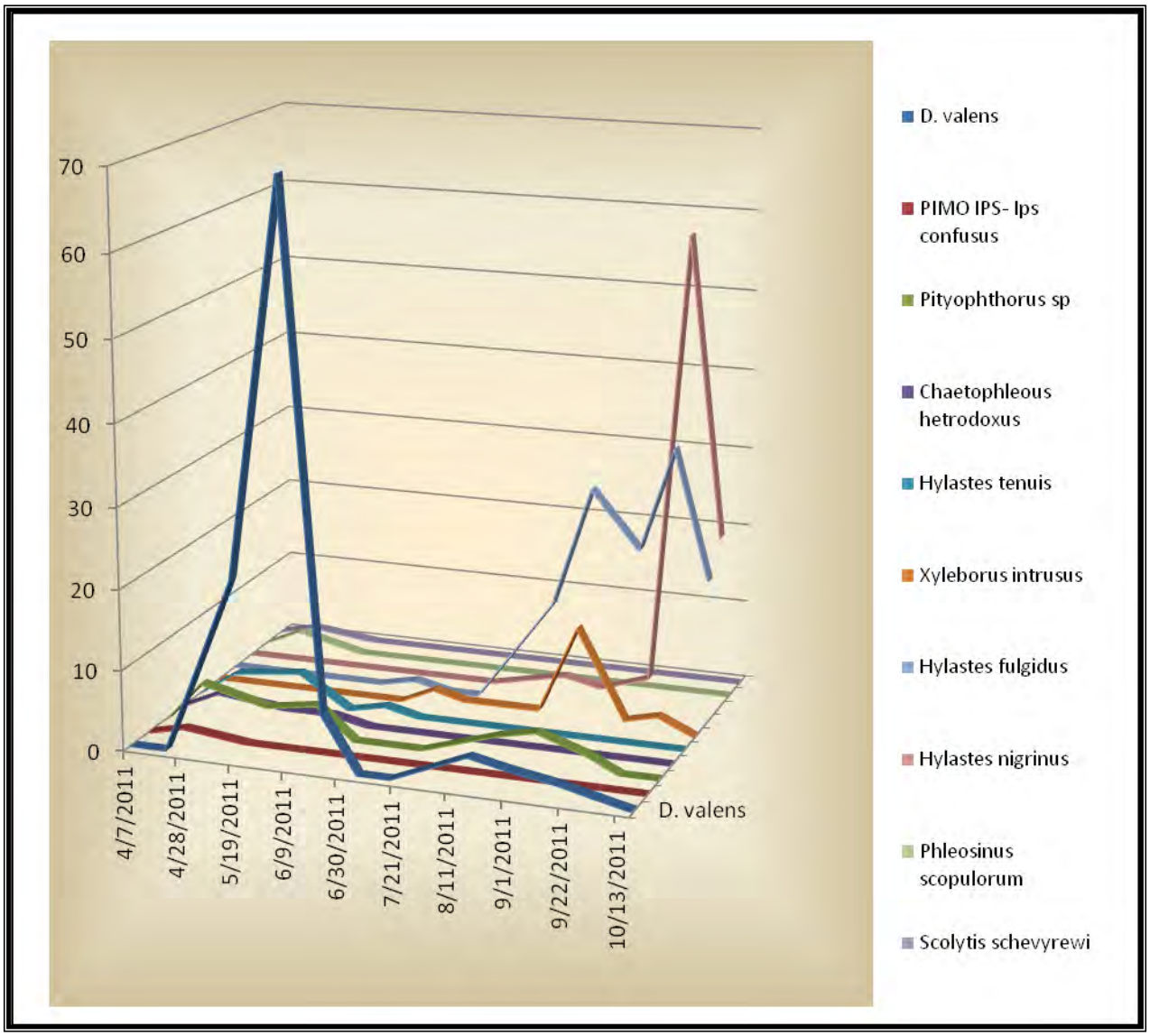

Figure 26 – Cold Creek, NE Spring Mts, Clark County trap catches summer 2011 showing a dominance of *D. valens* in the spring and early summer with *Hylastes fulgidus* and *H. nigrinus* dominating late summer-fall.

Carson City County – Pinyon mortality decreased to 4 acres with 9 trees in small spots associated with the pinyon scale outbreak and in Sullivan and Brunswick Canyon watershed and east of Erasta Spring in the Pine Nut Range.
Clark County – There was no mapped mortality, in 2011. Traps set up in the lower pinyon juniper woodland in Cold Creek and only 1 PEB was caught with the Ips lure on 4/21/2011, but other bark beetles were dominant as shown in Figure 26
Douglas County –175 trees killed over 88 acres in many scattered spots throughout the Pine Nut Mountain Range from California border north into Lyon County and Carson City County border

Elko County –16 trees were mapped on 8 acres with mortality occurring in small spots mostly on the southwest end of the Ruby Mountains.
Eureka County – Decreased to 203 trees on 106 acres. Mortality occurred in scattered, small spots at the lower elevations of the Monitor Range, especially in the areas heavily hit by pinyon needle sawfly.
Lander County – 80 trees were mapped on 43 acres in scattered spots in the northwest Shoshones, northwest Toiyabes and north Toquima Ranges.
Lyon County –52 acres with 102 trees scattered in small spots of mortality in the northeast Pine Nut Range.
Nye County – 354 acres with 544 trees were observed in scattered spots in the Grant and Quinn Canyon Range, Hot Creek, Monitor, Toquima, southern Toiyabe and Shoshone Mountains.
Storey County – Decreased to 3 acres with 7 trees mapped in the Virginia Range in two spots (the northeast area of the Virginia Range just south of Highway 341 in the canyon west of Geiger Summit and one north in the Highlands subdivision).
Washoe County – 14 acres with 34 trees was mapped in small spots throughout the northwestern portion of the Virginia Range mostly south of Highway 341.
White Pine County – Mortality was mapped on 127 acres with 252 trees killed. Much of the mortality was associated with older pinyon needle scale on the west side of the Moorman Mountains and eastern White Pine Range. Mortality was also observed scattered on the southern Eagan 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 the heavy scale infestations. In 2007, a large outbreak over hundreds of acres was noted throughout the lower elevations of the east side of the Wilson Creek Mountains west of Camp Valley Creek, and south of Pine Creek (Figure 18). This moth is still active in Nevada and is mixing in with the pinyon needle scale in many of the infested areas of Nevada in 2011.


OCT 10 2007


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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

European Gypsy Moth
Lymantria dispar

Hosts: various deciduous species

In 2011, 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.

Figure 29 - 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; all traps were negative.

Mediterranean Pine Engraver Beetle (MPE) and Red Haired Bark Beetle (RHBB) Orthotomicus erosus and Hylurgus ligniperda

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

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

Hosts: various species

In 2011, The Nevada Department of Agriculture NDOA conducted funnel trapping for exotic wood borers using EDRR style trapping methods and sites (30 traps total) surveyed 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 for 2009. Nine sites were selected for their proximity to a possible pathway for introductions and for their representation of local forest conditions. Over 4,700 specimens were screened by the State Entomologist. Three new state records of scolytids resulted from the survey. They were cedar (juniper) bark beetle (*Phloeosinus serratus)*, fir root bark beetle (*Pseudohylesinus granulatus)*, and European shothole borer (*Anisandrus dispar)*. Representative specimens of these and numerous other scolytids are being incorporated into the reference collection at the Nevada Department of Agriculture. There also appears to be several new state records for cerambycids, buprestids and other beetles that have yet to be confirmed.

In 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, Nevada Dept of Agriculture trapped for EPSM with 141 traps in 9 counties in 2007. Four traps were positive in Douglas County in 2006 and one trap was found positive in Washoe County in 2007. There was no activity in 2011.

Light Brown Apple Moth
Epiphyas postvittana

In 2010, Trapping was conducted from May 3rd to November 16th. 600 traps were placed in 10 counties; all traps were negative. In 2011, there was no activity.

Japanese Beetle
Popillia japonica Newman

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

In 2011, 80 traps were placed in four counties. All were negative. NDOA is carefully watching infestations in several other western states.

Walnut Twig Beetle
Pityophthorus juglandis

In 2011, Steve Seybold (USDA FS PSW Station) and Paul Dallara (UCD Entomology) inspected known populations of black walnut trees, *Juglans nigra ,* in northern Nevada to determine if walnut twig beetle and the associated fungus, *Geosmithia morbida,* were in the area. Walnut twig beetle and its galleries were found in walnut trees in Reno, Carson City, and Genoa, Nevada. *Geosmithia morbida* and hence, thousand canker disease could be associated with the beetles at these localities, results are pending.

Figure 30 – Walnut twig beetle galleries with suspect canker in Genoa, NV, September, 16, 2011

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. Heavy dwarf mistletoe infestation can predispose trees to attack by insects and other diseases, reduce incremental growth, affect the forest canopy structure, lower resistance to drought, affect production of seed, and affect recreation and aesthetics. Since dwarf mistletoe infests trees of all ages, infestation problems may exist in secondary growth and regeneration, as well as mature and overmature tree stands.

Dwarf mistletoe on pinyon pine can be found throughout the state, but it has never been comprehensively surveyed. The State Forest Health Specialist has found DMT from the Spring Mountains in the south and north through the Toiyabes and east and west to both borders of the state. Pinyon engraver beetle-caused mortality was observed in some of the heavy dwarf mistletoe

infected pinyon pine stands around the state of Nevada. Some of the dwarf mistletoe-weakened trees succumbed to pinyon engraver beetle attacks.

Currently, fuel reduction activities are being undertaken in heavily DMT infested stands of pinyon pine in western Nevada. The treatments are being done to create a buffer between non-infected stands and infected stands to prevent the spread of this disease (Figure 21). 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 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 in 2011 predisposing them to attack by mountain pine beetle in those areas.

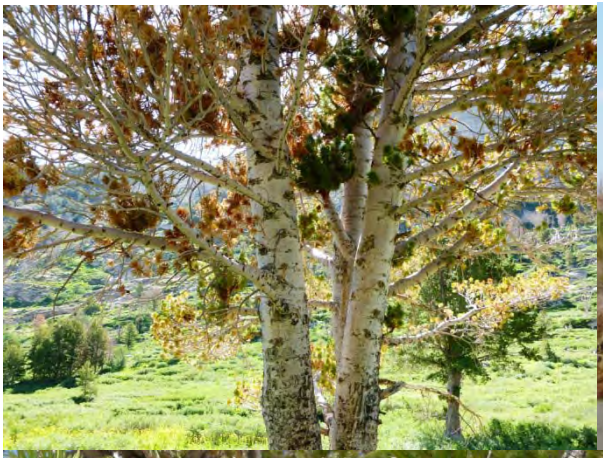

Figure 31 – *A. cyanocarpum* infecting whitebark pine in Lamoille Canyon in the Ruby Mts and on limber pine at Angel Lake in the Eastern East Humboldts and subsequently being killed by mountain pine beetle.

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 prevalent throughout the state. It attacks and kills small trees (Figure 22) and causes branch flagging on larger more resistant trees. Many of the rust infections were attacked by pitch mass borer. This disease is mainly found in a band between 6000 and 7000 feet of elevation near drainages that are suitable for the alternate host (*Ribes* spp.).

Figure 32- Singleleaf pinyon pine that is infected with pinyon blister rust near its base.

White Pine Blister Rust
Cronartium ribicola

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

White pine blister rust (WPBR) has been observed in western Nevada on the east side of the Sierra Nevada Mountains in sugar, whitebark and western white pines. The rust has expanded its range in Nevada in recent years, with populations of rust now confirmed in the Jarbidge Mountains. Forest Health Protection conducted a ground survey for WPBR in the mountain Ranges in eastern Nevada primarily focused on high elevation Great Basin bristlecone pine in 2004. No newly infected areas were discovered, and the previously reported rust infection in the Ruby Mountains was found to be dwarf mistletoe. At this point the only confirmed population of white pine blister rust in eastern Nevada is in the Jarbidge Mountains. There is concern that WPBR could become established in sensitive populations of Great Basin bristlecone pine. In 2010, researchers initiated an effort to collect seed from Great Basin bristlecone to include this species into breeding efforts aimed at detecting resistance to WPBR in 5 needle pines. Additionally, seed from bristlecone in Great Basin National Park will be collected in 2011.

Sudden Oak Death
Phytophthora ramorum

Sudden Oak Death (SOD), a newly identified forest disease caused by the pathogen *Phytophthora ramorum*, has been killing thousands of tanoak and oaks in the coastal areas of California, but has not been observed in Nevada. However, with the release of potentially infected nursery stock into all 50 states from a single California nursery, NDOA officials contracted with the USFS to conduct surveys in forest areas on host and potential host species near nurseries or where landowners may have out planted this potentially infected stock. Nevada Division of Forestry personnel have assisted NDOA officials with these surveys. NDOA forest SOD survey data showed no SOD for all regions surveyed to date.

Root Diseases

Annosum Root Disease
Heterobasidion annosum

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

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

Figure 33 - Annosum root disease conk at the base of a tree.

Armillaria Root Disease
Armillaria spp.

Hosts: All trees

Figure 34 - Armillaria mushrooms, photo: Gail Durham

Evidence of Armillaria root disease can be found throughout the state causing mortality in all species of trees. This disease also frequently functions as a weak pathogen or saprophyte. Fruiting bodies grow in clusters from the roots or at the base of the tree during moist conditions. There is a close association between root disease pockets and endemic level bark beetle populations. Armillaria was observed on pinyon pine roots in the Virginia Highlands of Storey County and on white fir in the Success Summit area of the Schell Creeks of White Pine County in 2006. It has also been found on Jeffrey pine roots in Carson City County in the Clear Creek area.

Black Stain Root Disease
Ophiostoma wageneri

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

Figure 35 - Black stain root disease on pinyon pine in Storey County, NV, 2011

Black stain root disease is an important disease of several hosts, but it is only found on pinyon pine in the state of Nevada. It usually kills affected trees within a few years, and it can produce groups of mortality that are several acres in size. Pockets of infected trees are preferred host for low-level populations of pinyon engraver beetles. No new pockets of black stain root disease were observed by aerial survey in 2010, but pockets were found in the Virginia Highlands in Storey County in 2011 after ground disturbing mastication activities (see Figure 36) .

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 36 - 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 2011, mortality attributed to subalpine fir mortality complex was 80% of 2010 mortality and resulted in the death of 995 trees (Figure 37). The acreage affected in 2011 was 3,719 acres. Most of this subalpine fir mortality was on the Mountain City and Jarbidge Ranger Districts of the Humboldt-Toiyabe National Forest in Elko County.

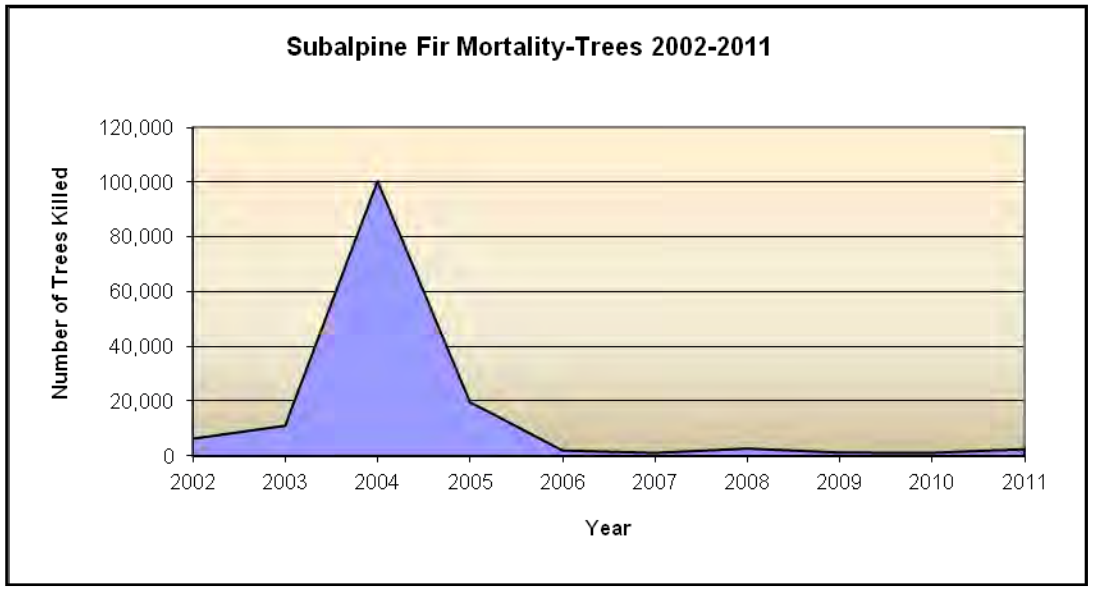

Figure 37- Number of subalpine fir killed in Nevada from 2002-2011.

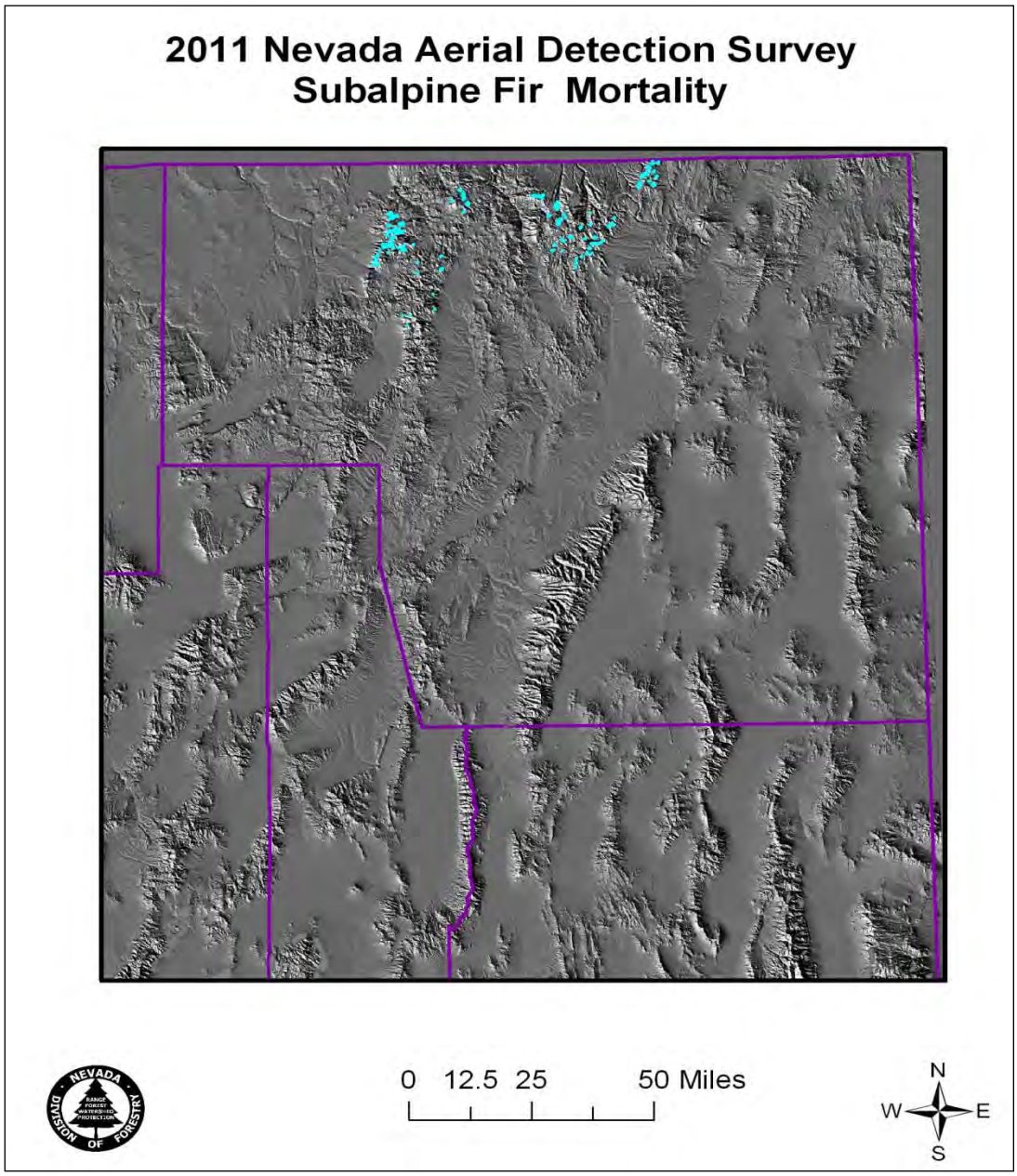

Figure 38 - Subalpine fir mortality 2011 in Elko County, NV.

Elko County – Over 995 trees in scattered patches of mortality were mapped in the Jarbidge Mountains, including the Jarbidge Wilderness, in the Elk Mountains, the Bull Run Mountains, and the northern Independence Mountains.

Aspen Decline/Dieback

Host: Aspen

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

Aspen dieback has been noted anecdotally for many years in the Intermountain Region, and dieback has been recorded by aerial survey since 2003. In 2004, Intermountain Region FHP examined what had been mapped as insect defoliator damage or Cytospora canker in several areas in north-central Nevada and discovered that a number of insect and disease agents were involved. In 2006, FHP established monitoring plots in several areas in Nevada.

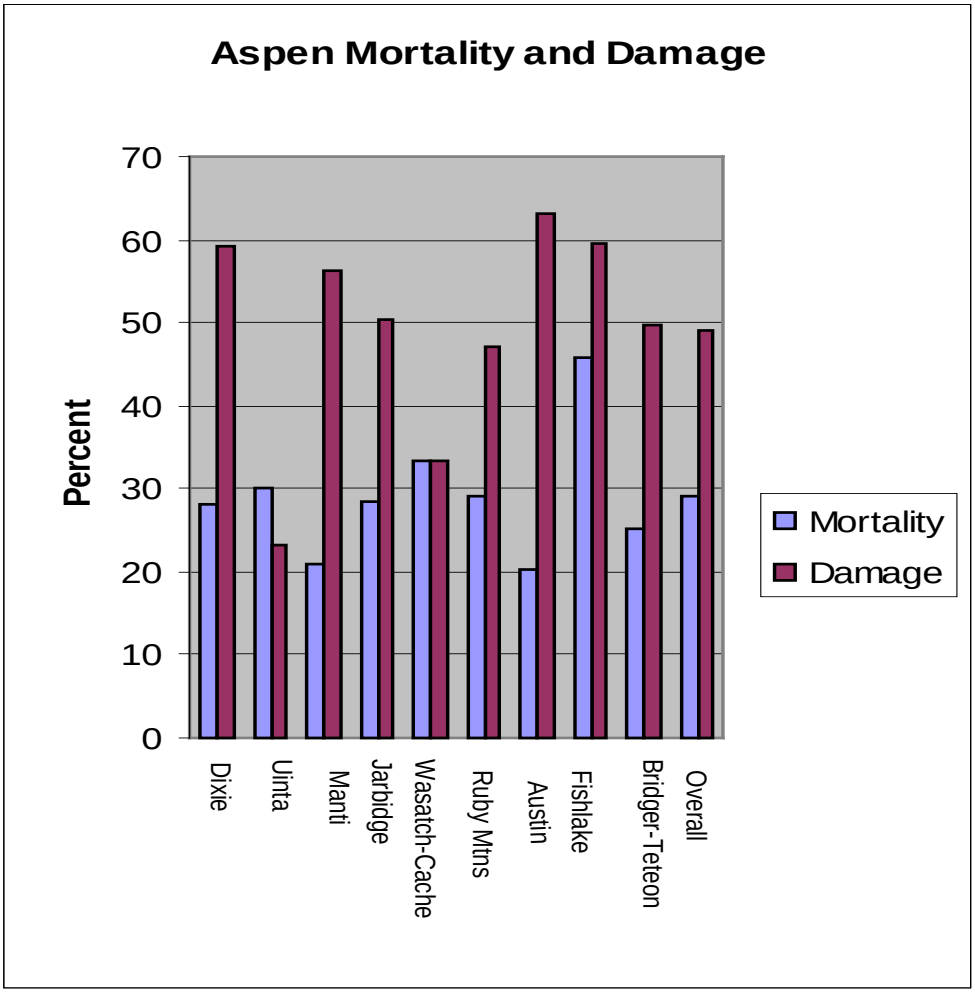

Figure 39 – Percentage of aspen damaged and killed in National Forest Ranger Districts in 2006.

Data analysis of these plots is ongoing but a few trends were evident from an early review of the data. In the areas evaluated, there were observed high levels of mortality and moderate to heavy damage in the trees over 2 inches in diameter at breast height (Figure 29). The most common agents involved were canker diseases and insect borers. In the aspen regeneration, the number of trees per acre was highly variable (Table 6). In some cases regeneration was heavily damaged, primarily by animal browsing.

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

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

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

In 2011, 4,474 acres of aspen dieback/decline were mapped in six counties. This is a decrease of 58% when compared to 2010's figures. Affected acreage decreased in most counties such as Douglas, Elko, Humboldt, Lincoln, Storey and Nye but slight increases or static conditions were seen in Eureka, Lander and Washoe counties.

Elko County – 2,845 acres of dieback was mapped in numerous spots in the lower elevations of the south and west Jarbidge Mountains, in small spots throughout the Tennessee, Mahoganies, Elk, Bull Run, Independence, East Humboldt, and Ruby Mountains.
Eureka County -107 acres of light dieback was mapped in small spots in the northernmost end of the Monitor Range and a small spot at the headwaters of Wallace Canyon.
Lander County – 143 acres of aspen dieback occurred in a number of small spots on the north end of the Toiyabe Range just south of Austin Summit and one spot at the headwaters of Clear Creek south of Broad Canyon.
Nye Counties – 1,311 acres of dieback was mapped in one spot midway up Big Creek Canyon in the Quinn Canyon Range, and scattered small spots in the Toiyabes from just west of Peavine Mountain north to the county line. It was found in small spots throughout the

Toquima Range from Spanish Peak north to Boulder Creek, and in the Monitor Range from the top of Cottonwood Canyon north to the county line and with one isolated spot near Pinyon Peak in the south.

Washoe County –68 acres was found in patches up Hunter Creek (south of Interstate 80) and one west and one north of Peavine Peak.

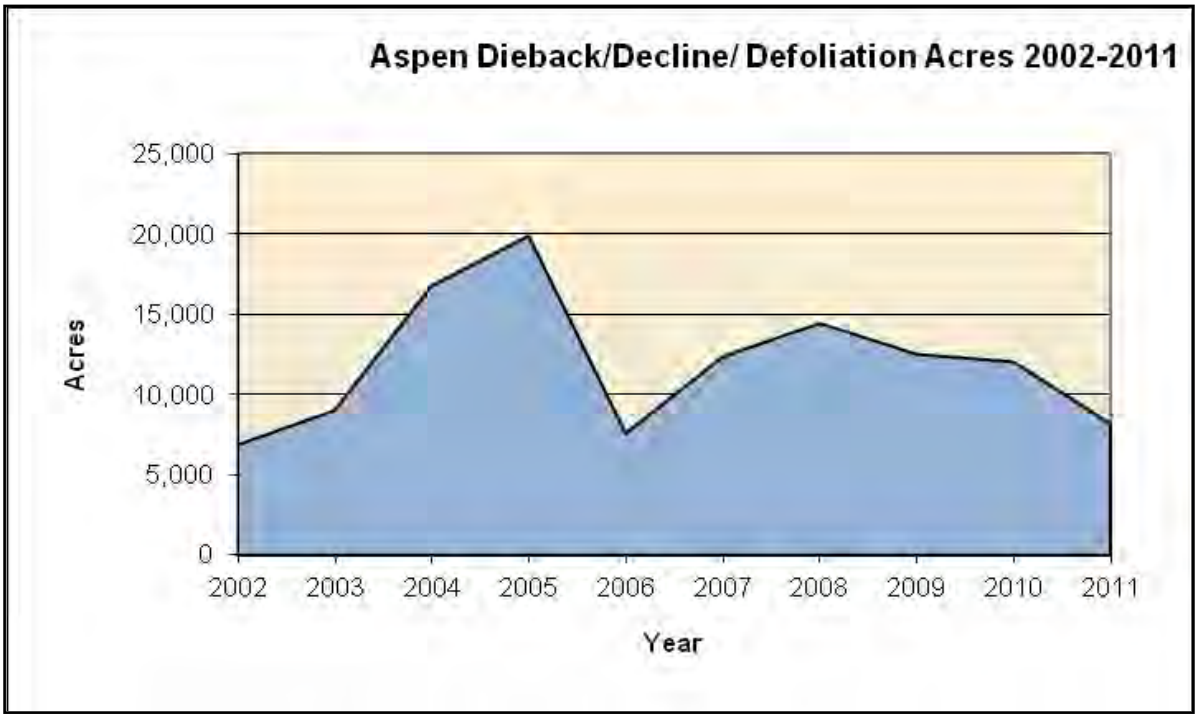

Figure 40 - Acres with aspen dieback in Nevada and portions of eastern California from 2002-2011.

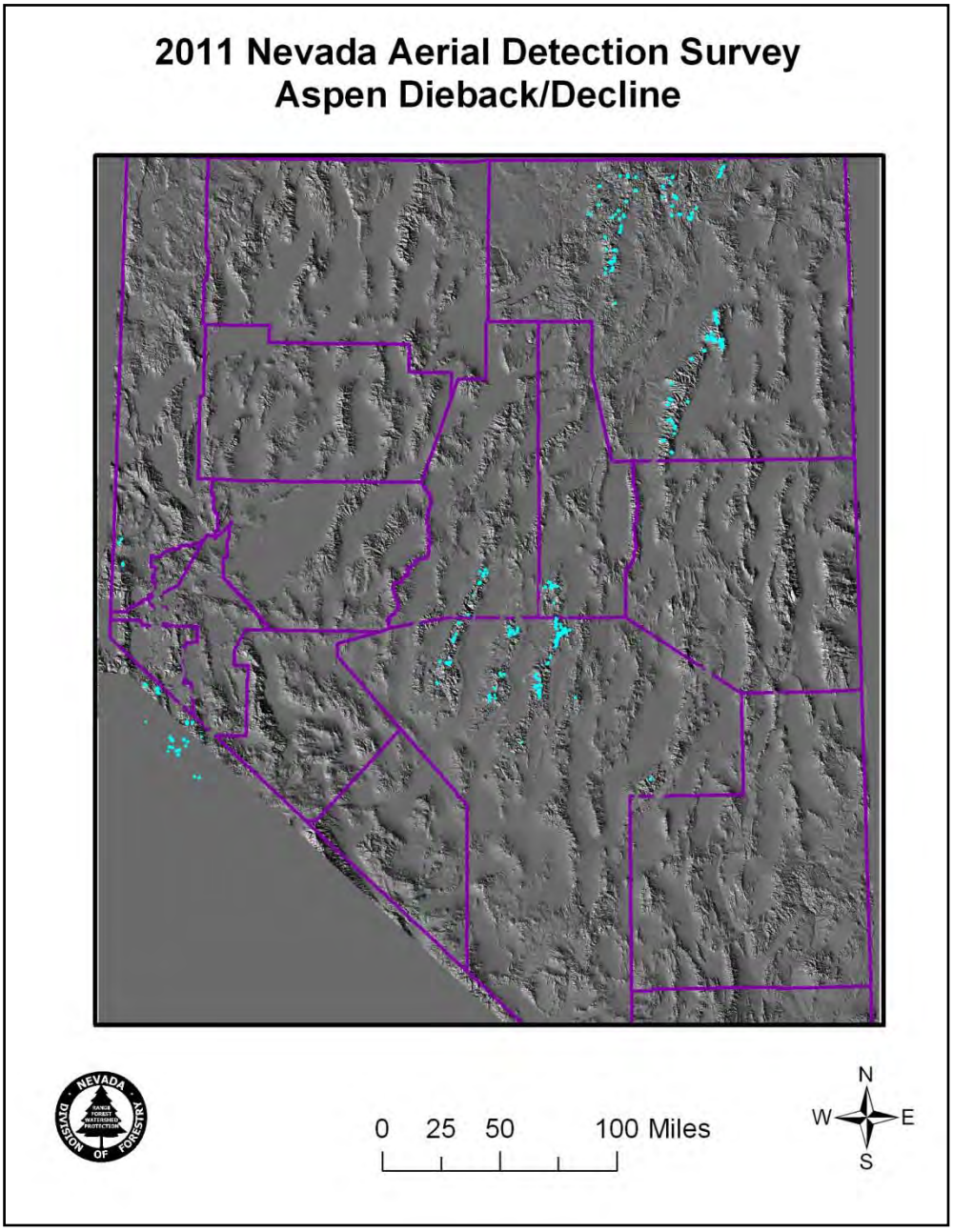

Figure 41 – Map showing acres with aspen decline/dieback in Nevada

Cytospora Canker
Cytospora spp.

Host: aspen

Cytospora canker is one of the most common diseases affecting aspen in ornamental situations and often attacks stressed trees through wounds. This fungus girdles branches by killing the cambium. Large, vigorous trees can withstand the disease and are rarely killed. Activity from this pathogen is most likely a symptom of several years of drought or defoliation from other insects or diseases. From the air, decline due to Cytospora canker can look similar to decline by forest tent caterpillar defoliation. The decline was mistakenly identified by aerial observers as forest tent caterpillar defoliation in 2002 and 2003. Further field study is needed to determine all the decline causes. In 2009, much of the aspen decline showed overstory decline but the understory regeneration was healthy.

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 32). In 2011, the mahogany appeared to recuperate, although many stands have dead centers. The amount of decline decreased in 2011 again (Figure 42).

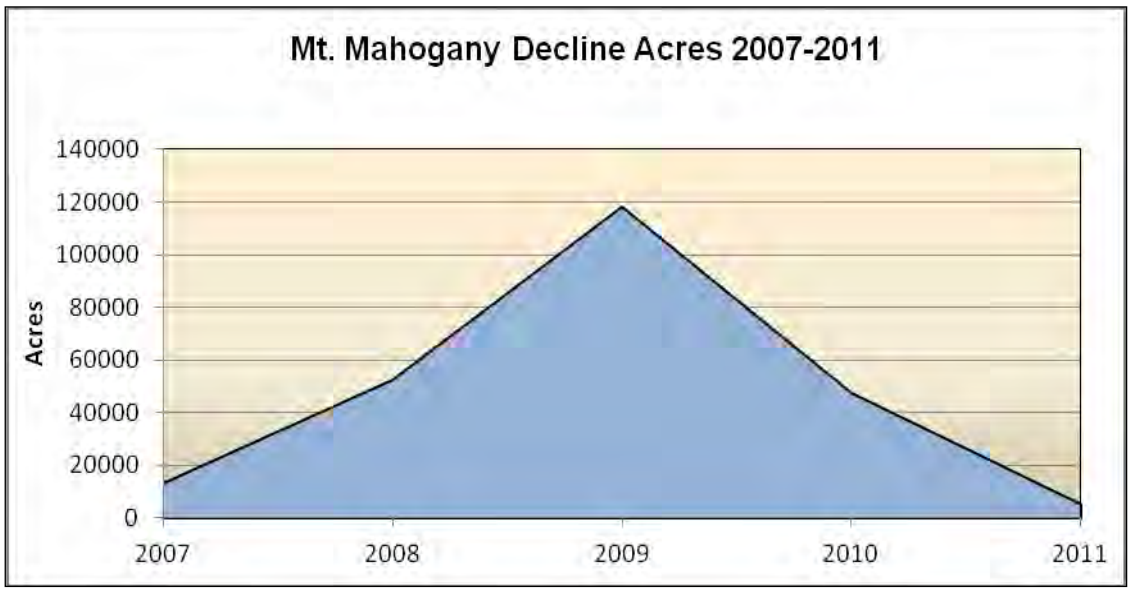

Figure 42 – The acreage of curlleaf mountain mahogany decline from 2007-2011.

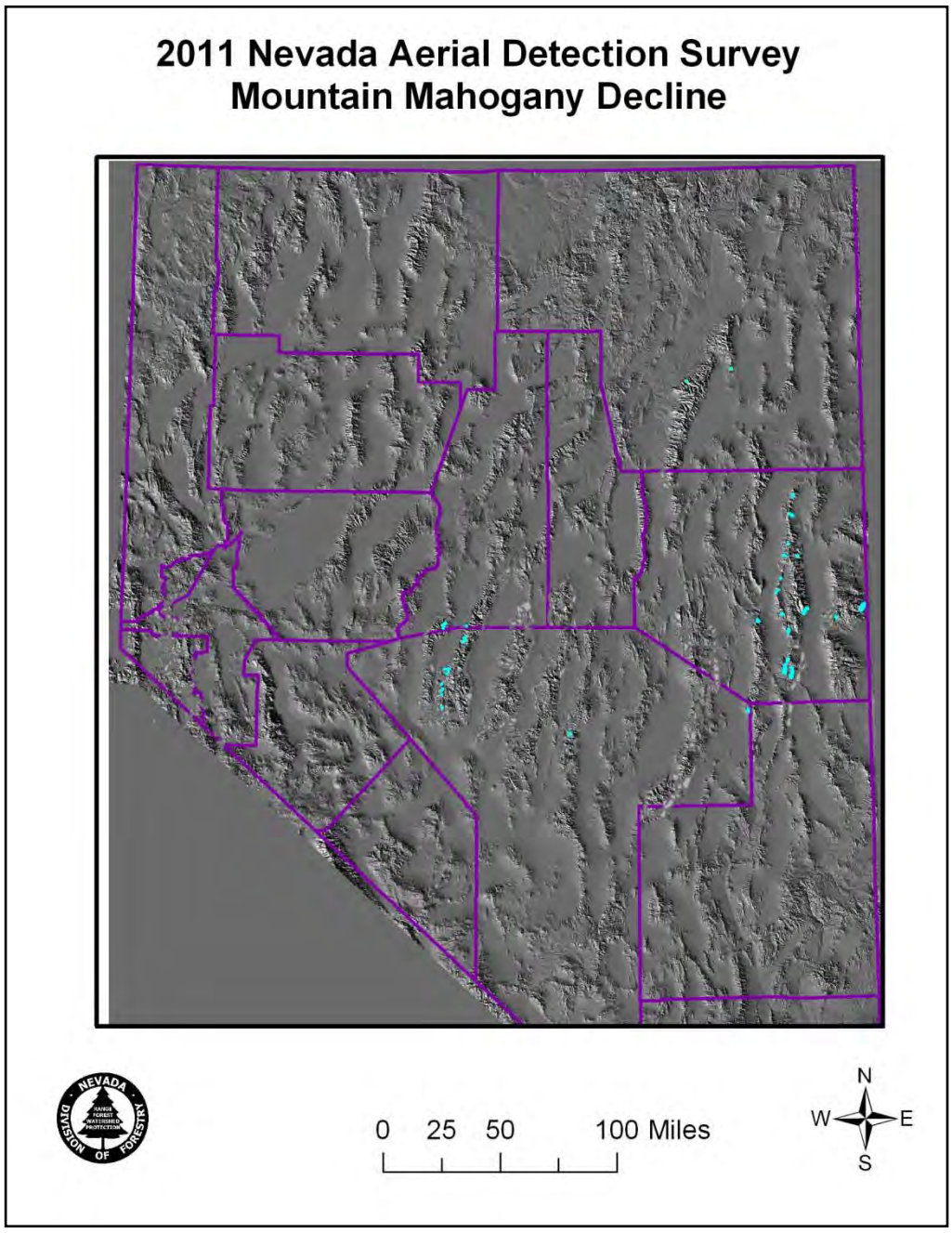

Figure 43 – 2011 Mountain mahogany decline from the 2011 Aerial Detection Survey

In 2011, the affected acreage (5,256 acres) decreased to 11% of the 2010 acreage (46,572) (Figure 41). In 2011, the number of counties affected decreased to five from eleven in 2010. Again, White Pine County had the majority of the followed by Nye County with small amounts in Elko and Lander Counties. The above average precipitation of 2011 was most likely the reason for the sharp improvement to mountain mahogany this year.

Elko County – 125 acres of light decline was mapped in two patches at the southern most end of the East Humboldts, and in one patch just north of Lamoille Canyon in the western Ruby Mountain
Lander County – 128 acres of decline was observed in small patches of the Northern Shoshone and west central Toiyabe Mountains.
Nye County – 589 acres of decline was mapped in many small-sized patches throughout the Toiyabe, one patch just south of Hot Creek Canyon in the Hot Creeks, and one patch east of Emigrant Springs on the Egan Range .
White Pine County – 4,414 acres of decline was mostly detected in large patches in the lower elevations of the northern Snake , and in small patches scattered throughout the Schell Creek Range, Duck Creek Range, and northern Egan Range (including the Ward Mountain area.

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. Although no blowdown was mapped in 2011, extensive limb breakage was noted from 2011's heavy snows on many forest species including pinyon, juniper, Jeffrey pine, ponderosa pine, fir and aspen. Damage was noted in southeast Nevada at about the 7,000 ft elevation level.

Wildfire Damage

A few fires in Western Nevada burned thousands of acres of pinyon pine, ponderosa pine and Jeffrey pines. In 2011, 45 Jeffrey pines on 48 acres in Douglas County in areas just south of Edgewood Creek and Hwy 207 and 10,000 pinyon pines over 3, 976 acres in the southern Pinenut Mountains along Highway 395 in Douglas County were burned over.

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

Toadflax Bio-control

Toadflax stem boring weevils (*Mecinus janthinus*)

In 2010, on June 2nd NDOA made a trip to Salt Lake City to collect the stem boring weevil (*Micinus janthinus*) off of Dalmatian toadflax. On June 3rd an inspection of the five release sites in Pioche Nevada was performed. One of the four sites had been mowed down in the spring. Of the remaining four, all had signs of insect damage with three of the four sites having adult weevils on the plants. Three additional releases of 300 weevils each were conducted on June 3rd in Pioche at the Main Street mine tilling, the elementary school, and the water treatment area. Two additional inspections of the Pioche sites were conducted on August 30th and November 3rd; all sites showed signs of plant damage and over wintering adults.

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

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

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

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

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