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Forest Pest Conditions in Nevada 2005

Forest Health Specialists

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

Steve Munson, Group Leader
Email: smunson@fs.fed.us

Darren Blackford, Entomologist
Email: dblackford@fs.fed.us

Valerie DeBlander, Forestry Technician
Email: vdeblander@fs.fed.us

John Guyon II, Pathologist
Email: jguyon@fs.fed.us

Elizabeth Hebertson, Pathologist/Entomologist
Email: lghebertson@fs.fed.us

Ben Meyerson, Biological Technician
Email: bmeyerson@fs.fed.us

Brytten Steed, Entomologist
Email: bsteed@fs.fed.us

Nevada Division of Forestry
Department of Conservation and Natural Resources
Western Region 1 Headquarters
885 Eastlake Blvd.
Carson City, NV 89704-9167

John Christopherson, Resource Management Officer
Email: jchrist@forestry.nv.gov
Phone: 775-849-2500 ext. 243

Nevada Division of Forestry
Department of Conservation and Natural Resources
State Headquarters
2478 Fairview Drive
Carson City, NV 89701

Gail Durham, Forest Health Specialist
Email: gdurham@forestry.nv.gov
Phone: 775-684-2513

Rich Harvey, Resource Program Coordinator
Email: rharvey@forestry.nv.gov
Phone: 775-684-2507

Front Cover Photo: Fir Engraver damage on top of Schell Creek Mountains August - 2005 by Gail Durham

NEVADA FOREST PEST CONDITIONS
2005

Compiled by:
Gail Durham, Forest Health Specialist, NDF
Brytten Steed, Entomologist, USDA-FHP

With Contributions from:
Dick Halsey, FS FHP GIS Specialist
John Guyon II, FS FHP Pathologist
Jeff Knight, Nevada State Entomologist
Dr. Shouhua Wang, Nevada State Pathologist
Dawn Rafferty, Nevada State Noxious Weed Coordinator

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Forest Health Conditions 2005
Introduction & Summary

In an effort to simplify discussions of forest health in Nevada, this report focuses only on the impacts of insects, diseases, and weather on the various tree species of the state. Aerial detection surveys (ADS) from USDA Forest Service and Nevada Division of Forestry are the principle data used to describe mortality trends in the state from year to year.

Mortality trends are described in terms of acres affected; however, not all trees on these acres are dead. Thus, an estimate of the number of trees killed is also provided. Not all forested lands are surveyed, and not all the same acres are surveyed every year. If the same areas are surveyed and tree mortality occurred, the same acres may be counted over a period of several years. Total acres tallied may also change between years due to increases or decreases in the total number of acres surveyed. However, total acres surveyed for various ownership groups are similar for the 2002-2005 period (Table 1).

The ADS data encompasses most of the Humboldt-Toiyabe National Forest including portions of the Bridgeport and Carson Ranger Districts located in California. A large portion of the survey area is also composed of Bureau of Land Management (BLM) acres with smaller acreage surveyed for Great Basin National Park, other federal lands, state lands, and private lands (Table 1).

Table 1. Total number of acres surveyed in each of the ownership categories for the years 2002-2005.

	Number of Acres Surveyed			
	2002	**2003**	**2004**	**2005**
Humbolt-Toyabe NF (NV)	3,760,541	3,551,831	3,924,916	3,697,058
Humbolt-Toyabe NF (CA)	515,917	529,402	595,027	531,615
BLM	554,298	1,069,113	1,076,408	1,108,999
private (NV)	309,788	284,879	298,632	344,314
private (CA within NF)	29,802	30,520	32,594	31,546
Great Basin NP	76,465	77,052	76,244	76,721
Other Federal*	2,609	1,479	41,957	2,866
NV State Lands	17,929	18,342	17,813	17,955
TOTAL:	**5,267,349**	**5,562,618**	**6,063,591**	**5,811,074**

* Includes USF&W, DOD, BIA, and other tribal lands

Long term insect trend data summarizes activity detected on all surveyed ownerships in NV and CA. However, discussion of activity by individual insect and disease agents detected in 2005 is for Nevada only and summarized on a county

basis. Total acres surveyed and percent of each county surveyed in 2005 are provided in Table 2. (The difference between the two tables in acres surveyed is not significant <.0007 percent, so I don't think we need to mention it.)

Table 2. Number of Acres Surveyed in Nevada Counties

County	2005Acres Surveyed	Total Acres in County	% Surveyed
Carson City	50,284	103,569	48.6
Clark	233,453	5,176,177	4.5
Douglas	221,938	478,351	46.4
Elko	985,318	10,979,963	9.0
Eureka	125,968	2,663,738	4.7
Humboldt	174,504	6,219,557	2.8
Lander	232,702	3,534,543	6.6
Lincoln	353,704	6,782,623	5.2
Lyon	58,849	1,310,315	4.5
Mineral	0	2,462,989	0.0
Nye	1,408,920	11,686,348	12.1
Storey	28,255	167,774	16.8
Washoe	147,702	4,234,009	3.5
White Pine	1,229,778	5,676,727	21.7
Total	**5,251,375**	**61,476,683**	**8.5**

Nevada experienced drought from 1999 to 2004 (Figure 1). However, in 2005, most of Nevada's watersheds received above normal precipitation in the winter with above normal summer precipitation in the southeastern portion of the state. Precipitation is crucial for trees to remain vigorous which increases resistance to insect and disease pests. With adequate rainfall or snowmelt, trees can maintain their defenses; pushing out attacking bark beetles with pitch or growing more foliage to replace foliage consumed by defoliating insects. Without adequate precipitation, tree resistance is significantly reduced. Insect defoliators are less affected by changes in precipitation and were observed at low levels in the state. However, forest declines and tree diseases may be affected by weather extremes and climate change.

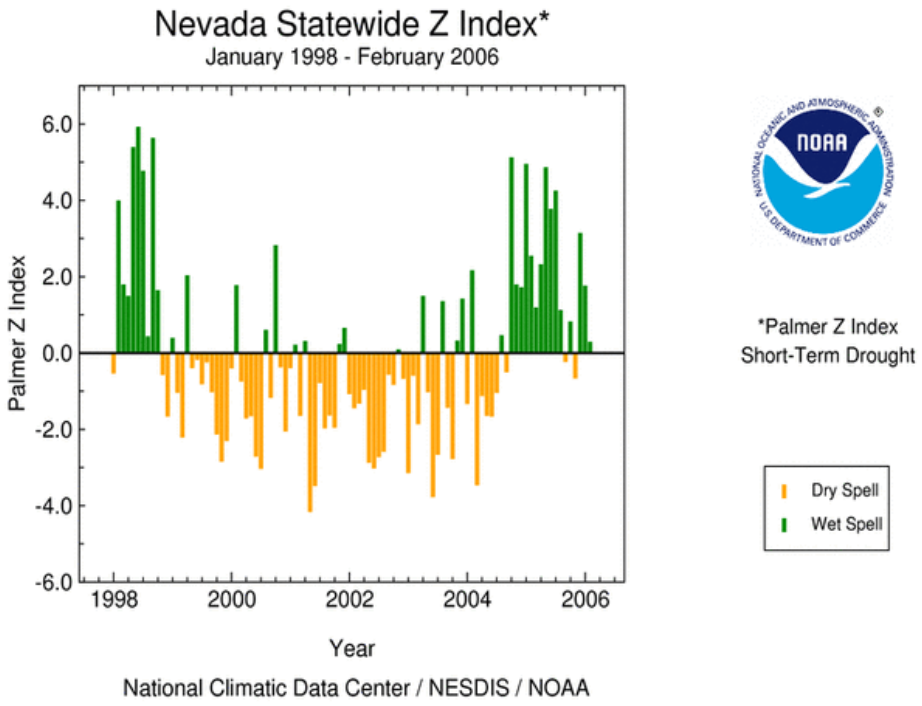

Figure 1. National Oceanic and Atmospheric Administration's Palmer Z Drought Index for Nevada from 1998-2006 showing drought years from 1999 to 2004 and above normal water years in 1998 and 2005-2006 (from NOAA Website).

In 2005, most estimates of mortality caused by insect outbreaks (acres affected and number of trees killed) declined significantly from 2004 levels. One of the most notable changes in 2005 was the decline in singleleaf pinyon mortality caused by pinyon ips (*Ips confusus*) to only 2.2% (acres) and 1.3% (trees killed) compared to 2004 acres and number of trees killed. Fir engraver beetle-caused tree mortality, affecting primarily white fir, decreased significantly in 2005 from over 276,000 trees on approximately 55,000 acres in 2004 to approximately 31,000 trees affecting over 20,000 acres in 2005. Local increases were mapped in the Mt. Wilson range in Lincoln County and newly surveyed areas, Cherry Creek Range and Spruce Mountain area. In Nevada in 2005, Jeffrey pine beetle on Jeffrey pine and mountain pine beetle on white pines such as limber, bristlecone and whitebark pine declined to almost 50% of the mortality detected in 2004 (see Table 3).

Most of the mortality noted is attributed to bark beetle activity. Please note that most bark beetle-killed trees are not typically symptomatic (faded foliage) until the following summer after attack. Therefore, the numbers of acres affected or trees killed by bark beetles as recorded by the ADS flights are often a reflection of the

previous year's beetle populations and attacks. Defoliation levels, however, reflect current year's activity or activity since budbreak.

Table 3. Mortality Detected in 2005 by Forest Pest for Nevada Counties[1]

County	Mountain Pine Beetle[1]		Fir Engraver Beetle		Pinyon Ips		Subalpine Fir Mortality Complex	
	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Carson City	5	3	105	52	517	360		
Clark	283	201	2,754	1,228	5	3		
Douglas			70	35	47,183	15,098		
Elko	1,150	575	1,206	1,402	15	8	19,962	13,855
Eureka	45	22			15	8		
Humboldt	35	18						
Lander	141	71			125	63		
Lincoln			2,618	1,251	361	226		
Lyon					1,677	435		
Mineral								
Nye	987	520	460	146	580	290		
Storey					116	58		
Washoe	275	137	836	1,000	149	74		
White Pine	2,262	975	22,999	15,233	35	18		
Total	**5,183**	**2,589**	**31,048**	**20,347**	**50,778**	**16,640**	**19,962**	**13,855**

[1] Mountain pine beetle-caused mortality in whitebark, bristlecone and limber pines only and does not include lodgepole/ponderosa pine mortality. Mortality in lodgepole included 5 trees/1 acre, 15 trees/4 acres and 534 trees/458 acres in Carson City, Douglas, and Washoe Counties, respectively. Mortality in ponderosa included 135 trees/66 acres and 5 trees/3 acres in Clark and White Pine counties, respectively.

In 2005, most estimates of defoliation and dieback caused by insect and disease activity in Nevada (acres affected) were similar to or increased slightly from 2004 levels. Douglas-fir tussock moth defoliation increased slightly in 2005 from 2004, while aspen decline detected in 2005 was similar to 2004 numbers with approximately 21,000 acres mapped in nine counties (Table 4).

[1] Table 3. Produced by G. Durham, Nevada Division of Forestry, using data provided by USDA FS Forest Health Protection

Table 4. [2]Insect Defoliation/Dieback by County

County	Aspen Decline	Douglas-fir Tussock Moth
	Acres	Acres
Carson City		
Clark		
Douglas	109	
Elko	11,706	5,657
Eureka	572	
Humboldt	2,100	
Lander	927	
Lincoln	153	
Lyon		
Mineral		
Nye	5,237	
Storey		
Washoe	31	
White Pine	186	
Total	**21,020**	**5,657**

Invasive weed species continued to spread throughout the State affecting additional counties in 2005. Since 2002, weed species such as black henbane, puncturevine and poison hemlock have been added to the list in three or more counties. A few species are widespread such as salt cedar (tamarisk), perennial pepperweed, hoary cress, Russian knapweed and Scotch thistle (see Table 5).

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

Table 5. Nevada Noxious Weeds by County

County	State Declared Noxious Weeds																												
	African Rue	Black Henbane	Canada Thistle	Dalmatian Toadflax	Diffuse Knapweed	Dyer's Woad	Goat's Rue	Hoary Cress/Whitetop	Houndstongue	Leafy Spurge	Malta starthistle	Mediterranean Sage	Musk Thistle	Perennial Pepperweed	Poison Hemlock	Puncturevine	Purple Loosestrife	Purple Starthistle	Rush Skeletonweed	Russian Knapweed	Sahara Mustard	Salt Cedar (Tamarisk)	Scotch Thistle	Sowthistle	Spotted Knapweed	Squarrose Knapweed	Sulfur Cinquefoil	Water Hemlock	Yellow Toadflax	Yellow Starthistle
Carson City			+					+		+				+					+	+			+							+
Churchill	+							+					+	+					+	+		+	+							+
Clark							+				+			+		+				+		+	+		+					+
Douglas			+	+	+			+						+	+	+		+	+	+		+	+		+					+
Elko		+	+	+	+	+		+	+	+		+	+	+	+	+		+	+	+		+	+		+	+	+	+	+	+
Esmeralda								+								+				+		+								+
Eureka		+	+		+			+		+			+	+	+	+		+		+		+	+		+			+		
Humboldt			+					+		+			+	+						+		+	+							+
Lander		+	+		+			+					+	+		+		+		+		+	+			+		+		
Lincoln			+	+	+			+					+	+						+		+	+		+	+				
Lyon								+					+	+			+			+		+	+							+
Mineral	+																					+	+							
Nye		+	+	+	+			+		+			+	+	+				+	+	+	+	+	+	+	+				
Pershing			+					+						+		+				+		+	+	+						+
Storey				+				+					+	+	+							+								
Washoe			+	+	+	+		+				+	+	+	+	+	+			+		+	+	+	+					+
White Pine		+	+	+	+			+		+			+	+	+					+		+	+	+	+	+		+		

+ Located in the County according to the Nevada Noxious Weed GIS database, Natural Resources Conservation Service, 5/24/02 and the various weed control districts representatives and BLM personnel.

STATUS OF INSECTS

NATIVE-DEFOLIATORS

DOUGLAS-FIR TUSSOCK MOTH
Orgyia pseudotsugata

Hosts: All true firs, Douglas-fir, and spruce

The Douglas-fir tussock moth is an important native insect capable of causing significant defoliation of true firs (Figure 2). 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.

Douglas-fir tussock moth defoliation in the surveyed area slightly increased in 2005 to 5,657 acres from 4,284 acres mapped in 2004 (Figure 3).

Figure 2. Douglas-fir tussock moth larvae.

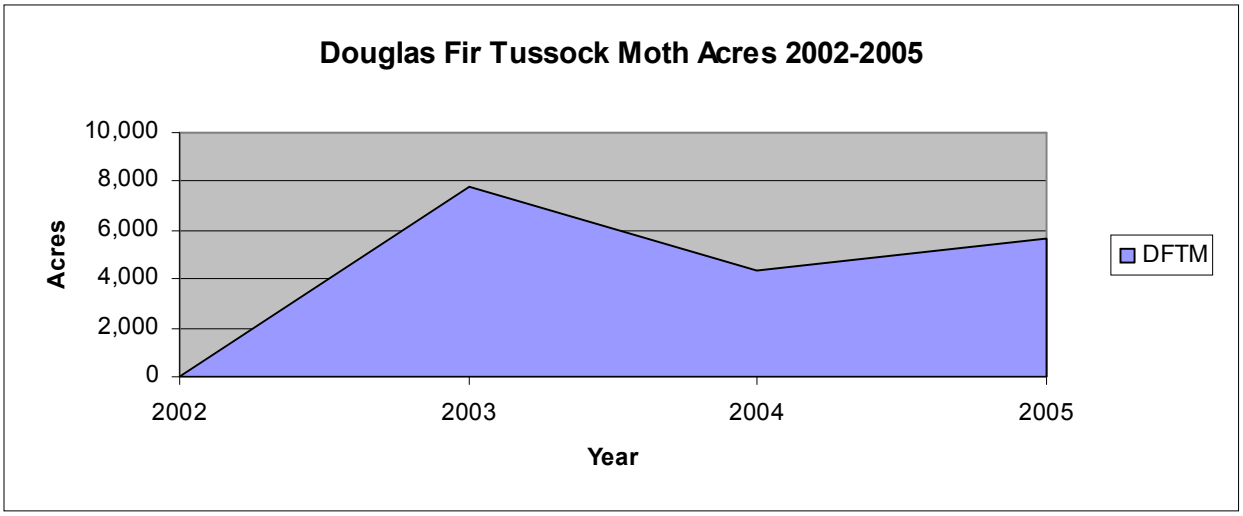

Figure 3. Acres impacted by Douglas-fir tussock moth defoliation in Nevada and east central portions of California mapped during aerial detection surveys.

In Nevada defoliation levels ranging from light to heavy were detected on 5,657-acres. This represents almost a 25 percent increase compared to acres affected in 2004 (4,284 acres). Affected acres are lower compared to the 2003 mapped acreage of 7,800 acres. True fir defoliation occurred in Elko County on the

Mountain City and Jarbidge Ranger Districts of the Humboldt-Toiyabe National Forest (Table 4).

- **Elko County** – 5,657 acres of light to heavy defoliation occurred in the Jarbidge Mountains. The majority of the defoliation was in the Jarbidge Wilderness in patches along ridgelines above the Jarbidge and East Fork drainages of the Jarbidge river.

NATIVE-BARK BEETLES

FIR ENGRAVER
Scolytus ventralis

Host: white fir and subalpine fir

In the survey area fir engraver (FE) beetle-caused tree mortality, affecting primarily white fir, decreased significantly in 2005 from over 276,000 trees on approximately 55,000 acres in 2004 to roughly 34,000 trees on over 23,000 acres in 2005 (Figure 5).

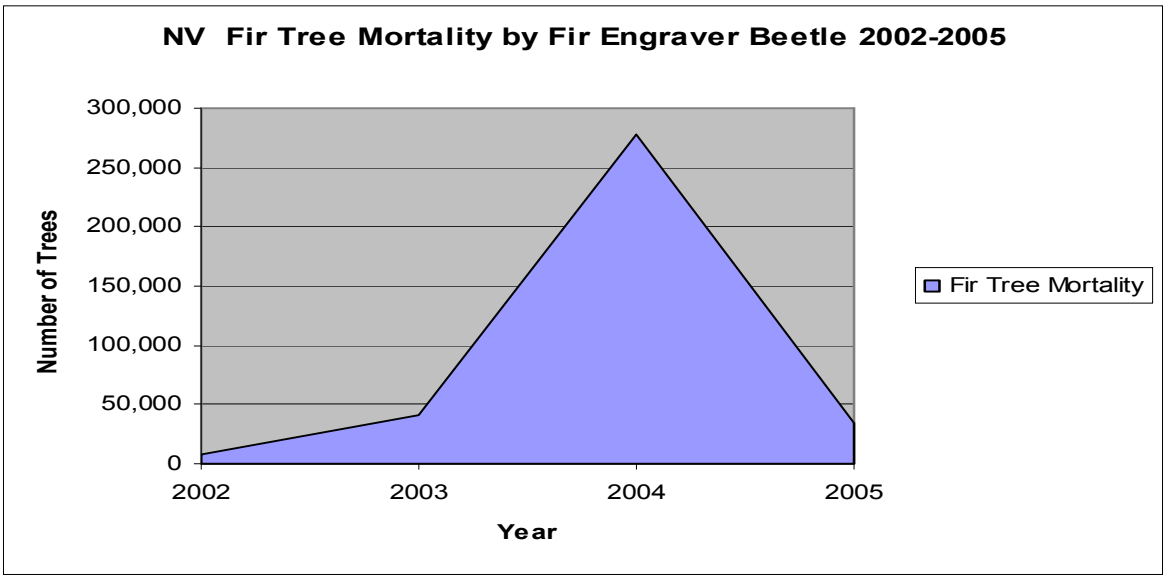

Figure 4. White fir tree mortality in Nevada and east central portions of California mapped during aerial detection surveys.

In Nevada, White Pine County had the highest rate of tree mortality for the third consecutive year, affecting approximately 23,000 trees over 15,200 acres in 2005. Fir mortality in Clark County decreased significantly from over 13,000 trees in 2004 to 2,750 trees in 2005 (Table 3).

- **Carson City County –** 52 acres, 105 trees mapped in this county in 2005 were similar to 2003 levels of approximately 100 trees on approximately 50 acres. Most of the 2005 mortality was in two polygons on the hillside above Secret Harbor and southeast of Skunk Harbor at Lake Tahoe.
- **Clark County** – 1,228 acres, 2,754 trees mapped in 2005 is about a 20% decrease compared to last year's very high levels. Scattered pockets were mapped throughout the upper elevations of the Spring Mountains with large polygons at the top of Wallace Canyon and around Bonanza Peak.
- **Douglas County** – 35 acres, 70 trees were killed in the Carson Range in scattered polygons on the west slope above Lake Tahoe.
- **Elko County**- 1,402 acres, 1,200 trees were killed in new areas mapped in the Spruce Mountains and Cherry Creek Range.
- **Lincoln County** – 1,251 acres, 2,618 trees mapped in 2005 was about 165% higher in this county compared to 2004. Trees killed in 2005 were mostly in the higher elevations of the Mount Wilson Range. Field checks on the ground prior to aerial surveys verified the higher mortality and fir-engraver beetle infestations.
- **Washoe County** – 1,000 acres, 830 trees of mortality mapped in 2005 was only slightly lower than in 2004. Most of the new mortality consisted of scattered polygons throughout the Carson Range with a few larger patches of 20 to 100 trees west of Incline Village, near the headwaters of Little Valley, south of Whites Creek, and along the north and west sides of the northern end of the Range.
- **White Pine County** – 15,233 acres, 23,000 trees resulted in the largest FE mortality mapped in Nevada. Considerable mortality occurred in the Cherry Creek Range, Schell Creek Range, southwestern White Pine Range, Ward Mountain, Snake Range, southern Egan Range, and Great Basin National Park.

Figure 5. Old and new white fir mortality from fir engraver in the top of the Wilson Creek Range in Lincoln County, July, 2005 (look at the far hills in the background).

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 the Intermountain Region, Jeffrey pine is only found in the Sierra Nevada Mountains of western Nevada.

In 2005, 421 trees were mapped within 181 acres in all surveyed areas. This is approximately 53% of the total number of trees and 38% of the total acres affected in 2004.

In Nevada, Jeffrey pine beetle-caused tree mortality affected 210 trees compared to 2004 when 794 trees were killed. Over half of the mortality was in Washoe County with smaller amounts in Carson City County and Douglas County.

- **Carson City County** – 10 trees killed in two spots: one on the Douglas County line just south of Hwy 50 on Clear Creek and on the Washoe County line east of Hwy 28.
- **Douglas County** – 40 acres, 80 trees killed in scattered spots throughout the Carson Range especially on the west slope above Lake Tahoe.
- **Washoe County**– 60 acres, 120 trees of mortality was scattered throughout the east side of the Sierra Front in small spots.

MOUNTAIN PINE BEETLE
Dendroctonus ponderosae

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

Mountain pine beetle (MPB) can kill thousands of trees a year during an outbreak year 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” diameter at breast height. Extensive mortality may alter large forest landscapes by converting the pine forest ecosystem to a grass and shrub landscape for a period of 10-20 years. This conversion affects wildlife species, water yields and fuel loading.

Mountain Pine Beetle in Limber, Whitebark, and Bristlecone Pine s

Mountain pine beetle-caused mortality in whitebark/limber pine/bristlecone (NV & CA) decreased in 2005, dropping from 14,200 trees on 4,263 acres in 2004 to 4,974 trees on 2,694 acres in 2005 (Figure 6).

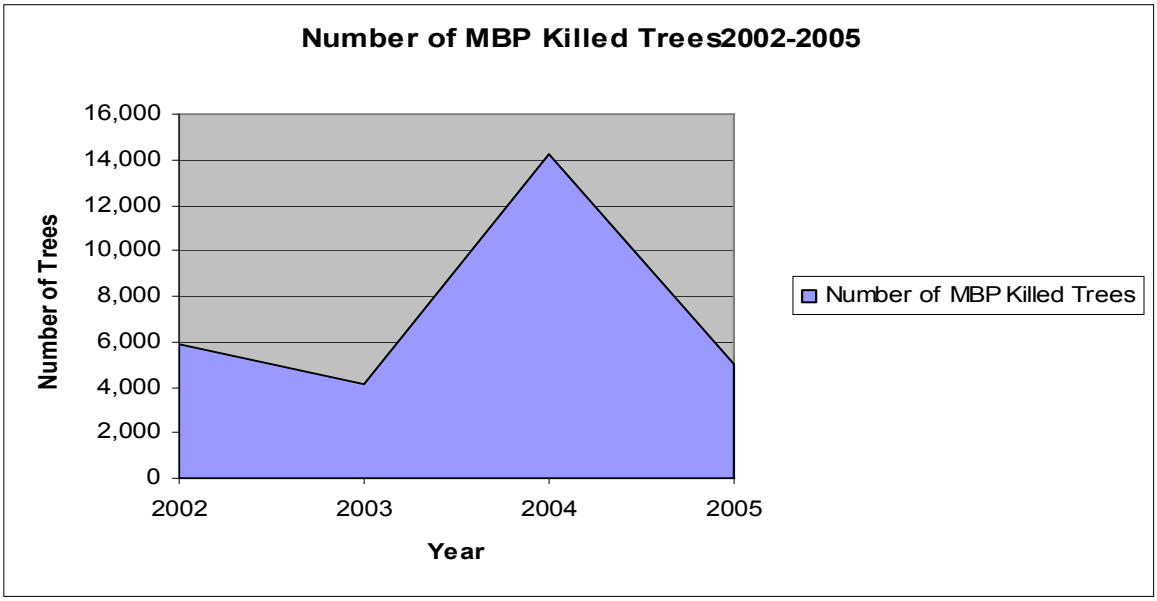

Figure 6. Whitebark, limber and bristlecone pine tree mortality in Nevada and east-central portions of California mapped during aerial detection surveys.

In Nevada**,** the following counties experienced the heaviest tree mortality in 2005; Clark, Elko, Nye, Washoe, and White Pine (Table 3). These were also the counties with heavier mortality in 2004. Most of the mortality consisted of small polygons of 5 trees on surveyed ridgetops.

- **Carson City County** – 3 acres, 5 trees in a polygon just west of North Canyon.
- **Clark County** – 201 acres, 283 trees of both limber and bristlecone pine mortality is mixed throughout the Spring Mountains in the higher elevations. Most of the mortality is confined to small polygons. Two small polygons of limber pine were mapped west of the divide at the headwaters of Carpenter and Trout Creeks and one 40 tree polygon of bristlecone pine mortality was mapped at the headwaters of Lovell Creek.
- **Elko County** –575 acres, 1,150 trees were scattered in small pockets of mortality throughout the higher elevations near the ridgeline of Spruce Mountain (limber pine) , north half of the Cherry Creek mountains (limber pine), Ruby Mountains, East Humboldt Range, throughout the Jarbidge and Cooper Mountains, the north end of the Independence Mountains, small polygons in the Mahoganies, and near Pennsylvania Peak in the Bull Run Mountains

- **Eureka County** – 22 acres, 45 trees were found as scattered polygons in a few small areas in the northernmost end of the Monitor Range north of Summit Mountain.
- **Humboldt County** - Eighteen trees were killed in small polygons at the headwaters of cabin creek and southwest of Paradise Peak in the Santa Rosa Range.
- **Lander County –**71 acres, 141 dead limber pine was mapped in the north Shoshone Mountains and the north Toiyabes – north and south of Kingston Canyon.
- **Nye County** – 520 acres, 978 dead trees - Small-sized groups (20 to 50 tree polygons) mixed with smaller polygons were mapped in the Toiyabes from Mahogany Mountain north to South Toiyabe Peak, west side of the Toquima Range from Moores Creek south to Jefferson Creek, and on the Monitor Range south of Tulle Creek to Dry Canyon, mostly on the east side of the range and south end of the White Pine Mountains. A few small polygons of limber pine mortality were mapped on top of the Grant Range around Timber Mountain.
- **Washoe County** - 137 acres, 275 trees scattered throughout the higher elevations of the Carson Range were mapped
- **White Pine County** – 741 acres, 2,262 trees were observed in pockets of scattered mortality along the tops of the central and southern Cherry Creek Range (Limber Pine), southern end of the White Pine Range, in spots along the top ridgeline of Ward Mountain in the Egan Range, and scattered throughout the Snake Range, the Schell Creek Range, and Great Basin National Park.

Mountain Pine Beetle in Lodgepole Pine

In Nevada, MPB activity continued in three counties killing 554 trees over 463 acres.

- **Carson City County** – 1 acre, 5 trees in one spot on the south end of Marlette Lake.
- **Douglas County** – 4 acres, 15 trees in three small polygons south of Hwy 50 to Lincoln Creek.
- **Washoe County** – 458 acres, 534 trees scattered throughout the Carson Range with one large 500 tree polygon mapped at the headwaters of the middle fork of Bronco Creek.

Mountain Pine Beetle in Ponderosa Pine

In Nevada, MPB activity continued in two counties killing 140 trees over 69 acres.

- **Clark County** – 66 acres, 135 trees in small polygons on the south facing slope of Kyle Canyon and just north of the entrance to Lee Canyon. Other beetles such as western pine beetle (*Dendroctonus brevicomis*) and

roundheaded pine beetle (*Dendroctonus adjunctus*) have also been found contributing to the ponderosa pine mortality in the Spring Mountains.

- **White Pine County –** 3 acres, 5 trees in one polygon.

Figure 7. Mountain pine beetle galleries in ponderosa pine in Lee Canyon (left) and western pine beetle in ponderosa pine in Kyle Canyon (right).

PINYON IPS
Ips confusus

Host: singleleaf pinyon

Pinyon-juniper (PJ) woodland is the principle forest type in Nevada. During the recent drought, large areas of PJ in Nevada and portions of California experienced high rates of tree mortality due principally to attacks by pinyon ips on stressed trees (Figure 8). Because the insect produces multiple generations each year, populations can build and spread rapidly.

In 2002, pinyon-juniper forest was occasionally surveyed when adjacent to traditionally surveyed areas. In 2003, in response to increasing concern of pinyon pine mortality, a multi-state survey effort was made. Approximately 3 million of the estimated 11.9 million acres of singleleaf pinyon that occur in Nevada were surveyed in 2003. In 2004, over 3.5 million acres of pinyon-juniper woodlands were flown. Reported *Ips*-caused mortality of singleleaf pinyon increased overall in 2004, primarily due to increased survey coverage of the pinyon pine type. In 2005 pinyon mortality decreased significantly within the surveyed area.

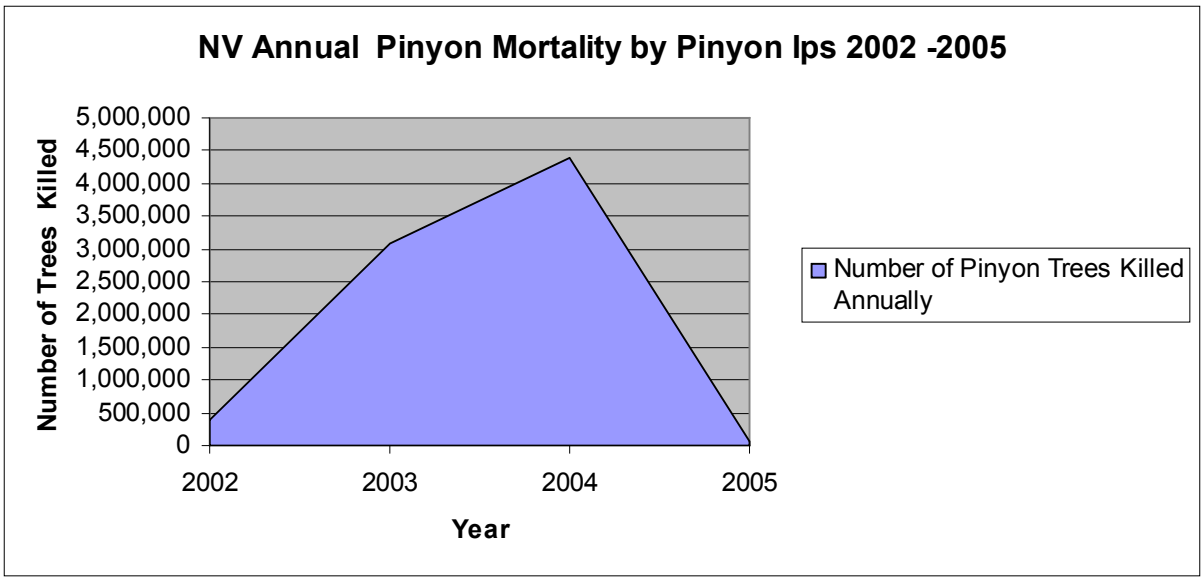

Figure 8. Singleleaf pinyon tree mortality in Nevada and portions of California mapped during aerial detection surveys.

In Nevada in 2005, 15,778 dead pinyon trees on 16,640 acres in twelve counties were recorded during this recent outbreak. This was a dramatic decrease from 2004's survey with 2005 having only about 2.2% of the acres and 1.3% of the number of trees affected compared to 2004. Douglas County had the majority of tree mortality in acres, 91% and number of trees killed, 93% (Table 3). Two previously un-surveyed BLM ranges, Spruce Mountain and the Cherry Creek Range, were surveyed in northeastern Nevada to determine old and new pinyon mortality. Very little new pinyon mortality was mapped in these ranges, but significant numbers of older pinyon pine mortality were mapped.

Results of the 2005 aerial detection survey follows:

- **Carson City County** - 360 acres, 517 trees in small to moderate sized polygons were recorded in the Pine Nut Range from McTarnahan Hill west of Brunswick Canyon east to the county line, including Eldorado Canyon.
- **Clark County** -3 acres, 5 trees in one small polygon found just south of Wheeler Pass on the north end of the Spring Mountains.
- **Douglas County** -15,098 acres, 47,183 trees was recorded in the Pine Nut Mountain Range from the California border north into Lyon/Carson City Counties. Large areas of mortality still exist from Pinenut Valley north to Sunrise Pass with smaller polygons of tree mortality mapped throughout the rest of the range.
- **Elko County** -8 acres, 15 trees indicate low mortality levels in this county with a few small polygons mapped in the north and east central portions of the Cherry Creek Range. Older pinyon mortality on the Cherry Creek Range and Spruce Mountain totaled 26,279 trees on 21,874 acres.

Figure 9. Singleleaf pinyon mortality in the Pinenut Mountains caused largely by pinyon ips, indicated by brown polygons along slope of the mountain range.

- **Eureka County** - 8acres, 15 trees represents a decrease to only 1% of 2004 mortality levels with three small polygons mapped on the end of the Monitor Range.
- **Lander County** - 63 acres, 125 trees represents a decrease to about 1% of 2004 levels. Most of the mortality was in small polygons mapped on the northeast side of Toiyabe and Toquima mountains and the north end of the Shoshone Mountains.
- **Lincoln County** - 226 acres, 361 trees represents less than 0.1% of 2004 mortality levels. The Wilson Creek Range had widespread scattered polygons of mortality. The lower end of the Quinn Canyon Range had small polygons of mortality mapped. Older mortality on 1,157 acres comprised of 2,153 trees was recorded on the north end of the Wilson Creek Range in an area not previously surveyed.
- **Lyon County** - 435 acres, 1,677 trees is a continuation of a previous epidemic in Douglas and Carson City Counties in the northern Pinenut Range east of Eldorado Canyon.
- **Nye County** - 290 acres, 580 trees represents <1% of 2004 levels due to the above normal water year of 2005 which improved residual tree health. Scattered polygons of mortality occurred throughout the Shoshone Mountains and Grant, Monitor, Toquima, and Toiyabe Ranges. Most of the mortality occurred in the central and southern Shoshone Mountains. Although not surveyed, it was noted that the north end of the Hot Creek, Paradise and Wassuk Ranges had little to no new mortality.

- **Storey County** - 58 acres, 116 trees; approximately 50% of the mortality of 2004 was mapped in the Virginia Range north of Geiger Summit with a few smaller areas around Flowery Peak .
- **Washoe County** -74 acres, 149 trees; mortality was mapped in the western portion of the Virginia Range.
- **White Pine County** - 18 acres, 35 trees. Small amounts of scattered mortality was mapped in Cherry Creek, one spot on the south end of Schell Creek south of Cooper Canyon, and two polygons in the White Pine Range. Small polygons of mortality were mapped in the center of the Snake Range near Lucky Boy Canyon and north of Strawberry Creek. Substantial older pinyon mortality was mapped in the Cherry Creek Range totaling 38,521 trees on 30,361 acres.

PITCH MASS BORER
Dioryctria spp.

Hosts: singleleaf pinyon, ponderosa pine, Jeffrey pine

In the larval stage, species of *Dioryctria* 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 further weakens pinyon trees that often succumb to pinyon ips attacks. Pitch mass borer is found throughout the state of Nevada in most counties where singleleaf pinyon occurs although the heaviest concentrations seem to occur in western Nevada where it also affects Jeffrey and ponderosa pine. Many young (20 year old) Jeffrey pines on the east slope of the Carson Range that regenerated post-fire disturbance have also been affected by this insect.

Figure 10. Pitch mass borer on pinyon pine indicated by copious pitch flow.

PINYON NEEDLE SCALE
Matsucossus acalyptus

Host: Singleleaf pinyon

The pinyon needle scale causes branch mortality, stunted growth and needle injury. Small trees may be killed and large trees may be seriously weakened after repeated infestations, rendering them susceptible to pinyon ips. Pinyon needle scale is found throughout Nevada wherever singleleaf pinyon occurs. No large outbreaks have been noted in recent years but have been in previous years, especially along the Utah border.

NON-NATIVE INSECTS

EUROPEAN GYPSY MOTH
Lymantria dispar

Hosts: Various deciduous species

Statewide detection surveys conducted by Nevada State Department of Agriculture and Animal and Plant Health Inspection Service (APHIS) using pheromone attractants resulted in no male moth captures in 2005.

Figure 11. Adult gypsy moths, female above, male below.

STATUS OF DISEASES

STEM AND BRANCH DISEASES

DWARF MISTLETOES
Arceuthobium spp.

Hosts: Douglas-fir, pines, true firs, singleleaf pinyon and spruce

Dwarf mistletoes are the single-most damaging agent of coniferous trees. These parasitic plants remain the most widespread and frequently observed disease within the state. Profusely branched, dense masses of host branches called “witches brooms” are typically observed. Heavy dwarf mistletoe infestation can predispose trees to insects and other diseases, reduce incremental growth, affect the forest canopy structure, lower resistance to drought, 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 over mature tree stands.

Figure 12. Dwarf mistletoe on pinyon pine

Heavy dwarf mistletoe on white fir in Kyle Canyon in the Spring Mountains may be predisposing the trees to fir engraver beetle attack. 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 it from the Spring Mountains in the South north through the Toiyabes and east and west to both borders of the state. Pinyon ips-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 ips attacks.

WHITE PINE BLISTER RUST
Cronartium ribicola

Hosts: white pines including limber, bristlecone, whitebark, sugar and western white

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

SUDDEN OAK DEATH
Phytophthora ramorum

Sudden Oak Death (SOD), a newly identified forest disease caused by the pathogen *Phytophthora ramorum*, has been killing thousands of tanoak and oaks in the coastal areas of California, but has not been recovered in Nevada. However, with the release of potentially infected nursery stock into all 50 states from a single California nursery, Nevada Department of Agriculture (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 outplanted infected stock. Nevada Division of Forestry personnel have assisted Nevada Department of Agriculture officials with these surveys. The 2004 and 2005 NDOA forest survey found no SOD occurrences in any surveyed areas. This includes the Las Vegas area.

ROOT DISEASE

ANNOSUM ROOT DISEASE
Heterobasidion annosum

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

Figure 13. Annosum conk at the base of a tree.

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

ARMILLARIA ROOT DISEASE
Armillaria spp.

Hosts: Douglas-fir, pines, spruce, subalpine fir, and red fir

Figure 14. Armillaria mushrooms.

Armillaria root disease is evident throughout the state functioning as a weak pathogen or saprophyte on all species of coniferous and deciduous trees. 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. This disease is prevalent in the success summit area of White Pine County on the ridgeline of the Schell Creek Mountains on private land.

BLACK STAIN ROOT DISEASE
Ophiostoma wageneri

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

Figure 15. Potential black stain root disease rings in singleleaf pinyon community south of Mount Wilson in 2004. Note doughnut shaped rings of dead pinyon trees at upper left and lower right.

Black stain root disease is an important disease of several coniferous hosts. However, in Nevada it is only found in singleleaf pinyon stands. It usually kills

affected trees within a few years, and it can produce groups of mortality several acres in size. Pockets of infected trees are preferred host for low-level populations of pinyon ips. No new pockets of black stain root disease were detected by aerial survey in 2005.

LEAF AND NEEDLE DISEASE

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, but were not observed in aerial surveys in 2005.

Figure 16. Symptoms of aspen leaf spot

DECLINES / COMPLEXES

Subalpine Fir Mortality Complex

Host: Subalpine fir

The western balsam bark beetle (WBBB) is the most significant mortality agent in a complex of forest insects and disease, causing subalpine fir mortality. Endemic populations will occur in storm-damaged trees, slash, or trees of poor vigor. WBBB infestations may build to epidemic levels particularly during drought periods, 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 17. Subalpine fir mortality.

Acres of subalpine tree mortality decreased slightly in 2005 from 2004 (13,680 from 15,210 acres). Numbers of trees killed has decreased significantly to about a fifth of the 2004 numbers; from 100,000+ trees to 19,670 trees in 2005 (Figure 17).

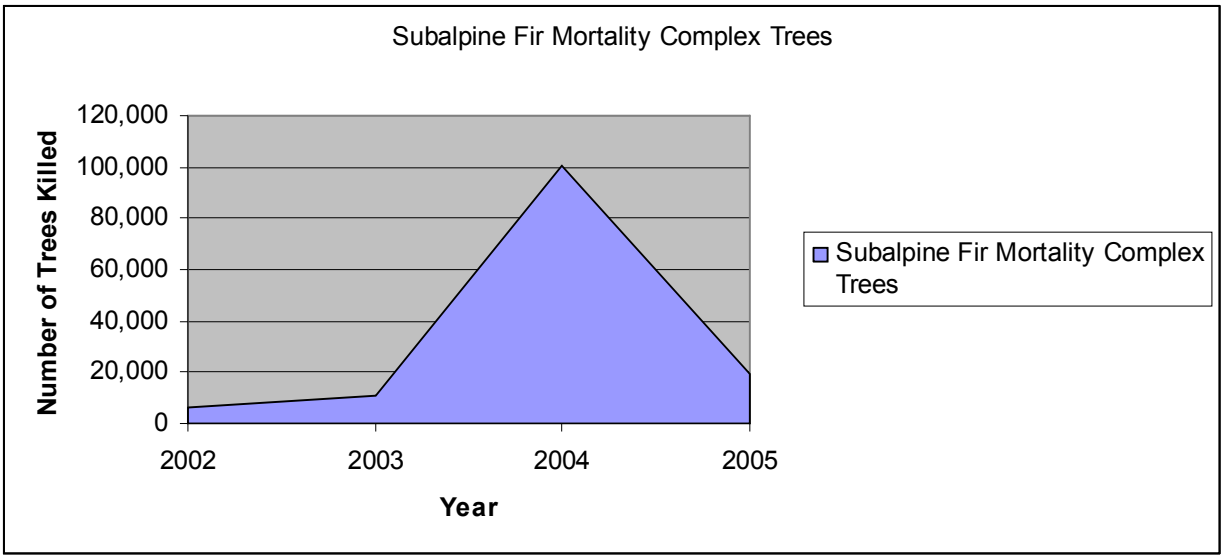

Figure 18. Subalpine fir tree mortality in Nevada and portions of east central California mapped during aerial detection surveys.

In **Nevada**, most of the 2005 subalpine fir mortality was located on the Mountain City and Jarbidge Ranger Districts of the Humboldt-Toiyabe National Forest.

- **Elko County** – Over 19,000 trees within large scattered mortality polygons were mapped throughout the Jarbidge Mountains, including the Jarbidge Wilderness. Additional mortality was reported in the Independence, Bull Run, and Mahogany mountains.

Aspen Decline

Host: Aspen

Aspen decline is a phenomenon that has been observed throughout the western U.S. for many years. Numerous pockets of aspen decline were observed by aerial survey in 2004. In the declining clones several types of canker diseases and heavy borer activity were found in ground surveys and may be responsible for the mortality listed as Cytospora canker. However, other major forces involved in aspen decline are drought, fire suppression, encroachment by other species into aspen forests, and grazing pressure. Many clones with heavy mortality and general decline have little or no reproduction.

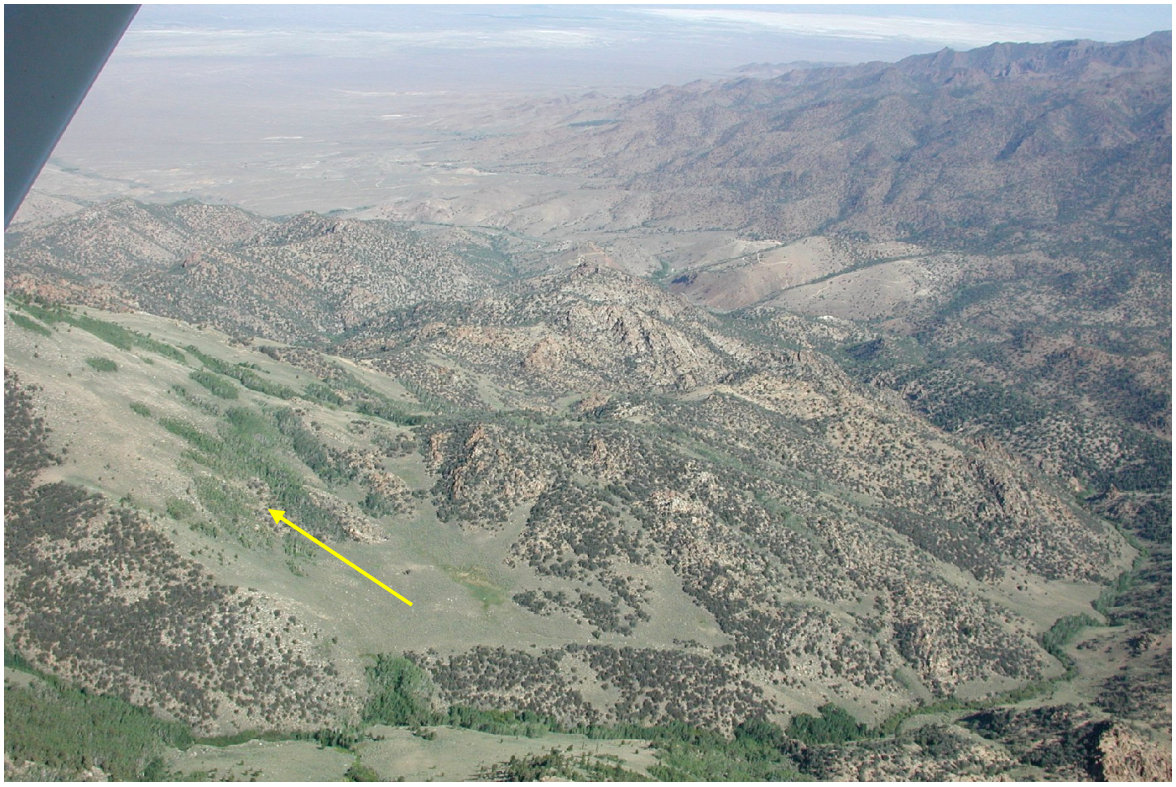

Figure 19. Aspen decline clones in Toquima Mtns. around Mt. Jefferson, July, 2004

Cytospora Canker
Cytospora spp.

Host: Aspen

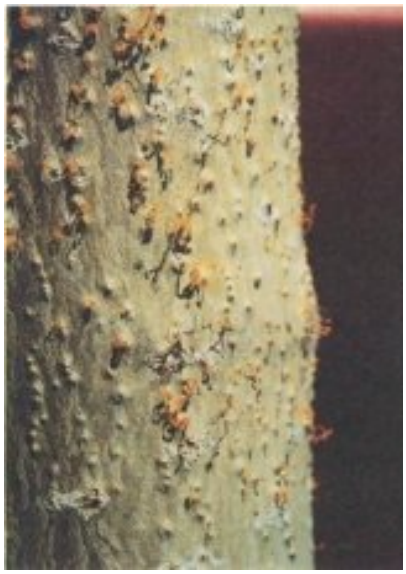

Figure 20. *Cytospora* fruiting bodies on aspen

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; however, vigorous trees can limit the disease and are rarely killed. Cytospora canker has been identified through ground checks but a number of factors including drought, fire stress and other diseases are most likely the cause of this aspen decline. Activity from this pathogen is most likely a symptom of several years of drought or defoliation from other insects or diseases. From the air, dieback due to cytospora canker looks similar to dieback by forest tent caterpillar defoliation. The dieback was mistakenly identified by aerial observers as forest tent caterpillar defoliation in 2002 & 2003. Further field study is needed to determine all of the causes associated with aspen dieback.

Levels of aspen decline in the NV-CA survey area in 2005 were similar to 2004 with approximately 21,000 acres mapped in nine counties (Table 4). In 2004 aspen decline was mapped over approximately 22,000 acres in six counties. In Nevada for both years, most of the aspen decline acreage was mapped in Elko County. Additional acreage was observed in Nye and Humboldt Counties.

In **Nevada**, 21,020 acres of aspen dieback/decline were mapped in nine counties.

- **Elko County** - 11,706 acres of dieback was reported in the Jarbidge, Tennessee, Bull Run Mountains, Independence Mountains, and around the Mahoganies. Light to heavy dieback occurred throughout the Ruby Mountain and East Humboldt Ranges from the White Pine County line to Star Valley.
- **Douglas County** - 109 acres of dieback in the southern Pinenut range in two polygons.
- **Humboldt County** - 2,100 acres of light to heavy aspen dieback occurred throughout the Santa Rosa Mountains in small pockets. This is about 50% of the acreage mapped in 2004.
- **Eureka, Lander, and Nye Counties** – 572, 927, and 5,237 acres respectively; dieback was mapped in many small patches on the Toiyabe, Monitor and Toquima Ranges. For the first time dieback was noted in the Shoshone Range in small pockets on the north and south end.
- **Lincoln County** - 153 acres; scattered in small pockets in the western, northern and northeastern portions of the Wilson Creek Range.
- **Washoe County –** 31 acres; in one pocket north of Peavine Peak,
- **White Pine County** – 186 acres; Most of the dieback was from the west side of the Cherry Creek Range from Paris Creek north to Snow Creek.

ABIOTIC DAMAGE

Frost Damage
Hosts: maple, gambel oak, aspen

No frost damage was reported during the 2005 survey.

Blowdown

Areas of concentrated, high velocity winds can cause trees to blow over. Blowdown occurs in groups or as scattered trees within the landscape. Depending on the tree species, patches of blowdown in coniferous forests can provide a food source for various bark beetles, enabling populations to build to epidemic levels. These epidemic populations may then attack and kill standing, live trees adjacent to the blowdown. No blowdown was mapped in 2005. Avalanche disturbance created downed white fir in Kyle Canyon in the Spring Mountains above the main subdivisions.

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 is the list of plants declared noxious weeds by the State of Nevada with occurrence data by county. Since 2002 species such as black henbane, puncturevine and poison hemlock have been sighted in three or more counties. Various invasives are widespread such as salt cedar (tamarisk), perennial pepperweed, hoary cress, Russian knapweed and Scotch thistle. For more up-to-date information on Nevada Noxious Weeds and the newly adopted three-tier State List go to:

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

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

http://www.invasivespeciesinfo.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.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_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, camelthorn, Canada thistle, Dalmatian toadflax, dyer's woad, goatsrue, houndstongue, Johnson grass, 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 bermudagrass, 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, as well as 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.