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Utah

Forest Insect and Disease Conditions Report

2002 - 2004

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Utah

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Forest Health Conditions Summary

From 2002 through 2004, most insect and disease damage agents in Utah increased significantly, in some cases to epidemic levels. Although there are many potential causes for these large increases, the most significant contributing agent is drought. The extended drought throughout the Intermountain Region lowered tree resistance to insect attacks or infections caused by diseases. Once insect populations reach epidemic levels, insect disturbance becomes a stand-replacing event often leading to widespread tree mortality similar to wildfire. If advance regeneration occurs within stands affected by the epidemic, stands will eventually recover.

Depending on the affected tree species, wildfire can be a serious threat to existing and recently killed trees. The standing dead trees have fine branches and needles capable of quickly spreading the wildfire. If fire is absent during this phase, the trees will drop their needles and fine branches making the standing dead trees less susceptible to fire. Large, down trees, once ignited, sustain fire for long periods of time potentially causing soil sterilization and killing live trees around them. In areas managed for timber production, wildlife or other resource values that would be adversely affected by widespread tree mortality, vegetative strategies can be developed by resource managers to mitigate the effects of insect and disease.

As a result of an extreme fire season, only 16.2% of the state was surveyed in 2002. Most of the insect damage was scattered throughout forested areas. In 2003, 23.3% of the state was surveyed. In conjunction with the general detection survey, an intensive survey to capture old and new pinyon mortality occurred. In 2004, 21.8% of the state was surveyed including portions of the pinyon pine type not previously surveyed in 2003.

Table 1: Major Insect & Disease Survey Results for Utah by Year

Major Pest	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	21,965	5,658	62,664	20,026	196,904	49,043
Fir engraver beetle	7,985	2,239	26,940	11,308	531,837	102,859
Forest tent caterpillar				1,821		12,197
Mountain pine beetle	75,623	26,548	302,598	53,517	1,259,408	144,062
Elytroderma Needle cast		984		8,187		
Oak mortality						16,431
Pinyon engraver beetle	12,516	6,000	1,115,376	181,742	1,079,772	165,785
Spruce beetle	131,005	27,924	102,242	24,107	123,261	37,211
Subalpine fir mortality	206,925	30,251	141,161	34,968	297,379	61,534
Western spruce budworm		6,959		14,783		19,979

Douglas-fir beetle-caused tree mortality increased dramatically throughout Utah from 2002-2004. To illustrate the increasing tree mortality, in 2002, 39 spots had more than 100 trees affected and only 5 spots were greater than 100 acres in size. In comparison, the 2004 aerial survey recorded 333 mortality spots greater than 100 trees (fifteen were over 1,000 trees) and 100 spots greater than 100 acres in size (four over 1,000 acres). In 2002, most of the damage occurred on private lands (4,805 trees, 1,170 acres) and on the Duchesne Ranger District, Ashley National Forest (4,573 trees, 1,040

acres). For both areas in 2003, tree mortality more than doubled. In 2004, tree mortality reached epidemic levels on all National Forests , Bureau of Land Management lands, State and private lands.

Fall cankerworm – Although aerial surveyors recorded no defoliation caused by this insect, scattered light to moderate defoliation occurs annually in gamble oak. Most of the defoliation has occurred along the Wasatch Front and in Heber Valley in northern Utah.

Fir engraver beetle-caused white fir mortality and topkill also increased dramatically. In 2002, the Manti-La Sal National Forest had the majority of fir engraver tree mortality (3,155 trees, 1,015 acres). In 2003, many of the National Forest and private lands surveyed experienced the same or greater tree mortality compared to 2002. By 2004, damage was at epidemic levels on the Dixie, Fishlake, Manti-La Sal, Uinta and Wasatch-Cache National Forests, and adjoining private lands. Significant tree mortality caused by this insect was also observed on state lands and in Bryce Canyon National Park.

Forest tent caterpillar-caused tree defoliation affected large areas of primarily aspen in 2004. Most of the defoliation occurred on private lands (7,034 acres). The Dixie (1,327 acres), Uinta (1,365 acres) and Wasatch-Cache (1,522 acres) National Forests also experienced large areas of defoliation in 2004. 2004 defoliated acres in Utah are equivalent to 2003 defoliated acres mapped throughout the Region (Utah, Nevada, southern Idaho and western Wyoming).

Mountain pine beetle-caused tree mortality is affecting the Ashley and Wasatch-Cache National Forests and adjacent private land on a landscape level. Insect-caused stand replacement events are occurring across huge areas of contiguous lodgepole pine stands and in limber pine where it exists. In 2002, the Ashley and Wasatch-Cache National Forests were at epidemic levels (49,488 trees, 16,950 acres and 23,323 trees, 8,498 acres, respectively). In 2003, the outbreak of mountain pine beetle increased on both Forests (Ashley NF 142,588 trees over 26,182 acres and Wasatch-Cache NF 154,640 trees over 24,674 acres). The outbreak continued in 2004 with over 1 million trees killed over both Forests affecting over 120,000 acres. In 2004, lodgepole and limber pine mortality also occurred on private lands in Utah affecting 70,342 trees over 11,205 acres.

Needle cast – elytroderma is a disease primarily affecting ponderosa pine. Visually, branch flagging identifies elytroderma, where individual branches have fading red and yellow needles. Elytroderma was reported on the Dixie National Forest during the 2002 (1,004 acres) and 2003 (7,435 acres) survey. Climate probably plays an important role in determining branch-flagging frequency but once a branch flags, repeat flagging may occur. Another symptom of elytroderma is witches'-brooms. Although some mortality occurs, the greatest impact is on growth.

Widespread **oak mortality** of an unknown cause was reported during the 2004 survey. A significant amount of borer activity was noticed in several areas; however, the ultimate cause is probably drought. Private lands were primarily affected (9,796 acres) followed by Bureau of Land Management lands (3,960 acres), state lands (1,232 acres) and the Manti-La Sal National Forest (1,112 acres).

Pinyon engraver beetle – Tree mortality caused by pinyon ips had not been annually surveyed before 2002. However, the dramatic increase in pinyon mortality in 2001 and 2002 as a result of the extended drought and outbreak populations of pinyon ips necessitated documenting this widespread mortality. In 2002, a cursory survey was conducted in areas with large numbers of dead trees. In 2003, a more thorough survey of the pinyon pine component was conducted. Because many affected

sites were not flown previously, surveyors reported both old and new mortality. Lands administered by the Bureau of Land Management had the heaviest tree mortality with 584,461 trees killed over 82,941 acres. Other areas with heavy mortality include the Uinta and Ouray Indian Reservation (200,250 trees, 21,537 acres), state lands (121,103 trees, 17,704 acres), private lands (103,284 trees, 14,540 acres), the Dixie National Forest (104,601 trees, 17,112 acres) and Manti-La Sal National Forest (96,154 trees, 11,712 acres). In 2004, previously unsurveyed areas were included in the aerial survey. Areas previously surveyed with heavy mortality and new mortality was also monitored. Heavy mortality was reported on the Ashley (153,600 trees, 10,240 acres), Dixie (200,366 trees, 33,249 acres), and Manti-La Sal (122,176 trees, 20,283 acres) National Forests, Bureau of Land Management lands (301,321 trees, 49,384 acres), and state lands (101,815 trees, 16,456 acres).

Spruce beetle-caused tree mortality levels peaked on the Manti-La Sal National Forest (76,907 trees, 15,419 acres) in 2002. Mortality remained high in 2003 (70,213 trees, 13,638 acres) with lower mortality numbers recorded in 2004 (33,563 trees, 8,377 acres). In 2002, mortality levels were high on the Dixie (28,271 trees, 6,838 acres) and Fishlake (19,834 trees, 4,046 acres) National Forests. In 2003, the spruce beetle-caused tree mortality on the Dixie and Fishlake NF's decreased by 33 to 50 percent. However, in 2004, tree mortality increased to 40,277 trees across 9,166 acres (Dixie NF) and 9,875 trees across 4,261 acres (Fishlake NF). Increased spruce mortality has been observed on the Ashley and Wasatch-Cache National Forests where beetle-caused tree mortality has been building since 2003 and is now affecting over 15,000 trees on each Forest. Spruce beetle populations are also building on the Uinta National Forest affecting spruce stands near Strawberry Reservoir.

Subalpine fir mortality complex (SAF) can be a combination of several factors affecting tree mortality including bark beetles, tree diseases, and drought. While all land ownerships reported some subalpine fir mortality in 2002, the Dixie and Fishlake National Forests (NF's) experienced the heaviest mortality. The Dixie NF had 86,699 trees dead trees over 13,027 acres and the Fishlake NF had 53,115 dead trees over 6,940 acres. Other 2002 areas with subalpine fir mortality affecting in excess of 2,000 acres were the Manti-La Sal NF, Uinta NF, and adjacent private land. In 2003, most of the SAF mortality occurred on private lands with 36,034 trees across 8,803 acres. Abundant SAF mortality also occurred on the Dixie and Fishlake NF's with 30,635 trees on 8,514 acres and 23,265 trees on 4,945 acres, respectively. The Manti-La Sal and Wasatch-Cache NF's each had SAF mortality over 2,000 acres and Uinta NF had SAF mortality affecting 4,694 acres. In 2004, all National Forests, State and private lands in Utah were experiencing subalpine fir mortality across large acreages ranging from 3,457 to 14,654 acres. The greatest amount of damage occurred on the Dixie NF (76,877 trees, 14,654 acres), Uinta NF (55,046 trees, 9,852 acres) and private lands (64,831 trees, 10,553 acres).

Western spruce budworm-caused tree defoliation has been aerially sketchmapped for three consecutive years on the Dixie and Fishlake National Forests. On the Dixie National Forest, 3,747 acres of defoliation was reported in 2002, 8,966 acres in 2003, and 14,861 acres in 2004. The Dixie outbreak was the largest in the Region in 2004. On the Fishlake National Forest, 1,792 acres were defoliated in 2002, 3,087 acres in 2003 and 2,467 acres in 2004. Western spruce budworm primarily feed on new growth, thus sustained heavy defoliation over a four to five year period can result in growth reduction, top-kill and eventually tree mortality.

STATUS OF INSECTS BY COUNTY

BEAVER COUNTY

In 2002, the area east of Interstate 15 was surveyed or 11% of the county. In 2003, 13% of the county was surveyed incorporating the area surveyed in 2002 and including part of the southwest section of the county. In 2004, 13% of the county was surveyed with a slight expansion west of the 2002 survey area.

In 2002, spruce beetle-caused mortality affected the southeastern corner of the county. In 2003, surveyed areas included the pinyon-juniper component to capture tree mortality caused by pinyon ips. Because of the additional area flown, total acres with tree mortality increased significantly. In 2004, pinyon ips-caused mortality decreased by 98 percent. However, acres affected by several other species of bark beetles increased.

BEAVER COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	150	75	629	322	2,601	534
Fir engraver beetle	209	76	996	766	4,013	1,200
Forest tent caterpillar		25		49		
Mountain pine beetle	450	157	360	138		
Pinyon engraver beetle	154	49	101,085	10,934	1,311	270
Spruce beetle	7,789	1,236	1,545	676	1,724	886
Subalpine fir mortality	1,168	261	2,422	532	996	258
Western spruce budworm		529		767		902

2002:

- Douglas-fir beetle- small areas of mortality occurred in the South Fork of North Creek, Twitchell Canyon, and Indian Creek.
- Fir engraver beetle- small pockets of mortality occurred on Cork Ridge, Little Shelly Baldy Peak, and Pine Creek at the eastern county border.
- Mountain pine beetle- ponderosa pine mortality occurred in the vicinities of Copes Basin, South Fork of the Beaver River, and the upper portion of South Creek.
- Pinyon engraver beetle- small areas of mortality occurred between Beaver River and Birch Creek southeast of Beaver.
- Spruce beetle- most of the mortality occurred in the southeast corner of the county in the vicinity of Circleville Mountain, spruce mortality was also mapped south of Mount Holly.
- Subalpine fir mortality- was identified near Puffer Lake, in Merchant and North Fork of Three Creeks, and near the upper portion of South Fork Beaver River.
- Western spruce budworm- light defoliation was reported at the confluence of Three Creeks and East Fork Beaver River.

Beaver County continued

2003:

- Douglas-fir beetle- mortality was observed on the west side of Chokecherry Peak, Beaver River at South Fork Baker Canyon, Cork Ridge, Indian, Little North and South Fork Blue Lake Creeks.
- Fir engraver beetle- two large areas of mortality occurred in Pole Creek and the South Fork of Beaver River. Two small areas occurred in North Fork Baker Canyon and on Black Ridge.
- Mountain pine beetle- Most of the ponderosa pine mortality continued at the upper portion of South Creek with one spot in Briggs Creek. One limber pine mortality area was located west of Shingle Creek Meadow along the Sevier County border.
- Pinyon engraver beetle- several large areas of mortality were identified in the southwest corner of the county. Two additional large areas of mortality occurred near Black Mountain east of Beaver.
- Spruce beetle- mortality continued in the Circleville Mountain and Mount Holly areas.
- Subalpine fir mortality- Approximately 1,500 trees were killed in one large area at the confluence of Sevier, Piute, and Beaver Counties. Additional mortality occurred as small-scattered pockets in sites captured in the 2002 aerial survey.
- Western spruce budworm- light defoliation was identified in areas mapped in 2002.

2004:

- Douglas-fir beetle- mortality was scattered from Shingle Creek Meadow to South Creek with the largest concentration of mortality occurring in the upper portion of North Creek.
- Fir engraver beetle- scattered mortality occurred from Indian Creek to the South Fork of Beaver River with the largest concentration occurring in North Creek.
- Pinyon engraver beetle- small pockets of new mortality occurred from Black Mountain to Birch Creek.
- Spruce beetle- mortality continued in the Circleville Mountain area. Additional mortality occurred in Beaver River and the upper portion of South Creek.
- Subalpine fir mortality- scattered pockets of mortality occurred near Shingle Creek Meadow, Indian Creek, Merchant Creek, Puffer Lake, and Dry Hollow.
- Western spruce budworm- heavy defoliation occurred in areas defoliated in 2002 & 2003. Additional heavy defoliation occurred in the West Fork of Beaver River.

ASPEN DECLINE
Host: quaking aspen

Several types of canker diseases and heavy borer activity may be responsible for heavy aspen mortality. Many aspen clones with heavy mortality and general decline have little or no reproduction.

ASPEN LEAF BLIGHT
Host: quaking aspen

Aspen leaf blight is a general term that covers several fungi that affect aspen leaves. Foliar diseases affect the tree's appearance more than they affect its well-being, although the tree may grow more slowly with repeated annual attacks. The most common foliar problem is aspen leaf spot caused by the fungus *Marssonina populi*. After several years of defoliation, aspen leaf spot could kill aspens.

BOX ELDER COUNTY

Limited acreage was surveyed in Box Elder County in 2002. In 2003, less than 1% of the county was surveyed encompassing the hills east of US 89 to Devils Gate Valley and south of Brigham City, and the northern section of the Clarkston Mountains. In 2004, nearly 7% of the county was surveyed expanding the 2003 survey area slightly by including the Raft River Mountains.

In 2003, less than 40 acres of spruce and subalpine fir mortality was mapped east of Willard. In 2004, subalpine fir and Douglas-fir mortality was observed throughout the Raft River Mountains. Light insect damage also occurred in the southeast portion of the county.

BOX ELDER COUNTY	2003		2004	
	Trees	Acres	Trees	Acres
Douglas-fir beetle			195	162
Fir engraver beetle			77	38
Fall cankerworm				214
Mountain pine beetle			110	51
Spruce beetle	20	10	60	30
Subalpine fir mortality	50	25	5,018	1,595

2003:

- Spruce beetle- mortality occurred around Willard Mountain.
- Subalpine fir mortality- occurred in Willard Creek.

2004:

- Douglas-fir beetle- all mortality occurred in the Raft River Mountains from Rock Canyon to Rosevere Point.
- Fir engraver beetle- less than 10 acres occurred in the West Fork of Willard Creek and the remaining affected acres were mapped in the upper portion of Devils Hole Canyon.
- Fall cankerworm- heavy maple defoliation occurred in Dunns Canyon, Perry Canyon, and Willard Creek.
- Mountain pine beetle- all mortality occurred in the Raft River Mountains. Several small spots of limber pine mortality occurred between Rock Canyon and George Peak. Three five-tree lodgepole pine mortality spots were mapped in Clear Creek.
- Spruce beetle- one area of approximately 30 acres of spruce mortality was mapped in the West Fork of Willard Creek.
- Subalpine fir mortality- most of the mortality occurred in the Raft River Mountains. Large pockets of mortality occurred in the higher elevations from Browns Canyon to Rice Creek. Additional mortality occurred southeast of Brigham City in the upper portion of Devils Hole Canyon and in Dunns Canyon and Willard Creek.

CACHE COUNTY

In 2002, 8% of the county was surveyed from Logan in a 4-mile swath along the south side of US 89 to the eastern county border. In 2003 and 2004, approximately 62% of the county was surveyed encompassing the Bear River and Wasatch Ranges.

Cache County continued

In 2002, Douglas-fir beetle caused tree mortality was the only forest pest damage reported. In 2003, insect related mortality increased, especially mortality caused by Douglas-fir beetle and the subalpine fir mortality complex. However, most of this mortality was widely scattered in the surveyed areas. In 2004, Douglas-fir beetle related mortality and subalpine fir mortality increased for the third consecutive year. Fall cankerworm and forest tent caterpillar (FTC)-caused defoliation of oak and aspen increased significantly.

CACHE COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Aspen defoliation				337		
Aspen mortality				235		
Douglas-fir beetle	401	154	2,374	875	6,169	1,890
FTC / Fall cankerworm				60		2,423
Mountain pine beetle			251	102	689	169
Oak mortality				38		
Spruce beetle			30	15	60	30
Subalpine fir mortality			2,230	718	6,042	1,203

2002:

- Douglas-fir beetle- Small areas of mortality were observed in Logan Canyon at Mill Hollow. Scattered mortality was observed east of Logan Canyon from Temple Fork to Horse Lake. A 54-acre polygon of tree mortality was mapped in Bear Creek.

2003:

- Aspen defoliation- occurred in the upper portion of the Right Fork of Logan Canyon.
- Aspen mortality- occurred in Bear River at the Weber County border, in Scare and Millville Canyons, and in the upper portion of the Right Fork of Logan Canyon.
- Douglas-fir beetle- mortality was scattered throughout the Bear River and Wasatch Ranges with the heaviest concentration occurring in the Bear River Range southeast of Logan.
- Forest tent caterpillar- Heavy aspen defoliation occurred in the Right Fork of Logan Canyon at Willow Creek.
- Mountain pine beetle- Small pockets of lodgepole pine mortality were scattered along the Rich County border from Strawberry Valley to the Amazon mine. Small pockets of limber pine mortality occurred along the Logan River drainage near Mount Jardine and at Horse Lake.
- Subalpine fir mortality- was scattered throughout the Bear River and Wasatch Ranges. The heaviest concentration of mortality occurred in the Wasatch Range along the Rich County border.

2004:

- Douglas-fir beetle- mortality was scattered throughout the Bear River and Wasatch Ranges with the heaviest concentration occurring north and west of Ant Valley.
- Forest tent caterpillar & fall cankerworm- heavy aspen and maple defoliation occurred in the Bear River Range from the Weber County border to the Logan River. The largest pocket occurred between South Fork of Little Bear Creek and Threemile Creek drainages.
- Mountain pine beetle- mortality continued in the northeast corner of the county. Lodgepole mortality was mapped in Jebo Canyon and Beaver Creek drainages. Limber pine mortality occurred in the Logan River drainage.

Cache County 2004 continued

- Subalpine fir mortality- was scattered throughout Beaver River and Wasatch Ranges with the heaviest concentration occurring in the northern portion of both ranges.

CARBON COUNTY

In 2002, 26 % of the county was surveyed including Gordon River on the west side of the county and the area west of Price Canyon, Miller and Serviceberry Creeks. Minnie Maud Ridge and Ninemile Canyon were surveyed in the northern part of the county. In 2003, 50% of the county was surveyed. Additional survey area included the West Tavaputs Plateau southeast to the Uintah County border. In 2004, 31% of the county was surveyed. In 2004, the Gordon River to Miller Creek area was not surveyed and the Book Cliff plateau from Soldier Creek and Roan Cliff were surveyed to the Emery County border.

Insect activity was high in Carbon County. In 2002, damage was scattered throughout the surveyed area. In 2003, insect activity increased including large areas of pinyon engraver beetle-caused mortality. The 2003 aerial survey included pinyon-juniper areas not previously surveyed. In 2004, the number of mortality polygons decreased but the affected area increased. Large pockets of pinyon mortality were mapped in addition to increasing pockets of Douglas-fir mortality.

CARBON COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	2,097	742	6,153	2,024	16,911	5,063
Fir engraver beetle	150	75	250	104	1,631	349
Forest tent caterpillar				195		125
Mountain pine beetle	320	88				
Pinyon engraver beetle	331	209	70,031	8,355	30,622	6,124
Spruce beetle	1,840	539	1,231	370	1,256	450
Subalpine fir mortality	580	141	9,485	2,289	12,196	2,787
Western spruce budworm				364		245

2002:

- Douglas-fir beetle- Numerous small pockets were noted west of US Highway 6 affecting the tributaries and drainages of Price River/Canyon, Beaver Creek, Spring Canyon and from First Water Canyon to King Mountain along the west edge of the county. Additional mortality was observed in Soldier Creek, Right Fork of Cow Canyon, and Ninemile Canyon.
- Fir engraver beetle- mortality was noted in the North Fork of Gordon Creek and between Seely and Mud Water Canyons.
- Mountain pine beetle- Ponderosa pine mortality was reported along Price Canyon, the largest pocket occurred at Rolapp Mine.
- Pinyon engraver beetle- Small areas of mortality were identified at Wildcat Canyon, North Spring Canyon, and in Miller Creek near Hiawatha.
- Spruce beetle- Most of the mortality occurred in the southwest corner of the county in the upper portion of the Right Fork of Miller Creek. One of the largest areas occurred on Minnie Maud Ridge in Bear Canyon.
- Subalpine fir mortality- occurred in Mud Creek near Eccles Canyon, North Fork of Gordon Creek, and Price River near Scofield Reservoir.

Carbon County continued

2003:

- Douglas-fir beetle- mortality occurred in two areas, one encompassed the tributaries of Mud Water Canyon, Mud, Beaver, and Gordon Creeks, the Price River drainage and Price Canyon. The other included Cow, Sheep, and Ninemile Canyons. Additional mortality pockets were found in Flat Canyon, Rock and Jack Creeks.
- Fir engraver beetle- Small areas of mortality occurred between the North Fork of Gordon Creek and Bob Wright Canyon.
- Forest tent caterpillar- Heavy aspen defoliation occurred between French Creek and Andrew Dairy Canyon near Scofield Reservoir on the northwest side of the county.
- Pinyon engraver beetle-Most of the large areas of mortality occurred on the west side of the county in Gordon and Serviceberry Creeks and Garley Canyon. On the east side of the county, large areas of mortality were located in Cottonwood Canyon and between Jack Creek and Flat Canyon.
- Spruce beetle- mortality continued in the upper portion of Miller Creek. Additional mortality occurred in the Right Fork of Whitmore Canyon.
- Subalpine fir mortality- Scattered mortality occurred from Castle Valley Ridge to Little Bear Creek and near Price River at Scofield Reservoir. Additional mortality occurred on the eastern ridge paralleling Range Creek from Dry Creek to the Left Fork of Rock Creek.
- Western spruce budworm- The Sanpete County line bisected an area of light subalpine fir defoliation in Woods Canyon.

2004:

- Douglas-fir beetle- Several large pockets of mortality were mapped from Price Canyon west to Beaver Creek. Another concentration of mortality occurred in the Soldier Creek and Ninemile Canyon tributaries. The largest area of Douglas-fir mortality was mapped along Range Creek and in Little Horse Canyon.
- Fir engraver beetle- Moderate areas of mortality occurred in Crandall Canyon and adjacent to Price River near Scofield Reservoir.
- Forest tent caterpillar- Heavy aspen defoliation occurred in Mud Creek near Clear Creek and on Granger Ridge near the Sanpete County border.
- Pinyon engraver beetle- Large areas of mortality were mapped on the Book Cliffs from Dugout Creek to Columbia.

DOUGLAS-FIR BEETLE
Dendroctonus pseudotsugae
Host: Douglas-fir

Douglas-fir beetle is the most destructive bark beetle of Douglas-fir in western North American forests. At endemic levels, these insects infest scattered trees of low vigor and poor health. Where there is an abundance of trees of low vigor and poor health, populations can build rapidly and spread to adjacent healthy, green standing trees.

Douglas-fir beetle-caused mortality spots.

Carbon County 2004 continued

- Spruce beetle- small pockets of mortality occurred adjacent to Mud, Gordon, and Johnston Creeks, and in Miller Canyon near Scofield Reservoir. Additional mortality occurred at Mount Bartles and along the Roan Cliffs adjacent to Range Creek.
- Subalpine fir mortality- Most of the mortality occurred in the vicinity of Scofield Reservoir. Affected drainages include Price River, Mud Creek and all tributaries, Beaver Creek west of Johnston Creek, French and Pondtown Creeks. Subalpine fir mortality was also mapped in Horse Canyon, Range Creek drainage, and at Mount Bartles.
- Western spruce budworm- One area of heavy subalpine fir defoliation occurred at Trough Springs on the Emery County border.

DAGGETT COUNTY

In 2002, Daggett County was not surveyed. In 2003, 41% of the county was surveyed encompassing the southern two-thirds of the county from the Summit County border to Jackson Creek south of Red Canyon. In 2004, 39% of the county was surveyed covering the same general area.

In 2003, insect activity was scattered and relatively light with the heaviest activity occurring along the Lodgepole Creek drainage. In 2004, bark beetle activity increased significantly. Areas of mortality were larger and more numerous. The Douglas-fir beetle-caused tree mortality observed in the north portion of Uintah County in 2003 is now spreading to Daggett County.

DAGGETT COUNTY	2003		2004	
	Trees	Acres	Trees	Acres
Douglas-fir beetle	1,277	530	22,273	5,700
Mountain pine beetle	14	3	5,291	1,058
Subalpine fir mortality	50	25	13,709	4,147

2003:

- Douglas-fir beetle- mortality occurred in scattered pockets across the county. Affected drainages include Lodgepole, Sheep, Carter, Cart, and Pipe Creeks.
- Mountain pine beetle- Scattered lodgepole pine mortality occurred in the upper portion of Hope Creek.
- Subalpine fir mortality– occurred in Cub Creek in the Uinta Mountains.

2004:

- Douglas-fir beetle- mortality polygons of approximately 1000-acres were mapped in Lodgepole Creek, East Fork of Deep Creek extending into Carter Creek, and at the Uintah County border between Gorge and Jackson Creeks. Additional mortality occurred in Hope, Spruce, Pipe, and the West Fork of Eagle Creek.
- Mountain pine beetle-A large area of mortality was mapped in Deep Creek.
- Subalpine fir mortality- Large areas of mortality were mapped on the south and west side of State Highway 44 from Elk Creek to Francis Creek.

DAVIS COUNTY

In 2002, 1% of the county was surveyed in the Bountiful Peak area. In 2003 and 2004, approximately 13% of the county was surveyed encompassing all of the forested land on the east side of the county.

In 2002, no damage was reported. In 2003, insect-caused damage was minor. In 2004, most of the damage consisted of scattered fir engraver beetle-caused tree mortality affecting true firs from Farmington to the Salt Lake County border.

DAVIS COUNTY	2003		2004	
	Trees	Acres	Trees	Acres
Aspen mortality		87		
Fir engraver beetle			900	234
Forest tent caterpillar		47		
Subalpine fir mortality			100	24

2003:

- Aspen mortality- Two areas of aspen mortality were identified, one in Rudd Creek and the other in Corbett Creek on the east side of the county.
- Forest tent caterpillar- Heavy aspen defoliation was located in Farmington Creek and Corbett Creek.

2004:

- Fir engraver beetle- scattered pockets of mortality occurred from Steed Canyon to North Canyon on the Salt Lake County border.
- Subalpine fir mortality- One area of mortality was located in the South Fork of Line Creek on the Morgan County border.

DUCHESNE COUNTY

In 2002, 50% of the county was surveyed from the Wasatch County border stretching east. In 2003, 56% of the county was surveyed to the Uintah County border. In 2004, 45% of the county was surveyed. The difference from 2003 is the Summit County border area was not surveyed.

In 2002, most of the insect caused damage was heavy but scattered across the surveyed area. Mountain pine beetle-caused mortality was the exception, large areas of lodgepole pine mortality occurred from the Wasatch County border to Yellowstone Creek in the Uintas Wilderness. In 2003, insect-caused damage was heavy and while still scattered, the number of large polygons increased. Duchesne County had the largest amount of Douglas-fir mortality in Utah. Mountain pine beetle-caused tree mortality continued to increase in size and intensity in and near the Uintas Wilderness killing lodgepole and ponderosa pine. Also, pinyon engraver beetle killed large areas of pinyon pine south of Duchesne. In 2004, the heaviest mortality continued to affect lodgepole and pinyon pine in the same general areas.

Duchesne County continued

DUCHESNE COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	7,327	2,500	11,119	3,685	38,393	8,846
Mountain pine beetle	59,190	20,517	202,500	34,581	719,501	68,421
Pinyon engraver beetle	649	303	154,746	16,777	283,028	36,123
Spruce beetle	200	68	12,742	4,214	14,889	6,123
Subalpine fir mortality	4,670	602	9,930	2,797	3,010	706

2002:

- Douglas-fir beetle- Numerous areas of mortality were mapped in the canyons from Long Ridge to Argyle Ridge. On the Uintah & Ouray Reservation, various Canyons such as Lake, Sam's, Dry, Horse Ridge, Timber and Simmons all had pockets of mortality.
- Mountain pine beetle- outbreaks affecting lodgepole pine were mapped in the following drainages: Yellowstone River, Hells Canyon, Duchesne River, Moon Lake, Rock Creek, and Hades Creek. Two small pockets of ponderosa pine mortality were found on Tub Ridge and in Calf Hollow.
- Pinyon engraver beetle- Small-scattered pockets of pinyon mortality were found on the Uintah & Ouray Reservation on Blacktail and Cottonwood Ridges and in Sams, Lake, Sowers, Indian, Alkali, and Wells Canyons.
- Spruce beetle- One 68-acre area of mortality was located in Minnie Maud Creek.
- Subalpine fir mortality- The largest concentration of mortality was located around Tabby Mountain and in the upper portion of Willow Creek. Isolated spots of mortality occurred near Mirror and Moon Lakes, the East Fork of Farm Creek, and on Long Ridge.

2003:

- Douglas-fir beetle-Scattered damage occurred throughout the county with larger pockets of mortality north of Argyle Ridge on the Ashley National Forest and on the Uintah and Ouray Reservation lands. Additional pockets of mortality occurred around Tabby and Dry Mountains, northwest of Red Creek Reservoir, Duchesne River, Dry Canyon, and Rock and Farm Creeks.
- Mountain pine beetle- Lodgepole pine mortality increased in the areas identified in 2002. Additional mortality was observed in the Whiterocks River drainage. One 1,075-acre area of ponderosa pine mortality was reported in Dry Gulch Creek and two smaller areas were reported in Left Fork Lake Canyon and First Canyon.
- Pinyon engraver beetle- Large areas of pinyon pine mortality were reported in Ninemile and Avintaquin Creeks; Antelope, Sowers, Skitzy, Dry, Lake, and Cottonwood Canyons; Cottonwood Ridge, and along the Strawberry River drainage.
- Spruce beetle-Large areas of mortality occurred in the Uintas Wilderness in Rock Creek and the West Fork of Dry Gulch Creek, along the Uinta River and adjacent to Jordan and Bollie Lakes.
- Subalpine fir mortality- Concentrations of dead trees occurred around Tabby Mountain, in the Farm Creek Peak/McAfee Basin area and on Reservation, Argyle, and Lightning Ridges.

2004:

- Douglas-fir beetle- Large areas of mortality occurred along Reservation and Argyle Ridges. Numerous scattered pockets of mortality were mapped throughout the southern portion of the county. Mortality continued in the Tabby Mountain area. Additional mortality occurred in Pole Creek near the Uinta River.

Duchesne County 2004 continued

- Mountain pine beetle- Heavy lodgepole pine mortality continued in all previously identified areas of the Uintas Wilderness. A new large area of mortality was mapped along the Uinta River. Ponderosa pine mortality in Dry Gulch Creek expanded to encompass a large area between Timothy and Dry Gulch Creeks. Additional ponderosa pine mortality was mapped in the West Fork of Willow Creek, near the Twin Pots Reservoir, and adjacent to the Yellowstone River.
- Pinyon engraver beetle-small pockets of mortality identified in 2002 and 2003 have combined into fewer but much larger areas of mortality from Long Ridge to Antelope Canyon.
- Spruce beetle-A large area of new mortality starts at Mirror Lake extending into Summit County. New pockets of mortality were also mapped on the East Fork of Whiterocks River and near Cliff and Pole Creek Lakes. Mortality continued at Jordan Lake and along the Uinta River.
- Subalpine fir mortality- continued around Tabby Mountain, along Rock Creek and on Dry Ridge. A large area of mortality in Utah County extends into Duchesne County on Reservation Ridge. Additional mortality was located in the South Fork of Avintaquin Creek and in Farm Creek on the Uintah County border.

DOUGLAS-FIR TUSSOCK MOTH
Orgyia pseudotsugata
Hosts: Douglas-fir, true firs, Engelmann and Colorado blue spruce

Adult male Douglas-fir tussock moth.

Douglas-fir tussock moth is an important native insect, causing significant defoliation and tree mortality. Defoliation occurrs quickly, with treetops sometimes killed after only a single season of severe injury. Outbreaks are cyclic, usually appearing abruptly and typically subsiding after one to four years in the same manner.

EMERY COUNTY

In 2002 and 2003, approximately 10% of the county was surveyed encompassing the forested land west of State Highway 10 to the Sanpete County border. In 2004, 15% of the county was surveyed. Roan and Book Cliffs, east of Interstate 6, from Carbon County border to Elgin were also surveyed.

In Emery County during the 2002 and 2003 survey, most of the insect damage occurred in the East Mountains and in Waters Creek tributaries. Spruce beetle-caused tree mortality was the most abundant mortality mapping within the county. Douglas-fir mortality also affected a large number of trees, however the mortality occurred in small, scattered pockets. In 2004, while spruce mortality remained static, fir engraver beetle-caused tree mortality increased. The additional area surveyed contributed to the increase in Douglas-fir mortality numbers.

Emery County continued

EMERY COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	1,450	538	3,872	1,398	8,127	2,536
Fir engraver beetle	210	55			5,793	1,224
Mountain pine beetle	30	15			50	25
Pinyon engraver beetle			100	50	7,284	1,446
Spruce beetle	18,377	3,938	14,848	3,320	13,008	3,258
Subalpine fir mortality	540	114	405	145	500	73

2002:

- Douglas-fir beetle– Small areas of mortality occurred in the East Mountains from Joes Valley Reservoir to the Carbon County border.
- Fir engraver beetle- mortality was mapped in Cottonwood Creek and Straight Canyon near Joes Valley Reservoir.
- Mountain pine beetle-One spot of limber pine mortality was located west of Nelson Mountain.
- Spruce beetle-Large heavy spruce mortality areas occurred in the canyons between Lowry Water and the Sanpete county border and from East Mountain to Seeley Mountain. Smaller areas of mortality were observed from the Right Fork of Fish Creek to Gentry Mountain along the Carbon County border and on the southwest side of Electric Lake.
- Subalpine fir mortality– occurred along Huntington Creek, Electric Lake, and Nuck Woodard Canyon in the northwest corner of the county.

2003:

- Douglas-fir beetle- Most of the mortality occurred in the East Mountains from Joes Valley Reservoir to Upper Joes Canyon and in the Huntington Creek drainages of McCadden and Gentry Hollows and the Mill Fork and Left Fork of Rilda Canyon.
- Pinyon engraver- Small areas of mortality were reported in North Dragon Creek and in Straight Canyon east of Cottonwood Creek.
- Spruce beetle- Heavy mortality continued in the same areas reported in 2002.
- Subalpine fir mortality- was reported along Cottonwood Creek and in Nuck Woodard Canyon.

2004:

- Douglas-fir beetle- most of the mortality occurred on Book and Roan Cliffs from Cherry Meadow Canyon to the Carbon County border. Mortality reoccurred in the East Mountain area from Straight Canyon to Upper Joes Valley. Additional mortality occurred in Clay Bank Swale, Lowrey Water, and Huntington Creek.
- Fir engraver beetle-The largest area of mortality occurred in Huntington Creek. Additional pockets of mortality occurred along Cottonwood and Ferron Creeks, in Straight Canyon, and along the East Rim near Horn Mountain.
- Mountain pine beetle- Limber pine mortality occurred east of South Horn Mountain.
- Pinyon engraver beetle-The largest area of pinyon pine mortality occurred in North Dragon Creek. Additional mortality was reported on Biddlecome Ridge, at Mahogany Point and Cox Swale in Straight Canyon, in Cottonwood Creek and in the upper portion of Turtle Canyon on Book Cliff.
- Spruce beetle- Except for the continuing mortality from Mill to Potters Canyons on the Sanpete County border, most of the mortality shifted north. Mortality was reported in the tributaries of Huntington Creek from Horse Canyon to Upper Huntington Creek.
- Subalpine fir mortality- occurred in Lowrey Water and Black Canyon along the Sanpete County border and at the northern portion of Electric Lake.

GARFIELD COUNTY

In 2002, 32% of the county was surveyed including Fivemile Ridge northeast of Dickinson Hill and from Interstate 89 east to Upper Valley and Escalente northeast to Tantalus Flats. In 2003, 39% of the county was surveyed with the addition of the area west of Interstate 89 to the Iron County border. In 2004, 36% of the county was surveyed.

In 2002, spruce beetle-caused tree mortality was heavy on the Sevier Plateau in the Mount Dutton area and in the Escalante Mountains. Subalpine fir mortality was heavy in the Aquarius Plateau area. In 2003, aerial surveys in the pinyon pine component captured additional mortality resulting in a tremendous increase in affected acres. Subalpine fir mortality continued at a high rate in the Griffin Top and Aquarius Plateau area. Douglas-fir and spruce beetle population caused mortality over many acres; however, the mortality occurred in small, scattered polygons. Western spruce budworm defoliation was more noticeable on the Aquarius Plateau. In 2004, the most significant agent causing tree mortality was the pinyon engraver beetle. Subalpine fir and Douglas-fir mortality remained high in the same previously reported areas. Spruce and fir engraver beetle caused mortality increased most noticeably in the Griffin Top area. Budworm defoliation continued on the Aquarius Plateau.

GARFIELD COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Aspen blight		672				
Douglas-fir beetle	430	169	4,126	1,696	9,809	2,316
Elytroderma		1,005		618		
Fir engraver beetle	230	67	864	283	43,419	8,738
Forest tent caterpillar						1,071
Mountain pine beetle	81	40	680	493	2,197	890
Oak mortality						239
Pinyon engraver beetle	84	42	202,636	27,039	403,230	69,801
Spruce beetle	28,104	6,881	6,434	1,079	34,935	6,671
Subalpine fir mortality	84,134	12,861	29,063	8,096	73,909	14,017
Western spruce budworm		1,009		3,716		4,577

2002:

- Aspen blight- was reported in Wildcat Creek, between Middle and East Deer Creeks, and in the West Fork of Ditch Creek in the Boulder Mountain area.
- Douglas-fir beetle- mortality pockets were located along the Sunset Cliffs from Proctor Canyon to the Kane County border.
- Elytroderma- was reported from South Hollow to Canaan Peak in the Upper Valley area.
- Fir engraver beetle- Small areas of mortality occurred in Butler Creek and on Fivemile Ridge along the Iron County border.
- Mountain pine beetle- Small, scattered pockets of ponderosa pine mortality were reported on Fivemile Ridge, Sunset Cliffs, near Pine Lake and in West Branch of Pine Creek.
- Pinyon engraver beetle- mortality was noted along the west side of Johns Valley from Prospect Creek to Cottonwood Creek.
- Spruce beetle-The heaviest mortality occurred in the Mt. Dutton area, from Powell Point to Antimony Creek in the Escalante Mountains, and Iron Spring Draw to Roundy Reservoir on the Aquarius Plateau.

Garfield County 2002 continued

- Subalpine fir mortality- The largest concentration of tree mortality occurred on Griffin Top, along the Aquarius Plateau from Jacobs Reservoir to Grass Lake and around Deer Lake in the Boulder Mountain area.
- Western spruce budworm- Heavy defoliation was observed throughout Horse Valley above Panguitch Lake. Light defoliation was located at Roger Peak and Pine Creek on the Aquarius Plateau.

2003:

- Douglas-fir beetle- mortality increased along the Sunset Cliffs. Pockets of mortality were also mapped at Haycock Mountain near Panguitch Lake, on the Pink Cliffs of the Paunsaugunt Plateau, near Mount Dutton, Horse Valley Peak, and Table Mountain on the Sevier Plateau, and in North and Birch Creeks in the Escalante Mountains.
- Elytroderma- was reported on the Pink Cliffs in Bryce Canyon National Park and continued in the Upper Valley area previously recorded in 2002.
- Fir engraver beetle- mortality continued in the area reported in 2002. Additional mortality occurred between Spencer and Water Canyons in the Escalante Mountains.
- Mountain pine beetle- Small pockets of ponderosa pine mortality occurred from Panguitch Lake to Haycock Mountain, on Fivemile Ridge, in the Birch Creek tributaries from Deer Canyon to Birch Canyon, and on Pretty Tree Bench near Mount Ogden.
- Pinyon engraver beetle- Large areas of mortality were reported west of Panguitch from the Sevier River to Threemile Creek, on the Sevier Plateau from Casto Canyon to the Piute County border and from Prospect Creek to Deer Creek, and in the Escalante Mountains from Henrieville Creek to Headquarters Valley on the Kane County border.
- Spruce beetle- mortality continues at a reduced level in the same areas reported in 2002.
- Subalpine fir mortality- Heavy mortality continues in the same areas reported in 2002.
- Western spruce budworm- Heavy defoliation continued in Horse Valley and from Roger Peak to McGrath Lake. Light defoliation occurred at Posy Lake and from Jacobs Reservoir to Blue Lake on the Aquarius Plateau.

2004:

- Douglas-fir beetle- mortality continued near Panguitch Lake and on the Paunsagunt and Sevier Plateaus. In the Escalante Mountains, a couple of small spots occurred near Pine Lake and in Dry Creek.
- Fir engraver beetle- mortality continued on Fivemile Ridge and increased in the Escalante Mountains along Barney Top. New mortality was located on the Paunsaugunt Plateau along the Pink Cliffs, which appears to be connected to the outbreak in Kane County. A very large area of mortality occurred at Griffin Top in the Escalante Mountains. Other small areas of mortality occurred at Chokecherry Point in the Boulder Mountain area and between Casto Canyon and Blind Spring Mountain in the Sevier Plateau.
- Forest tent caterpillar- Heavy aspen defoliation occurred in Badger Creek on the Paunsaugunt Plateau; along Antimony Creek, in Coyote Hollow and near Big Lake on the Aquarius Plateau; from East Fork of Boulder Creek to West Deer Creek and along Pleasant Creek in the Boulder Mountain area.
- Mountain pine beetle- Ponderosa pine mortality occurred in small pockets throughout the survey area. Tree mortality was concentrated in the southwest corner of the county, around Haycock Mountain, on the Sunset Cliffs, west of Mount Dutton, in Bryce Canyon National Park, around Canaan Peak, and along Pleasant Creek.
- Oak mortality- of unknown cause occurred on Windmill Ridge in the Boulder Mountain area.

Garfield County 2004 continued

- Pinyon engraver beetle- affected a very large area on the Sevier Plateau from South Fork of Prospect Creek crossing into Piute County on the east side and to a lesser extent from Red Canyon to Horse Valley Creek on the west side. Additional large areas of mortality occurred in the lower elevations west of Panguitch from Mammoth Creek to the Iron County border at Threemile Creek, in Bucket Hollow, in Bryce Canyon National Park west of Tropic, on the Escalante Mountains in the vicinity of Canaan Peak, between South Creek and Black Ridge, and between Birch and Allen Creeks. Smaller areas of mortality occurred in the Boulder Mountain area of King Bench, Boulder Town, and between Pleasant Creek and Oak Creek near Bowns Reservoir.
- Spruce beetle- Most of the mortality occurred in the Escalante Mountains from Powell Point to Escalante Canyon and around Pacer Lake. Smaller pockets of mortality occurred on Sevier Plateau from Mount Dutton to Rocky Ford Creek and on the Aquarius Plateau in Deep Creek, west of Jacobs Reservoir, and in Dark Valley.
- Subalpine fir mortality- Most of the mortality occurred on the Aquarius Plateau between South Point and West Deer Creek. Additional mortality occurred from Jacobs Reservoir to Big Ridge in the Boulder Mountain area and from Clay Creek to Antimony knoll in the Escalante Mountains.
- Western spruce budworm- Heavy defoliation continued in the Horse Valley area above Panguitch Lake. However, most of the heavy defoliation occurred on the Aquarius Plateau adjacent to Pine Creek, in Rock Spring Draw, and around McGrath Lake. A large area of light defoliation occurred at Posy Lake.

GRAND COUNTY

In 2002, 14% of the county was surveyed encompassing the Manti-LaSal National Forest portion of the LaSal Mountains in the southeast corner of the county and the East Tavaputs Plateau from the Uintah County border to Roan Cliffs. In 2003, 25% of the county was surveyed encompassing all of the LaSal Mountains and expanding the 2002 survey east to include the Book Cliffs. In 2004, 7% of the county was surveyed, limited to the LaSal Mountains.

In 2002, insect activity was extremely light. In 2003, insect activity increased primarily affecting pinyon on the East Tavaputs Plateau. Numerous pockets of Douglas-fir and subalpine mortality pockets were mapped in the LaSal Mountains. In 2004, pinyon pine mortality was the most frequently mapped damage in the LaSal Mountains followed by subalpine fir mortality.

GRAND COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Aspen mortality				233		
Douglas-fir beetle	27	13	3,232	1,187	249	79
Fir engraver beetle	100	50	120	48	125	28
Fall cankerworm				464		
Oak mortality						921
Pinyon engraver beetle			46,064	5,834	43,645	8,099
Spruce beetle					40	20
Subalpine fir mortality	1,330	426	3,880	521	900	108

Grand County continued

2002:

- Douglas-fir beetle- Small areas of mortality were mapped within the Fish and Willow Creek drainages on the East Tavaputs Plateau.
- Fir engraver beetle- mortality was mapped in Spring Branch of Castle Creek and in Porcupine Draw in the LaSal Mountains.
- Subalpine fir mortality-occurred in Shuman Gulch, Castle, Bear, and Deep Creeks around the LaSal Mountains and in Pioche Creek on the East Tavaputs Plateau.

2003:

- Aspen mortality- of unknown cause was located between Pace Lake and Taylor Creek in the LaSal Mountains.
- Douglas-fir beetle- Localized mortality in the LaSal Mountains occurred along South Beaver Mesa, from Pinhook Creek to Mary Jane Canyon and south of Pace Lake. On the East Tavaputs Plateau, the largest area of mortality occurred from Pipeline Canyon to Middle Canyon. Additional pockets of mortality occurred in Slough, Tenmile, She, and East Canyons and along Willow and Pioche Creeks.
- Fir engraver beetle- mortality occurred along the Bear and Castle Creek drainages.
- Fall cankerworm- Heavy oak defoliation occurred in East and Middle Canyons on the East Tavaputs plateau.
- Pinyon engraver beetle- Large areas of mortality were reported on Moon Ridge and from Dark Canyon to Bryson Ridge. Smaller areas of mortality were reported in Hill and Willow Creeks on East Tavaputs Plateau. In the LaSal Mountains area, small polygons of mortality were reported from Castle Creek to South Beaver Mesa.
- Subalpine fir mortality- Small pockets of mortality occurred from Schuman Gulch to Bear Creek around the LaSal Mountains. In the East Tavaputs Plateau area, mortality occurred in Hill Creek from Walker Draw to Steer Ridge and at the head of Pioche Creek.

ELYTRODERMA
Elytroderma deformans
Host: ponderosa pine

Elytroderma is the most important needle disease of ponderosa pine in the Pacific Northwest and parts of adjacent regions. Damage varies greatly but the greatest impact is to growth. The most prominent feature of Elytroderma is the reddish brown needles (flags) that appear in the spring fading to yellow. Twigs once flagged usually will flag again each spring and soon curve upward.

2004:

All damage occurred in the LaSal Mountains.

- Douglas-fir beetle- Small pockets of mortality occurred in Pinhook Creek, Sids Draw, and south of Pace Lake.
- Fir engraver beetle- Small pockets of mortality occurred in Fisher Creek and Hideout Canyon.
- Oak mortality-A large area of oak mortality of unknown cause occurred in Bear Creek.
- Pinyon engraver beetle-Large areas of pinyon pine mortality occurred in the lower elevations from Castle Creek to South Beaver Mesa.
- Spruce beetle- Small pockets of mortality occurred in Schuman Gulch and Bear Creek.
- Subalpine fir mortality- Small pockets of mortality occurred from Porcupine Draw to the upper portion of Taylor Creek.

Witches broom in ponderosa pine caused by elytroderma needle cast.

IRON COUNTY

In 2002, 9% of the county was surveyed. The survey area covered the Dixie National Forest east of Parowan from Summit Mountain to Cottonwood Mountain. In 2003, the survey area doubled to 18% including more private and Bureau of Land Management lands. The survey area covered the eastern portion of the county from Kanarra Mountain to Cottonwood Mountain, including the Cedar Breaks National Monument. Additionally it covered the White Rock Mountains side of the county west of Hamlin Valley from the northern border to Etna Mine. In 2004, the survey included 21% of the county incorporating nearly all of the area east of Interstate 15 and a small portion of the White Rock Mountains in the northwest corner of the county.

Generally, insect damage for 2002 was fairly light; most of the mapped mortality was caused by pinyon engraver and western spruce budworm. In 2003, additional pinyon and Douglas-fir mortality was reported and western spruce budworm defoliation increased. In 2004 there was an increase in tree mortality and defoliation caused by insects with the exception of mountain pine beetle associated mortality.

IRON COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	20	10	1,847	760	3,575	936
Fir engraver beetle	260	91	588	309	21,906	4,906
Forest tent caterpillar	- -	- -				260
Mountain pine beetle	30	15	348	160	241	110
Pinyon engraver beetle	2,166	2,166	377,261	31,523	24,820	4,486
Spruce beetle	170	45	1,265	861	4,191	1,916
Subalpine fir mortality	430	86	20	10	160	54
Western spruce budworm	- -	1,829		2,715		6,502

2002:

- Douglas-fir beetle-Two small spots were located in Parowan Canyon.
- Fir engraver beetle-Three small pockets were located in North Fork Threemile Creek, Butler Creek, and Moseman Canyon.
- Mountain pine beetle-One limber pine mortality spot occurred on Navajo Ridge.
- Pinyon engraver beetle- Extensive areas of mortality were observed on BLM land northeast of Paragonah by Willow and Little Creek and on National Forest Land in the Cottonwood Mountain area. Large pockets of mortality were also observed southwest of Parowan on BLM, State and private lands (Maple Spring Hollow and Dalley Canyon).
- Spruce beetle-One polygon of mortality was located in Dalley Canyon and a slightly larger polygon occurred east of State Highway 143 near Navajo Ridge.
- Subalpine fir mortality-One polygon of mortality occurred in Parowan Canyon near Navajo Ridge and two polygons were located in Second Left Hand Canyon.
- Western spruce budworm-Five areas of heavy defoliation were mapped around Horse Valley and two defoliated areas were mapped at Sandy Peak east of Upper Bear Valley. One large area of low defoliation was mapped near Yankee Meadow Reservoir

Iron County continued

2003:

- Douglas-fir beetle-All mortality occurred in the southeast corner of the county. Scattered mortality occurred in the Cedar Mountain area, along Parowan Canyon and along Delong Creek and the North Fork of Threemile Creek.
- Fir engraver beetle-All mortality occurred east of Interstate 15 in two general areas. Mortality was mapped in the Cedar Canyon area between the upper portion of Crow Creek and Pickering Creek with most of the mortality occurring adjacent to Rattlesnake Creek. Other polygons of mortality were mapped in the south side foothills of Upper Bear Valley
- Mountain pine beetle-One limber pine mortality spot occurred north of Kolob Reservoir and two were located near Simpkins Spring. Ponderosa pine mortality occurred at Wood Knoll east of Parowan Canyon and Delong Creek.
- Pinyon engraver beetle-Large areas of mortality were identified on the west side of the county from the Beaver County border to Etne Mine. Several small to large areas of mortality occurred east of Interstate 15 from Cedar Canyon to Cottonwood Canyon.
- Spruce beetle-A large area of mortality occurred near the lava fields north of Navajo Lake. Several smaller areas occurred in Cedar Canyon near Cedar Breaks National Monument and around Black Mountain.
- Western spruce budworm- Most of the heavy defoliation occurred south of Horse Valley and west-southwest of Panguitch Reservoir. One large area of heavy defoliation occurred in the upper portion of Second Left Hand Canyon and another occurred east of the lava fields in the southeast corner of the county.

2004:

- Douglas-fir beetle-Scattered mortality occurred from Cedar Mountain to Yankee Meadow Reservoir.
- Fir engraver beetle-Pockets of mortality were mapped from Sugarloaf Mountain to Red Creek Reservoir with most of the mortality occurring in the Summit Mountain area.
- Forest tent caterpillar-Heavy aspen defoliation occurred east of Houston Mountain and along Bunker Creek.
- Mountain pine beetle-Small pockets of ponderosa pine mortality occurred in Second Left Hand Canyon and on the Markagunt Plateau northwest of the lava fields.
- Pinyon engraver beetle-Large pockets of mortality were mapped along the Hurricane Cliffs from Cedar City to Cottonwood Canyon. Small to medium sized pockets of mortality occurred in the White River Mountains west of Hamlin Valley in the northwest corner of the county.
- Spruce beetle- mortality occurred along Cedar Canyon from the Kane County border to Pickering Creek.
- Western spruce budworm-Large areas of heavy Douglas-fir and subalpine fir defoliation were mapped in the area bounded by Navajo Ridge, Red Creek Reservoir, the eastern county border, and Mammoth Creek.

JUAB COUNTY

The surveys were limited to the eastern portion of the county. In 2002 and 2003, approximately 9% of the county was surveyed including the Canyon Mountains, the Wasatch Range east of Interstate 15 from the Utah County border to Nephi, and the San Pitch Mountains east of State Highway 28 to the Sanpete County border. In 2004, 11% of the county was surveyed with additional acreage flown in the Canyon Mountain area.

During all three years, most of the insect damage reported occurred east of Interstate 15 and State Highway 28. In 2002, spruce beetle and fir engraver caused tree mortality affected the most acreage. Also of note was one large area of forest tent caterpillar defoliation. In 2003, fir engraver and Douglas-fir beetle-caused mortality increased in size and intensity. In 2004, fir engraver beetle-caused tree mortality increased significantly; accounting for most of the mapped tree mortality in the county.

JUAB COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	300	49	754	497	36	18
Fir engraver beetle	721	240	3,183	1,372	19,196	5,764
Forest tent caterpillar		245				
Spruce beetle	2,161	251	800	195	500	97
Subalpine fir mortality			130	66		
Western spruce budworm		30				

2002:

- Douglas-fir beetle-Small areas of mortality occurred in Chriss Canyon and along Little Salt Creek in the southeast corner of the county.
- Fir engraver beetle- mortality occurred in Spring Hollow, Chriss, North and Old Pinery Canyons in the San Pitch Mountains. In the Wasatch Range, mortality was mapped in Salt and North Creek drainages. In the Canyon Mountains, one area of mortality occurred in Cow Canyon.
- Forest tent caterpillar-One large area of heavy aspen defoliation occurred west of Mount Baldy in the Wasatch Range.
- Spruce beetle- mortality occurred from the head of Bradley Canyon to Log Hollow in the San Pitch Mountains.
- Western spruce budworm-Light defoliation occurred above Fountain Green Pole Canyon in the San Pitch Mountains.

2003:

- Douglas-fir beetle- Most of the mortality occurred in Chriss Canyon in the San Pitch Mountains with a couple of mortality polygons in Hardscrabble and Wringer Canyons in the Canyon Mountains.
- Fir engraver beetle-A large concentration of mortality occurred from Chriss Canyon to Magistrate Canyon in the San Pitch Mountains. Additional mortality occurred in Reddick, Suttons, and Old Pinery Canyons; and along Pigeon and Fourmile Creeks. Along the Wasatch Range, mortality was noted in the upper portion of Pole and Red Creeks, along Andrews Creek, and in Pole and Bear Canyons.
- Spruce beetle-Mortality occurred to a lesser extent in the same area of the San Pitch Mountains as reported in 2002. In the Wasatch Range, small areas of mortality occurred in Salt Creek and the Left Fork of Pole Creek drainages.

Juab County 2003 continued

- Subalpine fir mortality- occurred above Willow Creek in the Wasatch Range and in Bradley Canyon and Log Hollow in the San Pitch Mountains.

2004:

- Douglas-fir beetle- Four small pockets of mortality occurred between Hardscrabble and Cow Canyons in the Canyon Mountains.
- Fir engraver beetle- mortality was reported throughout the San Pitch Mountains and the Wasatch Range. In the San Pitch Mountains, the heaviest concentrations of mortality occurred from Chriss Canyon to Magistrate Canyon and from Suttons Canyon to Andrews Spring Canyon. Smaller groups of mortality occurred along Chicken and Fourmile Creeks and in North and Meetinghouse Canyons. In the Wasatch Range from Red Creek to Mount Baldy, large areas of mortality cross the Utah and Sanpete County borders. Additional mortality is located in Salt Creek and Pole Canyon.
- Spruce beetle- Spruce mortality was mapped in the same areas previously reported in the San Pitch Mountains.

KANE COUNTY

In 2002, approximately 3% of the County was surveyed, primarily the Paunsaugunt Plateau area on the Dixie National Forest extending into the northern portion of Bryce Canyon National Park. In 2003 and 2004, the Kolob Terrace in the northwest corner of the county in addition to the Paunsaugunt Plateau was surveyed accounting for approximately 12% of the county.

KANE COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	200	36	2,150	961	4,370	1,521
Douglas-fir tussock moth						24
Elytroderma				7,572		
Fir engraver beetle			1,019	292	112,153	21,079
FTC/Fall Cankerworm						62
Mountain pine beetle	978	455	362	870	2,750	904
Pinyon engraver beetle	20	10	501	72	250	113
Spruce beetle	150	75	850	698	1,746	793
Subalpine fir mortality			2,280	788	400	114
Western spruce budworm				888		62

Paunsagunt Plateau: In 2002, most of the insect damage was mountain pine beetle-caused mortality of ponderosa pine. In 2003, large areas of elytroderma, a foliar disease affecting ponderosa pine, were mapped. Additionally, there was an increase in the number of small Douglas-fir beetle-caused mortality polygons. In 2004, large areas of fir engraver beetle-caused tree mortality and topkill of true firs were reported. Fir engraver beetle has not been active in this area since 1997.

2002:

- Douglas-fir beetle- Tree mortality was mapped on the ridge east of Crawford Creek.
- Mountain pine beetle- mortality of ponderosa pine occurred in several locations from Pink Cliffs northwest to the Right Fork of Upper Kanab Creek.
- Pinyon engraver beetle- scattered mortality was located in Pole Canyon.

Kane County, Paunsagunt Plateau 2002 continued

- Spruce beetle- Spruce mortality was mapped along the East Fork of Sevier River between Mill and Crawford Creeks.

2003:

- Douglas-fir beetle-Scattered polygons of mortality increased from Roundy Canyon on Kanab Creek to Horse Mountain.
- Elytroderma- Heavy needle cast in ponderosa pine occurred along the ridges of the East Fork of Sevier River from Crawford Creek north to the county border.
- Mountain pine beetle- was not identified in this area in 2003.
- Spruce beetle- remained in the same area as reported in 2002.
- Subalpine fir- mortality was located in Robinson Canyon.

2004:

- Douglas-fir beetle- remained static in the same areas mapped in 2002 and 2003.
- Fir engraver beetle-Large areas of five to ten trees per acre of mortality occurred along the East Fork of Sevier River from the northern county border to Swapp Hollow.
- Mountain pine beetle-A few mortality spots were identified in Pole Canyon.
- Spruce beetle- remained static in the same general area reported in 2002 and 2003.
- Subalpine fir- mortality remained static in the same area reported in 2003.

Kolob Terrace: In 2003, large areas of elytroderma needle cast were reported in addition to mountain pine beetle- and spruce beetle-caused mortality and western spruce budworm caused defoliation. In 2004, fir engraver beetle caused significant topkill and tree mortality. Oak mortality of an unknown cause was also mapped.

2003:

- Douglas fir beetle- Small mortality spots were reported in two areas south and east of China Point, and northwest of Stout Canyon.
- Elytroderma- affected most of the ponderosa pine between Swains and Willis Creeks.
- Fir engraver beetle- tree mortality was reported at Pine Knoll in the upper portion of Orderville Gulch.
- Mountain pine beetle- killed approximately 300 ponderosa pine trees in the Strawberry Creek drainage.
- Pinyon engraver beetle- tree mortality occurred in the Clear Creek drainage.
- Spruce beetle-A large area of spruce mortality occurred on the south shore of Navajo Lake.

FIR ENGRAVER BEETLE
Scolytus ventralis
Host: grand fir, subalpine fir

Fir engraver is a major pest of true firs in western forests. It attacks trees three inches in diameter at breast height and larger. Tree stress due to drought, disease, and defoliation may incite outbreaks, causing severe tree mortality. Fir engraver beetle is often associated with other forest pests such as Douglas-fir tussock moth, spruce budworm, bark beetles, woodborers, and fomes annosus root disease.

Fir engraver beetle caused damage.

Kane County, Kolob Terrace 2003 continued

- Subalpine fir mortality- was mapped in two areas, the upper portion of the North Fork of Virgin River and the Left Fork of Lydias Canyon.
- Western spruce budworm- defoliation occurred in two areas, between the south shore of Navajo Lake and Pink Cliffs and on the Pink Cliffs south of Swains Creek.

2004:

- Douglas-fir beetle- tree mortality occurred between the North Fork of Virgin Creek and Chokecherry Spring and west of Stout Canyon.
- Douglas-fir tussock moth- Heavy defoliation occurred in Orderville Canyon on the western county border.
- Forest tent caterpillar/Fall cankerworm- Heavy oak defoliation occurred in Corral Canyon.
- Fir engraver beetle- tree mortality was mapped from the North Fork of Virgin Creek east to Stout Canyon with the largest areas occurring in Strawberry and Swains Creeks and Ashdown Canyon.
- Mountain pine beetle- tree mortality occurred near Duck Lake on the northern county border.
- Oak mortality- Most of the tree mortality occurred between Bulloch Canyon and Muddy Creek with additional mortality in Seaman Canyon. The cause of the mortality is unknown.
- Pinyon engraver beetle-Small pockets of tree mortality were reported in Orderville Gulch.
- Spruce beetle- tree mortality was mapped on the north and south shore of Navajo Lake.
- Western spruce budworm-One area of heavy defoliation occurred on the east side of State Highway 14 at the northern county border.

MILLARD COUNTY

The surveys were limited to the eastern portion of the county. In 2002 and 2003, approximately 9% of the county was surveyed encompassing the Pahvant Range and the Canyon Mountains. In 2004, 12% of the county was surveyed extending the 2002/2003 areas east and west into private and Bureau of Land Management lands

In 2002, scattered insect-caused tree damage occurred throughout the surveyed area; most of the damage was Douglas-fir and subalpine fir mortality. In 2003, scattered tree mortality continued throughout the surveyed area. Douglas-fir mortality remained constant; however, fir engraver and pinyon engraver beetle-caused tree mortality increased. In 2004, damage remained scattered; Douglas-fir mortality polygons were smaller with fewer trees affected but fir engraver beetle-caused tree mortality and topkill increased in both size and intensity.

MILLARD COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	1,320	611	1,344	627	824	397
Fir engraver beetle	127	63	1,180	403	4,268	1,822
Mountain pine beetle	250	113				
Pinyon engraver beetle	40	20	1,891	387		
Spruce beetle			87	45	35	17
Subalpine fir mortality	540	153			112	56
Western spruce budworm				33		

Millard County continued

2002:

- Douglas-fir beetle- mortality occurred in the Pahvant Range east of Fillmore from Corn Creek to Noon Rock Peak south of Scipio with concentrations of mortality occurring in the tributaries of Corn Creek, South Fork Chalk Creek, and Raspberry Canyon. In the Canyon Mountains, tree mortality was mapped between Oak and Whiskey Creeks.
- Fir engraver beetle-One small area of mortality was found in the upper portion of Oak Creek in the Canyon Mountains. Two small areas of mortality occurred in Walker and Pine Creeks in the Pahvant Range.
- Mountain pine beetle- Most of the limber pine mortality occurred in the Pahvant Range between Holden and Round Valley with one 15 acre, 30 tree spot located in Hell Hole Canyon.
- Pinyon engraver beetle- In the Canyon Mountains, two small areas of mortality occurred just south of Blue Mountain.
- Subalpine fir mortality- Pockets of mortality occurred in the Pahvant Range along Cummings Creek, the North Fork of Meadow Creek, and Willow Creek.

2003:

- Douglas-fir beetle- In the Pahvant Range, scattered mortality occurred from Corn Creek to Noon Rock Peak. In the Canyon Mountains, one pocket of tree mortality was mapped in both John Williams Canyon and along Dry Creek.
- Fir engraver beetle- In the Pahvant Range, scattered pockets of tree mortality occurred in Cottonwood, North Fork Chalk, Pharo, and Pioneer Creek drainages, and between Leavitts Canyon and Pine Creek. In the Canyon Mountains, tree mortality occurred along Dry Creek and Eightmile Canyon.
- Pinyon engraver beetle-A large area of tree mortality was observed in Cove Creek on the Beaver/Millard County boundary in the Pahvant Range and a small pocket occurred in Little Long Canyon in the Canyon Mountains.
- Spruce beetle-Three areas of mortality were mapped in the vicinity of Coffee Peak in the Pahvant Range.
- Western spruce budworm-One area of light defoliation occurred in Robins Valley in the Pahvant Range.

2004:

- Douglas-fir beetle- In the Pahvant Range, small, scattered pockets of mortality were mapped from the North Fork of Corn Creek to Noon Rock Peak. In the Canyon Mountains, small, scattered pockets of tree mortality were mapped between Whiskey and Oak Creeks.
- Fir engraver beetle- Most of the tree mortality occurred as large pockets between Sunset and Wild Goose Canyons in the Pahvant Range. Additional tree mortality occurred in Cove and Cummings Creek drainagess. In the Canyon Mountains, one pocket of mortality occurred in Dry Creek.
- Spruce beetle-Four small pockets of tree mortality occurred in the Pahvant Range near Joseph and Coffee Peaks, in Pioneer and Wild Goose Canyons.
- Subalpine fir mortality- Most of the tree mortality occurred along the North Fork of Chalk Creek with a small pocket of mortality in the upper portion of Maples Hollow.

MORGAN COUNTY

In 2002, nearly 18% of the county was surveyed, primarily the Wasatch Range from Interstate 84 south to East Canyon. In 2003, 20% of the county was surveyed expanding into the Cottonwood Canyon area east of Ogden. In 2004, the survey area expanded to 39% of the county including the north side of Lost Creek.

In 2002, insect damage was relatively light with fir engraver beetle-caused and subalpine fir mortality comprising most of the insect damage. In 2003, very few areas were affected but the affected areas were larger in size. In 2004, fir engraver beetle-caused tree mortality and topkill was very heavy at the junction of Morgan, Salt Lake and Summit Counties. Large areas of subalpine fir mortality were mapped along the tributaries of Lost Creek.

MORGAN COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Aspen mortality			95	47		
Fir engraver beetle	493	228	350	63	10,562	1,067
Spruce beetle	130	86				
Subalpine fir mortality	360	87	400	89	3,534	630

2002:

- Fir engraver beetle- Most of the tree mortality occurred from Monument Creek to the Morgan/ Summit County border east of Big Mountain Pass. One pocket of mortality occurred in Hardscrabble Creek.
- Spruce beetle-Two small areas of tree mortality occurred in Hardscrabble Creek.
- Subalpine fir mortality- occurred in Farrells and Deep Creek drainages and Boiler Hollow.

2003:

- Aspen mortality-One area of tree mortality was mapped in Quaking Aspen Creek east of Big Mountain Pass.
- Fir engraver beetle-Two pockets of tree mortality occurred between Little Emigration Canyon and the Summit County border east of Big Mountain Pass.
- Subalpine fir mortality-Four areas of tree mortality occurred south of Cottonwood Creek between Bybee Creek and Durst Mountain.

2004:

- Fir engraver beetle-Most of the tree mortality adjoins tree mortality occurring in Summit and Salt Lake Counties from the Summit County border north to Little Dutch Hollow. Additional mortality occurred along the Right Hand Fork of Sheep Canyon, Hardscrabble Creek, and northeast of Big Mahogany Mountain.
- Subalpine fir mortality- Most of the tree mortality occurred along tributaries of Lost Creek from Blue Ridge to Rocky Canyon. One pocket of tree mortality was mapped in Sheep Canyon.

PIUTE COUNTY

In 2002, 51% of the county was surveyed encompassing the Tushar Mountains, most of the Sevier Plateau, and the northern portion of the Awapa Plateau. In 2003, 59% of the county was surveyed including all of the Sevier Plateau and the Tushar Mountains. In 2004, 65% of the county was surveyed which included all of the Tushar Mountains, most of Marysvale Valley and Sevier Plateau but omitting the northeastern edge of the Sevier Plateau from Pine Canyon to the South Fork of Greenwich Creek.

In 2002, insect damage was scattered throughout the Tushar Mountains and the northern portion of the Sevier Plateau. In 2003, insect damage intensity increased in both the Tushar Mountains and the Sevier Plateau. Additional survey acreage for old and new pinyon mortality identified large areas of tree mortality in the southern portion of the county. In 2004, insect activity remained high. Only new areas of pinyon mortality were mapped resulting in a reported decrease in pinyon engraver beetle-caused mortality.

PIUTE COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Aspen mortality				26		
Douglas-fir beetle	110	55	1,705	785	4,432	790
Fir engraver beetle	1,051	464	608	395	2,623	1,002
Forest tent caterpillar				21		38
Mountain pine beetle					50	25
Pinyon engraver beetle	20	10	35,596	7,179	8,642	1,792
Spruce beetle			97	48	260	88
Subalpine fir mortality	12,709	1,491	5,890	1,534	6,200	2,177
Western spruce budworm		1,084		1,349		604

2002:

- Douglas-fir beetle- Four small areas of mortality were scattered in the Tushar Mountains in Trail and Oak Basin Canyons, and Cottonwood Creek.
- Fir engraver beetle- tree mortality was scattered throughout the Tushar Mountains with concentrated mortality occurring northeast of Chokecherry Peak and north of Little Shelly Baldy Peak.
- Pinyon engraver beetle-One small pocket was identified between the Garfield County boundary and the East Fork of Sevier River.
- Subalpine fir mortality- In the Tushar Mountains, scattered mortality occurred from City Creek Peak north to the junction of Beaver, Sevier, and Piute Counties. On the Sevier Plateau, two large areas of tree mortality were mapped in Manning Creek and a small pocket was mapped in Tabadore Canyon.
- Western spruce budworm-Two large areas of light defoliation occurred in the South Fork of Box Creek.

2003:

- Aspen mortality-One area of defoliation occurred east of Manning Meadow Reservoir near McCardy Spring.
- Douglas-fir beetle- Most of the mortality was scattered throughout the Tushar Mountains (1,231 trees across 549 acres). Additional mortality occurred on the Sevier Plateau at Table Mountain, along Dry Creek and around the Box Creek Reservoirs.

Piute County 2003 continued

- Fir engraver beetle- In the Tushar Mountains, pockets of tree mortality occurred in Picnic, Fish, Beaver, Pine Creek drainages, Gold Gulch and Cougar Ridge. On the Sevier Plateau, mortality was mapped in Straight, Hell Hole, Pole, and Dead Horse Canyons, and along Dry Creek.
- Forest tent caterpillar-One spot of light defoliation occurred east of Manning Meadow Reservoir.
- Pinyon engraver beetle- In the Tushar Mountains, three large areas of tree mortality occurred in the foothills west of Piute Reservoir with two smaller areas in Beaver and Cottonwood Creeks. On the Sevier Plateau, most of the mortality occurred between Hell Hole and Kingston Canyons.
- Spruce beetle- mortality occurred on the Sevier Plateau west of Manning Meadow Reservoir.
- Subalpine fir mortality- Scattered tree mortality occurred in the northern portion of the county. In the Tushar Mountains mortality occurred from Gold Gulch to the Sevier County border. On the Sevier Plateau tree mortality occurred from Tibadore Canyon to the Sevier County border.
- Western spruce budworm-One area of heavy defoliation occurred along Cottonwood Creek in the Tushar Mountains. The remaining defoliation occurred on the Sevier Plateau between Dry Creek (heavy defoliation) and the Sevier County border in the Box Creek area (light defoliation).

2004:

- Douglas-fir beetle- tree mortality was scattered throughout the Tushar Mountains and the northern section of the Sevier Plateau from Dry Creek to the Sevier County border.
- Fir engraver beetle- In the Tushar Mountains tree mortality was mapped from the South Fork of City Creek to the Sevier County border. On the Sevier Plateau, tree mortality was mapped along Rocky Ford Creek at the Garfield County border and between Dry Creek and Tibadore Canyon.
- Forest tent caterpillar- Heavy aspen defoliation occurred on Table Mountain at the Garfield County border.
- Mountain pine beetle-One pocket of limber pine mortality occurred at Gold Mountain in the Tushar Mountains.

FOREST TENT CATERPILLAR
Malacosoma disstria
Hosts: Gambel oak, aspen, willow

The forest tent caterpillar is the most widely distributed and destructive tent caterpillar in North America. Trembling aspen is the caterpillar's preferred host, but it will attack a wide range of deciduous trees and shrubs. Larvae feed without building tents and when not feeding form clusters on leaves, branches or trunks. Outbreaks usually last only two to three years in western states and may cover up to 200 square miles. Repeated defoliation and other stress factors may reduce growth rates, kill trees, or predispose them to other diseases or insect pests.

Forest tent caterpillar cluster on aspen.

Piute County 2004 continued

- Pinyon engraver beetle-New mortality was identified on the east side of the Tushar Mountains from Oak Basin Canyon to Deer Creek. Additional new tree mortality occurred between Kingston Canyon and the Garfield County border and between Manning and Dry Creeks on the Sevier Plateau.
- Spruce beetle- mortality occurred on the Sevier Plateau west of Manning Meadow Reservoir and at Rocky Ford Creek and Coats Hollow near the Garfield County border.
- Subalpine fir mortality- In the Tushar Mountains, mortality occurred between Deer Trail Mountain and Joe Lott Creek. In the Sevier Mountains, mortality occurred from Tibadore Canyon to Manning Meadow Reservoir.
- Western spruce budworm- Light defoliation occurred in Cottonwood Creek in the Tushar Mountains and heavy defoliation occurred in Straight Canyon on the Sevier Plateau.

RICH COUNTY

Only a minimal portion of Rich County was surveyed in 2002. In 2003, the eastern edge of the Wasatch Range (5% of the county) was surveyed from New Canyon to the Idaho border. In 2004, the eastern edge of the Wasatch Range was again surveyed (12% of the county) from Woodruff Creek to the Idaho border.

In 2003, insect activity was very light but in 2004, insect damage increased significantly in the area surveyed.

RICH COUNTY	2003		2004	
	Trees	Acres	Trees	Acres
Douglas-fir beetle			505	141
Forest tent caterpillar		41		139
Mountain pine beetle	13	3	622	121
Spruce beetle			150	40
Subalpine fir mortality	310	127	4,239	1,010

2003:

- Forest tent caterpillar-one area of aspen defoliation occurred in Temple Canyon near Meadowville.
- Mountain pine beetle-Two small areas of mortality were mapped in Garden City Canyon along the Cache County border.
- Subalpine fir mortality- Most of the tree mortality occurred along the Cache County border between Hodges and Garden City Canyons. One pocket of tree mortality occurred in Jebo Canyon and another pocket was mapped in the Swan Creek drainage.

2004:

- Douglas-fir beetle- tree mortality occurred at Eccles Peak, in New and Sugar Pine Canyons and Road Hollow.
- Forest tent caterpillar-One area of heavy defoliation occurred along Cherry Creek.
- Mountain pine beetle- Lodgepole pine mortality occurred in the Richardson and Otter Creek drainages and Temple Canyon.

Rich County 2004 continued

- Spruce beetle- mortality was mapped along Woodruff Creek and the Big Spring Fork of Woodruff Creek.
- Subalpine fir mortality- Most of the tree mortality occurred between Cottonwood and New Canyons. Additional mortality was identified in Slideout, Edgar, Sawmill Canyons and Dip, Road Hollow and along the Cache County border.

SALT LAKE COUNTY

In 2002, less than 1% of the county was surveyed along the Summit County border. In 2003 and 2004 the Wasatch Range was surveyed, approximately 30% of the county.

In 2003, subalpine fir mortality was the most significant; although, fir engraver beetle-caused tree mortality and topkill was increasing in select areas. In 2004, all insect caused damage increased especially fir engraver beetle caused damage, which increased dramatically along the Summit County border. In 2004, subalpine fir mortality doubled.

SALT LAKE COUNTY	2003		2004	
	Trees	Acres	Trees	Acres
Douglas-fir beetle	80	40	870	190
Fir engraver beetle	410	146	12,844	1,842
Forest tent caterpillar		120		54
Mountain pine beetle	20	10	80	40
Spruce beetle			250	77
Subalpine fir mortality	2,334	443	4,776	799
Wind throw		108		

2003:

- Douglas-fir beetle-Four small areas of damage occurred on Mount Raymond, in Bells Canyon and west of Twin Peaks.
- Fir engraver beetle- fir mortality occurred in Little Cottonwood and Deaf Smith Canyons and along Big Willow Creek near Lone Peak Wilderness.
- Forest tent caterpillar- Heavy cottonwood defoliation occurred in Cottonwood Canyon near Coalpit Gulch.
- Mountain pine beetle-One small area of limber pine mortality was located east of Brighton Ski Resort.
- Subalpine fir mortality- Most of the subalpine fir mortality occurred in the southeast corner of the county from White Pine Fork of Little Cottonwood Canyon to Mill Creek Canyon. An additional pocket was mapped along City Creek.
- Wind throw- a micro-burst of wind caused mixed conifers to fall down or snap in Bells Canyon and Little Cottonwood Canyon east of Mineral Fork. Aerial surveyors observed no signs of subsequent insect activity as a result of the blowdown.

2004:

- Douglas-fir beetle-Scattered pockets of tree mortality were mapped between Mill Creek and Big Cottonwood Canyons.

Salt Lake County 2004 continued

- Fir engraver beetle-Large areas of tree mortality were mapped along the Summit/Morgan County borders. Additional pockets of mortality were mapped in Lambs Canyon and along the west side of the Wasatch Range from Little Willow Creek to Mount Olympus with larger pockets of tree mortality occurring in Little Cottonwood Canyon.
- Forest tent caterpillar- Heavy aspen defoliation occurred in the North Fork of Mill D in Big Cottonwood Canyon and in Mill Creek southwest of Mount Aire.
- Mountain pine beetle-Two small pockets of limber pine mortality occurred east of Brighton Ski Resort.
- Spruce beetle- spruce mortality occurred in the upper portion of Mill Creek Canyon and at Brighton Ski Resort.
- Subalpine fir mortality- Most of the tree mortality occurred on the east side of the Wasatch Range from the Utah County border to Lambs Canyon. Additional pockets of mortality occurred in Tolcats and Bear Canyons and at Lookout Peak

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SAN JUAN COUNTY

In 2002, 10% of the County was surveyed primarily on the Manti-LaSal National Forest. In 2003, the survey area was expanded to 20% of the county to capture pinyon mortality occurring east and southwest of Blanding. In 2004, 11% of the county was surveyed in the same general area as the 2002 survey with the addition of the Dark Canyon Wilderness area.

In 2002, insect damage, primarily subalpine fir tree mortality, was scattered throughout the LaSal Mountains with larger pockets of mortality in the Abajo Mountains. In 2003, scattered insect damage continued throughout the LaSal Mountains. The intensive survey of the pinyon-juniper component resulted in large areas of old and new mortality mapped in the lower elevations north and east of Blanding. Other insect damage remained static in the Abajo Mountains. In 2004, new pinyon mortality was mapped over large areas north of Blanding and other insect damage increased in intensity throughout all surveyed areas.

SAN JUAN COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	440	219	2,740	1,113	2,049	411
Fir engraver beetle	200	31	100	50	4,010	1,104
Forest tent caterpillar		64				193
Mountain pine beetle	454	191	341	169	528	151
Oak mortality						1,112
Pinyon engraver beetle			534,622	78,650	238,335	32,945
Spruce beetle	310	82	61	31	408	143
Subalpine fir mortality	8,832	1,463	5,251	1,336	5,001	967

2002:

- Douglas-fir beetle-Scattered tree mortality occurred on the Monticello Ranger District (RD), the largest concentration occurred around Horse Mountain. Additional pockets of mortality were reported in Tuerto and Shay Canyons.
- Fir engraver beetle-One area of mortality occurred along North Creek on the Monticello RD.

San Juan County 2002 continued

- Forest tent caterpillar- Small, scattered pockets of heavy aspen defoliation were observed on North Elk Ridge, Reef of Rocks, and along Blue Creek.
- Mountain pine beetle-A cluster of small pockets of ponderosa pine mortality occurred between Beaver and Hang Dog Creeks on the Moab RD. Additional pockets of tree mortality occurred at Horse Mountain and North Elk Ridge on the Monticello RD.
- Spruce beetle- spruce mortality was mapped between North and Abajo Peaks on the Monticello RD. Two small pockets of tree mortality occurred at LaSal Pass and east of Mount Mellenthin.
- Subalpine fir mortality- Most of the tree mortality was clustered in the Abajo Mountains. Scattered pockets of mortality occurred on the Moab RD and the LaSal Mountain State Forest.

2003:

- Douglas-fir beetle- Most of the scattered pockets of mortality occurred on the Monticello RD. In the Abajo Mountains tree mortality occurred on Duckett Ridge, Tureto Canyon, Shay Ridge, Shay Mountain, and North Canyon. Tree mortality also occurred along South Elk Ridge, North Long Point, and around Horse and Round Mountains. On the Moab RD, tree mortality occurred in the vicinity of South Mountain.
- Fir engraver beetle-Three small pockets of tree mortality occurred on the Moab RD in the LaSal and Geyser Creek drainages.
- Mountain pine beetle- On the Moab RD, scattered ponderosa pine mortality occurred from Doe Canyon to Hop Creek. On the Monticello RD, small clusters of ponderosa pine mortality spots were mapped east of Mount Peale and east of South Peak; one pocket of tree mortality occurred at Kigalia Point and another near Seven Sisters Butte.

MOUNTAIN PINE BEETLE
Dendroctonus ponderosae
Hosts: limber, lodgepole and ponderosa pine

A destructive forest insect capable of killing trees on a landscape level, mountain pine beetle kills thousands of trees a year during outbreak conditions, and millions of trees during extended epidemic periods in western forests. At endemic levels, mountain pine beetle will favor weakened, less vigorous trees to attack. During epidemics, trees down to 4 inches diameter at breast height may be attacked. Large forest landscapes may be altered, causing a pine forest ecosystem to revert to grass and shrub landscapes for a period of 10-20 years. Wildlife species, composition, and distribution may change, water yields in drainages may increase, and dead trees left after epidemics may serve as a fuel source for wildfires.

Lodgepole pine mortality caused by mountain pine beetle. D.Powell, USFS

San Juan County 2003 continued

- Pinyon engraver beetle-All of the tree mortality was mapped in a swath around Blanding from Cedar Mesa east to the Colorado border and north to Chippean Canyon.
- Spruce beetle- spruce mortality occurred on the Monticello RD east of Horsehead Peak and on the Moab RD north of South Mountain.
- Subalpine fir mortality- Most of the tree mortality was again clustered in the Abajo Mountains on the Monticello RD and around the LaSal Mountains on the Moab RD.

2004:

- Douglas-fir beetle- All of the tree mortality was mapped on the Monticello RD at Short and North Long Points, Abajo, Horse and Round Mountains, and in Tuerto Canyon.
- Fir engraver beetle- tree mortality occurred along the eastern edge of the Dark Canyon Wilderness from Arch Canyon to Seven Sisters Buttes. Additional tree mortality occurred in Tuerto Canyon and north of Shay Mountain. On the Moab RD, most of the tree mortality occurred around South Mountain.
- Forest tent caterpillar- Heavy aspen defoliation occurred between Trough and Tuerto Canyons on the Monticello RD. Most of the defoliation occurred on the Moab RD at South Mountain and along Geyser Creek near Pine Flat.
- Mountain pine beetle-A few pockets of ponderosa pine mortality occurred along the east edge of Dark Canyon Wilderness from Texas Canyon to Horse Mountain on the Monticello RD. Additional mortality occurred along Beaver Creek on the Moab RD.
- Oak mortality- three large areas of oak mortality occurred in Trough Canyon, North Creek and Clay Draw on the Monticello; cause of the mortality is unknown.
- Pinyon engraver beetle- large areas of new tree mortality occurred between Bullipup Canyon and Brushy Basin. Additional mortality was mapped from Woodenshoe Buttes to Little Baullie Mesa and from Hop Creek to Bridge Canyon on the Monticello RD. Another extremely large area of tree mortality occurred on Black Ridge on the Moab RD. Additional large areas of mortality occurred from Pine Ridge to LaSal.
- Spruce beetle-Two small pockets of spruce mortality were mapped in the Abajo Mountains at North and Twin Peaks on the Monticello RD. A larger area of mortality occurred in Geyser Pass on the Moab RD. Additional pockets of spruce mortality occurred at the head of Brumley and Pack Creeks.
- Subalpine fir mortality-Two large areas of fir mortality were mapped at North Peak in the Abajo Mountains. Additional tree mortality occurred throughout the Abajo Mountains on the Monticello RD. On the Moab RD, mortality was mapped around the LaSal Mountains.

SANPETE COUNTY

In 2002, 56% of the county was surveyed encompassing the Wasatch Plateau and the San Pitch Mountains from Dry Creek north. In 2003, 62% of the county was surveyed including all of the San Pitch Mountains. In 2004, 86% of the county was surveyed adding additional acreage in the Sanpete Valley.

In 2002, spruce beetle-caused tree mortality decreased following 2001 when over 100,000 trees died across 32,000 acres. Most other mortality agents decreased except for pinyon engraver beetle, which increased as a result of increased aerial survey acreage in the pinyon-juniper component. Western spruce budworm caused tree defoliation also increased. In 2003, spruce beetle-caused tree mortality

Sanpete County continued

affected almost 11,000 acres. Mortality caused by other insects/diseases also increased. In 2004, spruce beetle- and fir engraver beetle- caused tree mortality was prevalent within the county. Mortality by other damage agents increased slightly.

SANPETE COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	360	111	1,258	511	2,359	869
Fir engraver beetle	1,551	638	5,422	2,921	44,494	12,598
Forest tent caterpillar				294		379
Mountain pine beetle	180	90	131	66	400	169
Pinyon engraver beetle	3,270	1,099	5,182	1,084	892	178
Spruce beetle	61,038	12,374	56,383	10,782	23,491	5,908
Subalpine fir mortality	2,210	638	1,470	490	5,276	1,317
Western spruce budworm		964		852		509

2002:

- Douglas-fir beetle-Most of the mortality occurred in the southeast corner of the county along the South Fork of Muddy Creek; additional tree mortality occurred in New Canyon and in the Oak Creek drainage.
- Fir engraver beetle-Most of the tree mortality occurred on the Wasatch Plateau, the largest concentration occurred between Manti and Funk Canyons. Additional tree mortality occurred in Pole and Little Eccles Canyons, and in the following drainages: South Fork of Muddy Creek, North Fork of North Creek, Oak, Clear and Dry Creeks. In the San Pitch Mountains, tree mortality was noted in Maple and the Left Hand Fork of Axehandle Canyons.
- Mountain pine beetle- All limber pine mortality was located on the Wasatch Plateau. Most of the mortality occurred between Ferron Mountain and Flagstaff Peak. Additional tree mortality occurred at Julius Flat Reservoir, along Wagon Road Ridge and another pocket of tree mortality was mapped on Oak Creek Ridge.
- Pinyon engraver beetle-The largest areas of tree mortality occurred east of Black Hawk. Small pockets of mortality were detected in Olsen Canyon in the Mayfield State Wildlife Management Area, and in Sixmile and Chris Canyons.
- Spruce beetle-Large areas of spruce mortality were mapped from Haystack Mountain to Rolfson Reservoir on the Wasatch Plateau.
- Subalpine fir mortality-Scattered fir mortality was concentrated between Fairview Canyon and the Utah County border and to a lesser extent, in the area bounded by Sixmile Canyon, the Sevier and Emery County boundaries and Marys Nipple.
- Western spruce budworm- areas of scattered light defoliation were mapped east of Sanpete Valley from Pleasant Creek to North San Pitch Canyon.

2003:

- Douglas-fir beetle-Small pockets of tree mortality were scattered throughout the southern half of the Wasatch Plateau from the Sevier County boundary to Black Canyon. Douglas-fir mortality was also scattered through the eastern portion of the San Pitch Mountains from Dry Fork of Hells Kitchen Canyon to Log Hollow. Most of the tree mortality was mapped in Juab County at the head of Chriss Canyon.

PINYON ENGRAVER BEETLE
Ips confusus
Host: pinyon pine species

Pinyon engraver beetle is presenting an increasing problem in the pinyon pine forest ecosystem often affecting valuable home landscape trees. Continued drought conditions increases tree stress, which causes trees to become more susceptible to beetle attack. The rapid spread rate of an infestation can be attributed to the insect's ability to produce 2-4 generations per year.

- Fir engraver beetle-Large areas of tree mortality/topkill were mapped in Sixmile and Manti Canyons. Additional tree mortality/topkill occurred in scattered pockets along the west side of the Wasatch Plateau. Smaller areas of tree mortality/topkill were mapped in the San Pitch Mountains from Timber Canyon to Maple Canyon.
- Forest tent caterpillar-Heavy aspen defoliation was mapped between French and Gooseberry Creek in the northeast corner of the county.
- Mountain pine beetle- Ten small pockets of scattered limber pine mortality occurred along the east side of the Wasatch Plateau from the Sevier County line north to Littles Creek.
- Pinyon engraver beetle-Large areas of tree mortality occurred between Antelope Valley and Mellor Canyon in the San Pitch Mountains. Tree mortality was also mapped in Rock Canyon and on the Wasatch Plateau, small areas of tree mortality occurred in North Hollow, Chris Canyon, and along Pigeon Creek.
- Spruce beetle-The heaviest concentration of spruce mortality occurred between Horseshoe Flat and Huntington Reservoir on the Wasatch Plateau. Scattered mortality was mapped north and south of that area. Spruce mortality also occurred in the San Pitch Mountains in the Spencer Canyon area along the Utah County border.
- Subalpine fir mortality-Most of the mortality occurred between Fairview Canyon and the Utah County border on the Wasatch Plateau, most notably in the Gooseberry Creek drainage.
- Western spruce budworm- Heavy subalpine fir defoliation occurred between Johnson Ridge and Cabin Hollow. Light defoliation occurred along the Upper Huntington Creek drainage crossing into Carbon County and in the North Fork of Birch Creek drainage.

Pinyon engraver beetle-caused mortality of pinyon pine.

Sanpete County continued

2004:

- Douglas-fir beetle-Two large areas of Douglas-fir mortality were mapped in the South Fork of Muddy Creek drainage. Other mortality was scattered throughout the southern half of the Wasatch Plateau from Oak Creek to the Sevier County border. Additional pockets of mortality were mapped in the San Pitch Mountains from Timber Canyon to Axehandle Canyon and from Fountain Green Pole Canyon to Log Hollow.
- Fir engraver beetle- fir mortality occurred from the Sevier to Utah County borders along the west side of the Wasatch Plateau. The heaviest concentrations occurred between Chris and Canal Canyons. Large areas of mortality also occurred in the San Pitch Mountains from Timber Canyon to Magistrate Canyon, an extension of the mortality occurring in Juab County. Tree mortality was also observed at the junction of Utah, Sanpete and Juab County borders and between Reddik and North Canyons.
- Forest tent caterpillar-Heavy aspen defoliation occurred between Huntington Reservoir and Fish Creek along the Emery and Carbon County borders.
- Mountain pine beetle-Limber pine mortality continued between Ferron Mountain and Flagstaff Peak and from Little Bear Creek to Olsen Bench in the southeast corner of the county.
- Pinyon engraver beetle-One pocket of new mortality was noted at Black Hawk.
- Spruce beetle-The large areas of mortality continue to shift north from Black Canyon to Boulger Canyon. Smaller pockets of spruce mortality continue north to the Utah County border. Additional mortality was mapped between Little Bear Creek and Wagon Road Ridge, around Hay Stack and Heliotrope Mountains, and in Grizzly Gulch.
- Subalpine fir mortality- was scattered throughout the Wasatch Plateau, the heaviest mortality was mapped between Pleasant Creek and the Utah County border.
- Western spruce budworm- Heavy subalpine fir defoliation occurred north of Lower Gooseberry reservoir.

SEVIER COUNTY

In 2002 and 2003, 72% of the county was surveyed encompassing nearly all forested land except for the Kings Meadow Canyon area on the Sevier Plateau east of Glenwood. In 2004, 89% of the county was surveyed including King Meadow Canyon and Limestone Cliffs in the southeast corner of the county.

In 2002, subalpine fir and spruce mortality was noticeable on the Sevier Plateau and Douglas-fir mortality was observed in the Pahvant Range. In 2003, large areas of western spruce budworm defoliation were mapped with subalpine fir mortality continuing on the Sevier Plateau. As a result of an intensive aerial survey of the pinyon-juniper component, old and new pinyon mortality was reported in the Tushar Mountains. Fir engraver beetle-caused tree mortality and topkill increased east of Salina, spruce mortality increased around Mount Terrill and Douglas-fir mortality was scattered throughout the county. In 2004, fir engraver beetle-caused tree mortality and topkill increased significantly east of Salina. Subalpine fir and Douglas-fir mortality was high in the vicinity of Fish Lake. Spruce mortality also increased around Mount Terrill.

Sevier County continued

SEVIER COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle	1,168	514	3,763	1,741	2,971	828
Fir engraver beetle	437	220	1,881	948	20,298	4,555
Forest tent caterpillar		32		152		
Mountain pine beetle	50	25			401	92
Pinyon engraver beetle	2,119	702	16,716	3,694	799	160
Spruce beetle	12,473	2,972	4,321	1,749	8,266	3,454
Subalpine fir mortality	38,393	5,455	17,933	4,142	14,772	5,198
Western spruce budworm		180		1,165		1,116
Windthrow				76		

2002:

- Douglas-fir beetle- Most of the mortality occurred in the Pahvant Range west of Richfield from Cottonwood Creek to North Cedar Ridge Canyon. A few scattered mortality pockets were found in North Water Hollow, Water Hollow Ridge, Groens Hollow, along Clear Creek, West Tidwell Canyon, and in the Thompson Creek drainage on the Sevier Plateau.
- Fir engraver beetle- mortality occurred at Steves Mountain and Water Hollow north of Interstate 70 and between Rock and Squeedunk Canyons on the Sevier Plateau.
- Forest tent caterpillar-One area of heavy aspen defoliation occurred west of Fish Lake.
- Mountain pine beetle-One pocket of ponderosa pine mortality was found along Cowboy Creek. One pocket of limber pine mortality was located near White Mountain.
- Pinyon engraver beetle-Along the I-70 corridor east of Salina, numerous pockets of pinyon mortality were mapped on Cedar Mountain, Water Hollow, and along Salina and Gooseberry Creeks. Additional tree mortality occurred on the Pahvant Range along Cottonwood Creek and Dry and Oak Spring Hollows; and, along Mill Creek in the Tushar Mountains.
- Spruce beetle-Large areas of spruce mortality were recorded between Glennwood Mountain and Monument Peak, and around Mount Terrill on the Sevier Plateau. Additional spruce mortality occurred along Tusha Creek and northwest of Fish Lake.
- Subalpine fir mortality-Large areas of fir mortality were mapped across the southern part of the county from Monroe Creek to Geyser Peak. The heaviest concentrations of tree mortality were mapped near Monument Peak, around Fish Lake and at Geyser Peak. Another large area of tree mortality occurred in the Tushar Mountains by Shingle Creek Meadow.
- Western spruce budworm-Heavy defoliation was mapped on the north side of Monroe Peak.

2003:

- Douglas-fir beetle- mortality was scattered throughout the county but concentrations of tree mortality were mapped in the Pahvant Range between Cottonwood Creek and North Cedar Ridge Canyon, around Fish Lake on the Sevier Plateau and on Old Woman Plateau. Additional tree mortality occurred in the Clear, Koosharem and Thompson Creek drainages, in Rock Hollow and at Geyser Peak.
- Fir engraver beetle-Along Interstate 70, fir mortality occurred in Dead Horse and Catamount Canyons, around Steves Mountain, along West Beaver Creek, and on Water Hollow Ridge. Tree mortality also occurred along Fish Creek in the Tushar Mountains, in Dry Canyon on the Sevier Plateau, and between Cedar Ridge and North Cedar Ridge Canyons on the Pahvant Range.
- Forest tent caterpillar-Heavy aspen defoliation occurred in the Doxford Creek drainage near Glennwood Mountain and along Blackham Creek near Sheep Valley Reservoir.

Sevier County 2003 continued

- Pinyon engraver beetle-Large areas of tree mortality were reported in the Tushar Mountains from Shingle Creek to Lott Creek and in the southern Pahvant Range from Whiskey Spring Creek to Monument Hill. Pockets of tree mortality occurred along Interstate 70 from Gooseberry Creek to Spring Canyon. Tree mortality also occurred in the Pahvant Range from Table Mountain to Dry Canyon west of Aurora, in Dry Canyon on the Sevier Plateau near the Piute County border, and around Deer Peak west of the Limestone Cliffs.
- Spruce beetle-Most of the spruce mortality occurred in the vicinity of Mount Terrill. Additional tree mortality was mapped between Glennwood Mountain and Monument Peak on the Sevier Plateau, along Tasha Creek near Fish Lake, and at Geyser Peak.
- Subalpine fir mortality- continued in the same general areas from Monroe Creek to Geyser Peak. Subalpine fir mortality increased around Monroe Creek and Hilgard Mountain on the Sevier Plateau and Shingle Creek in the Tushar Mountains. Tree mortality remained static around Fish Lake, and decreased slightly around Monument and Geyser Peaks.
- Western spruce budworm- Light defoliation continued around the Monroe Peak area and was mapped along the Fishlake Hightop Plateau. Heavy defoliation occurred around Big Lake and Dry Canyon on the Sevier Plateau.
- Windthrow-Two areas of aspen blowdown were mapped around Mount Marvine.

2004:

- Douglas-fir beetle-Large areas of tree mortality occurred on Old Woman Plateau from North Water Hollow to Cowboy Creek especially in Convulsion Canyon and in the Duncan Mountain areas. Scattered tree mortality occurred from Skougaard Canyon to SB Ridge near Interstate 70 encompassing the Fish Lake area. Other pockets of tree mortality were mapped around Shingle Creek in the Tushar Mountains, from Cottonwood Canyon to North Cedar Ridge Canyon in the Pahvant Range and on the Sevier Plateau around Big Lake, Milos Kitchen and Dry Canyon.
- Fir engraver beetle-Most of the mortality occurred north of Interstate 70 from Steves Mountain to the Emery/Sanpete County borders. Additional mortality occurred in the following drainages: Dry Canyon and Hoodoo, Thompson, and Monroe Creeks on the Sevier Plateau, between the Beaver County border and Maple Spring Hollow in the Tushar Mountains, and in Willow Spring, Newts, and Sweet Canyons on the Pahvant Range.
- Pinyon engraver beetle-Two small areas of new tree mortality were mapped in Willow Springs near Mill Meadow Reservoir and on Walker Flat near the Emery County border.
- Spruce beetle- Most of the large areas of spruce mortality were mapped around Mount Terrill. Additional mortality occurred at Glennwood Mountain and at Geyser and Monument Peaks.
- Subalpine fir mortality- Most of the mortality occurred in the Fish Lake area bounded by Skougaard Canyon, Brome Bench, Hilgard Mountain and South Last Chance Creek. Other mapped tree mortality occurred on the Sevier Plateau around Monroe Peak, Indian Peak, and Glennwood Mountain.
- Western spruce budworm- Light subalpine fir defoliation was mapped at Monroe Peak and Big Lake. An area of heavy defoliation also occurred around Big Lake.

SUMMIT COUNTY

In 2002, 39% of the county was surveyed encompassing the Uintas Mountains outside of the High Uintas Wilderness from Kamas Valley to Henrys Fork and the eastern portion of the Wasatch Range that resides within Summit County. In 2003, 59% of the county was surveyed. Additional areas surveyed include the High Uintas Wilderness and the forested areas from Henrys Fork to the Daggett County border. In 2004, 43% of the county was surveyed similar to the area flown in 2002 except for the addition of forested areas from Henrys Fork to the Daggett County border just outside the High Uintas Wilderness.

In 2002, large areas of lodgepole pine mortality were reported extending into Summit County from the Duchesne and Wasatch County borders. Subalpine fir mortality was heavy north of the High Uintas Wilderness. In 2003, the lodgepole pine mortality along the Duchesne/Wasatch County borders coalesced and spread north of the area mapped in 2002. Subalpine fir mortality increased in area and number of trees affected east of Kamas Valley and along the Wyoming border. Douglas-fir mortality was mapped near the Daggett County border. In 2004, mountain pine beetle-caused lodgepole pine mortality was heavy covering large landscapes from the Kamas Valley to Henrys Fork. Subalpine fir mortality in the same area also increased significantly from 2003-mapped mortality. Fir engraver beetle-caused tree mortality and topkill affected true fir in the Wasatch Range. The area east of Kamas Valley also experienced increased Douglas-fir, spruce, and white fir mortality.

SUMMIT COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Aspen decline		155				
Douglas-fir beetle			1,200	522	2,751	813
Fir engraver beetle	277	137	750	143	26,963	3,087
Forest tent caterpillar				122		55
Mountain pine beetle	6,133	2,280	61,389	10,725	434,422	58,773
Spruce beetle	500	237	781	249	4,435	1,745
Subalpine fir mortality	17,161	2,602	22,405	4,933	60,076	10,663
Windthrow				35		

2002:

- Aspen decline-A large area of aspen decline was reported on the Provo River near Rileys Canyon.
- Fir engraver beetle-true fir mortality occurred near the juncture of Salt Lake and Morgan Counties.
- Mountain pine beetle-Large areas of tree mortality were mapped along the Wasatch County border from Cedar Hollow to Washington Lake. Additional mortality pockets were mapped in the Smith and Morehouse Creek drainages and along the Hayden Fork of Bear River.
- Spruce beetle-Small pockets of spruce mortality were mapped around Hoyt and Moffit Peaks, adjacent to the Provo and Weber Rivers, and near Long Lake.
- Subalpine fir mortality-Most of the tree mortality occurred between Moffit Peak and Blacks Fork with larger pockets of mortality near Whitney Reservoir and on private land by Elizabeth Mountain near the Utah–Wyoming border. In the Wasatch Range southwest of Park City a few large pockets were mapped in the Thaynes Canyon area.

Summit County continued

2003:

- Douglas-fir beetle-Scattered mortality occurred between Poison Creek and the Daggett County border, along Beaver Creek near Samak, on the Wyoming border near Elizabeth Mountain, and in the Smith and Morehouse Creek drainages.
- Fir engraver beetle- true fir mortality continued in the Wasatch Range near the junction of Salt Lake and Morgan Counties. Additional tree mortality occurred east of Kamas Valley in Seymour and Hoyt Canyons and along the Left Fork of Beaver Creek.
- Forest tent caterpillar-Heavy aspen defoliation was mapped in the northeastern foothills of Kamas and adjacent to Perdue Creek, a tributary of Weber River.
- Mountain pine beetle- Lodgepole pine mortality expanded along the Provo River and in other affected areas identified in 2002. Additional tree mortality was mapped along the Wyoming border between Moslander Reservoir and Dahlgreen Creek. Ponderosa pine mortality was mapped at the confluence of Beaver and Yellow Pine Creeks. One area of limber pine mortality was located on the Middle Fork of Beaver Creek on the east side of the County.
- Spruce beetle- spruce mortality increased near Hoyt Peak. Other small areas of spruce mortality were mapped in the upper portion of Fish Creek, near Moffit Peak and on the Daggett County border.
- Subalpine fir mortality-Large areas of fir mortality were mapped between Mill Creek and Smiths Fork along the Wyoming border and north of Hoop Lake on the east side of the county. Clusters of small mortality pockets were mapped east of Kamas to Whitney Reservoir. Tree mortality continued in the Thaynes Canyon area of the Wasatch Range.
- Windthrow-Aspen windthrow was reported in a tributary of Weber River near Stillman Creek.

2004:

- Douglas-fir beetle-Pockets of tree mortality occurred between Henrys Fork and Beaver Creek on the east side of the county, along Beaver Creek east of Samak, along the Weber River, in Pinon Canyon and along South Pullem Creek east of Kamas Valley, near Moffit Peak, and along the Stillwater Fork of Bear River.
- Fir engraver beetle-The tree mortality near the juncture of Salt Lake and Morgan Counties in the Wasatch Range became one large contiguous polygon of tree mortality with smaller pockets of mortality extending to Park City. The size and number of mortality pockets increased east of Kamas Valley from Seymour Canyon to Slate Creek.
- Forest tent caterpillar-Heavy aspen defoliation occurred in Pinon Canyon east of Oakley.
- Mountain pine beetle- Large areas of lodgepole pine mortality occurred from the Provo River to Henrys Fork. Small pockets of ponderosa pine mortality occurred along Yellow Pine Creek and Weber River.
- Spruce beetle- Most of the spruce mortality occurred between Washington and Wall Lakes near Mount Watson and along the Weber River near Notch Mountain. Other spruce mortality was mapped at Hoyt Peak and Hayden Peak adjoining spruce mortality in Duchesne County.
- Subalpine fir mortality- In the Wasatch Range, tree mortality occurred from Threemile Canyon to Bald Mountain. East of Kamas Valley, subalpine fir mortality occurred from the Cedar Fork of Beaver River to the Little West Fork of Blacks Fork on the Wyoming border. Subalpine fir mortality was also mapped in Dahlgreen Creek, near Hoop Lake and the Beaver Meadow Reservoir on the east side of the county.

TOOELE COUNTY

Tooele County was not surveyed in 2002 or 2003. In 2004, 2% of the county was surveyed in the Stansbury Mountains.

In 2004, large areas of pinyon mortality were noted on the west side of the mountains. Pockets of Douglas-fir, white fir and subalpine fir mortality occurred throughout the surveyed area.

TOOELE COUNTY	2004	
	Trees	Acres
Douglas-fir beetle	1,799	448
Fir engraver beetle	1,365	252
Mountain pine beetle	20	10
Pinyon engraver beetle	17,166	1,989
Subalpine fir mortality	400	65

2004:

- Douglas-fir beetle- Douglas-fir mortality was scattered throughout the area from Coal Pit Canyon to Vickory Mountain. The largest pocket of tree mortality occurred in East Hickman Canyon.
- Fir engraver beetle- two large areas of tree mortality were mapped in South Willow Canyon with two smaller pockets of tree mortality mapped on Vickory Mountain and Hickman Pass.
- Mountain pine beetle-Limber pine mortality was mapped in the upper portion of Barlow Creek.
- Pinyon engraver beetle- large areas of tree mortality occurred along the western foothills from South Lost Creek to Deadman Canyon.
- Subalpine fir mortality- was mapped in the vicinity of Deseret Peak and north of Vickory Mountain.

SPRUCE BEETLE
Dendroctonus rufipennis
Hosts: Engelmann and Colorado blue spruce

The spruce beetle is the most significant, natural mortality agent of mature spruce. Endemic populations usually exist in weakened or windthrown trees, logging slash, and fresh stumps. Outbreaks typically occur when beetle populations build to high levels in concentrations of windthrown trees. Dispersing adults may infest standing live trees, initially preferring larger diameter trees.

An adult spruce beetle is approximately 5mm long and 3mm wide.

UINTAH COUNTY

In 2002, 18% of the county was surveyed, specifically the Tavaputs Plateau area of the Uintah and Ouray Indian Reservation in the southern part of the county. In 2003, 34% of the county was surveyed expanding the 2002 survey area north a few miles and including the Uintah Mountains in the northern part of the county. In 2004, 9% of the county was surveyed which included the Uintah Mountains adjacent to the Wilderness area in the northern part of the county; the Uintah and Ouray Indian Reservation was not surveyed.

In 2002, a couple of pinyon mortality areas were mapped in the southeast portion of the county. In 2003, pinyon mortality was abundant throughout the Uintah and Ouray Indian Reservation. Douglas-fir mortality was mapped in the Uintah Mountains and on the Reservation. In 2004, large areas of spruce, lodgepole and Douglas-fir mortality were mapped in the Uintah Mountains.

UINTAH COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle			2,575	959	25,408	6,750
Mountain pine beetle			38	19	19,806	4,309
Pinyon engraver beetle	260	93	125,113	14,509		
Spruce beetle			200	48	11,086	5,094
Subalpine fir mortality			870	304	300	106

2002:

- Pinyon engraver beetle- pinyon mortality occurred in Indian Spring and Atchee Canyons in the southeast corner of the county.

2003:

- Douglas-fir beetle- In the Uintah Mountains, pockets of tree mortality occurred between Matt Warner Reservoir and the Daggett County border, and in Brownie Canyon, Dry Fork, and along Little Brush Creek. On the Uintah and Ouray Indian Reservation, tree mortality occurred in Chandler and Main Canyons, on Wild Horse Basin, and in the Willow and Bitter Creek drainages.
- Mountain pine beetle-A small pocket of lodgepole pine mortality was mapped in Black Canyon in the Uintah Mountains.
- Pinyon engraver beetle-All of the pinyon mortality recorded was on the Uintah and Ouray Indian Reservation. Large areas of tree mortality were mapped between the Carbon County border, Hill Creek, Grand County boundary, and Big Canyon Flat. Smaller areas of mortality were mapped on Winter, Atchee and McCook Ridges, in Main, August, Dragon and Sweet Water Canyons, and along Bitter Creek.
- Spruce beetle-Small spots of spruce mortality were mapped southeast of Marsh Peak and Brush Creek in the Uintah Mountains.
- Subalpine fir mortality- was mapped in the Uintah Mountains in Black Canyon, along Ashley and Little Brush Creeks, and northwest of Oak Park Reservoir.

Uintah County continued

2004:

- Douglas-fir beetle-Large areas of mortality occurred between Matt Warner Reservoir and the Daggett County border in the Uintah Mountains. Clustered pockets of tree mortality occurred between Reader and Pot Creek on the edge of Diamond Mountain Plateau and in Whiterocks River northeast of Whiterocks. Individual pockets of tree mortality were mapped in Brownie Canyon and the Big and Little Brush Creek drainages.
- Mountain pine beetle-Large areas of lodgepole pine mortality occurred along the Whiterocks River, in Dry Fork near Gull Lake, along Ashley Creek and in Black Canyon. Smaller pockets of ponderosa pine mortality occurred in the Whiterocks River and Dry Fork drainages.
- Spruce beetle-Large areas of tree mortality occurred in the northwest corner of the county from North Fork of Dry Fork to the Daggett and Duchesne County borders.
- Subalpine fir mortality-Small pockets of subalpine fir mortality occurred along Little Brush Creek near East Park Reservoir, along Big Brush Creek, and around Mosby Mountain in the Uintah Mountains.

UTAH COUNTY

In 2002, 43% of the county was surveyed, encompassing the Wasatch Range to the Wasatch County border except for the Maple Canyon area east of Mapleton and the area north of Provo Canyon to the Salt Lake County border. In 2003, 47% of the county was surveyed encompassing all of the Wasatch Range except for Loafer Mountain State Wildlife Area and the White River Valley. In 2004, 50% of the county was surveyed adding the White River Valley.

In 2002, most of the insect damage occurred in or south of the Spanish Fork Canyon drainages with the exception of Douglas-fir mortality that was scattered throughout the survey area. In 2003, most of the insect damage again occurred in or south of the Spanish Fork Canyon drainages; although, fir engraver beetle-caused tree mortality and topkill increased east of Springville. In 2004, while most of the insect damage still occurred in or south of the Spanish Fork Canyon drainages, all of the Wasatch Range was affected by insect damage.

UTAH COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Aspen blight		80				
Douglas-fir beetle	2,513	976	4,430	2,205	19,018	4,690
Fir engraver beetle	2,239	726	5,980	2,486	110,564	17,781
Forest tent caterpillar		36		44		298
Mountain pine beetle					100	50
Pinyon engraver beetle	3,357	1,416	10,179	2,040	551	142
Spruce beetle	50	25	270	84	791	286
Subalpine fir mortality	3,873	519	2,595	622	11,617	2,360
Western spruce budworm		46		65		111
Windthrow			20	10		

Utah County continued

2002:

- Aspen blight- was mapped in Windy Pass east of Lightning Peak.
- Douglas-fir beetle- Clusters of tree mortality occurred around Indian Head, Spring Canyon to the Carbon County border, in the Tie and Lake Fork drainages of Soldier Creek, and in the drainages around Cascade Mountain. Individual pockets of tree mortality were mapped in the Clear and Nebo Creek drainages, on Third Water Ridge, along Sixth Water Creek and Halls Fork of Diamond Fork drainages, around Ether Peak, and along the North Fork of the Provo River.
- Fir engraver beetle-Most of the tree mortality occurred in the Lake Fork of Soldier Creek or Thistle Creek drainages. Single pockets of mortality were mapped in Pole Heaven east of Springville and in Pole Canyon east of Orem.
- Forest tent caterpillar-One small area of heavy aspen defoliation was reported in Shurtz Canyon in the Loafer Mountain Wildlife Area.
- Pinyon engraver beetle-One large area of tree mortality occurred on the north side of Spanish Fork Canyon between Mill Fork and Sky View, smaller mortality pockets were mapped along Indian Creek.
- Spruce beetle-Two small pockets of spruce mortality occurred in the Tie Fork of Soldier Creek near Little Baldy Mountain.
- Subalpine fir mortality-Small pockets of subalpine fir mortality were mapped around Lightning and Provo Peaks, in the Shingle Mill Fork and Wadsworth Creek drainages near Twin Peaks, in Shurtz Canyon, in Summit, Beaver Dam, Fish, and Crab Creek drainages, and the Right Fork of Mill Fork of Soldier Creek.
- Western spruce budworm-An area of light defoliation was mapped on the south side of Twin Knolls.

2003:

- Douglas-fir beetle- Clusters of tree mortality continued in the 2002 locations with additional clusters occurring in the Mill Fork and Clear Creek drainages. Tree mortality also occurred in the Cottonwood, Fifth and Sixth Water Creek drainages of Diamond Fork, near Red Pine Knoll, in American Fork Canyon, and near Box Elder Peak in the Lone Peak Wilderness.
- Fir engraver beetle-A cluster of tree mortality polygons were mapped between Summit, Nebo, and Peteetneet Creek southeast of Santaquin. Tree mortality was also mapped between Fifth Water Creek and the Right Fork of Hobble Creek along the Wasatch County border including a large pocket at Timber Mountain; in the Starvation, Sweat, Third Water and Dry Creek drainages; in Cottonwood, Berryport, Whittemore, Mill and Tank Canyons; Pole Heaven; along Mill Fork and the Provo River near Vivian Park.
- Forest tent caterpillar-One area of aspen defoliation occurred adjacent to Bennion Creek in the southeast corner of the county.
- Pinyon engraver beetle-A large area of tree mortality was mapped on the north side of Soldier Creek between Sky View and Gilluly; two small pockets occurred along Dry Creek near Pines.
- Spruce beetle-All of the spruce mortality mapped occurred in tributaries of Nebo Creek.
- Subalpine fir mortality- occurred in three general areas including American Fork Canyon at the juncture of South Fork to the Salt Lake and Wasatch County borders, along the Wasatch County border from Wardsworth Creek to Forth Water Ridge, and between the Right Fork of Salt Creek and Black Canyon in Nebo Creek.
- Western spruce budworm-One small area of light subalpine fir defoliation occurred near Spanish Fork Peak and a larger area of heavy defoliation occurred in the Straight Fork of Fish Creek drainage.
- Windthrow- twenty trees were windthrown in Box Elder Canyon in the Lone Peak Wilderness.

Utah County continued

2004:

- Douglas-fir beetle-Douglas-fir mortality increased near Indian Head, Spring Canyon, Clear Creek, Tie and Lake Forks of Soldier Creek and American Fork. Mortality was also mapped in Wardsworth, Little Diamond, and Fifth Water Creek drainages, in Rock Canyon, and along the Provo River near Vivean Park.
- Fir engraver beetle-Large areas of true fir mortality continue in the Wasatch Range southeast of Santaquin, between Thistle and Starvation Creeks south of Spanish Fork Canyon, and in the Diamond Fork drainages especially on Fifth Water Ridge, Timber Mountain, and southwest of Wardsworth Peak.. Smaller pockets of mortality were mapped in the drainages of Left Fork Hobble Creek, the west side of the Cascade Mountains, in American Fork Canyon and along the Wasatch County border from Mill Canyon to Wildwood.
- Forest tent caterpillar-Heavy aspen defoliation occurred in Windy Pass east of Lightning Peak, along Wardsworth Creek near Wardworth Peak and along Spring Creek east of Springville.
- Pinyon engraver beetle-Small pockets of new pinyon mortality occurred on the south side of Spanish Fork Canyon from East Dairy Fork to Sky View.
- Spruce beetle-Most of the mortality occurred between the Straight Fork of Fish Creek and Bennion Creek near the Sanpete County border. Other spruce mortality was mapped along Summit Creek near Bald Mountain and on Strawberry Ridge near the Wasatch County border.
- Subalpine fir mortality-A large area of subalpine fir mortality occurred at Indian Head, clusters of mortality occurred between American Fork Canyon and the Wasatch County border, and between Clear Creek and the juncture of Sanpete and Carbon County borders. Other tree mortality occurred in Windy Pass, at Bald Knoll, in Burnt Hollow, in the Wardsworth, Summit, and Nebo Creek drainages, and east of Browns Peak.
- Western spruce budworm-Heavy subalpine fir defoliation occurred near Strawberry Peak along the Wasatch County border.

WESTERN BALSAM BARK BEETLE / SUBALPINE FIR MORTALITY COMPLEX
Dryocoetes confusus
Host: subalpine fir

The western balsam bark beetle is the most significant mortality agent in a complex of forest insects and diseases causing subalpine fir mortality. Endemic populations will occur in storm-damaged trees, slash or trees of poor vigor. Drought and environmental stress may cause subalpine fir stands to become susceptible to insect and disease agents. Western balsam bark beetle infestations may build to epidemic levels where mortality can occur in groups of 100 to 10,000 trees.

Subalpine fir killed by a complex of agents, which include western balsam bark beetle, root disease, & environmental conditions such as drought.

WASATCH COUNTY

In 2002, 86% of the county was surveyed. The only areas not surveyed were the foothills of Current Creek on the Duchesne County border, Heber Valley, Lady Long Hollow and The West Hills north of Heber City. In 2003, 84% of the county was surveyed adding Lady Long Hollow but omitting Strawberry Reservoir to the Duchesne County border. In 2004, 71% of the county was surveyed encompassing most of the 2002 survey area but again omitting from Strawberry Reservoir to the Duchesne County border.

In 2002, subalpine fir mortality and aspen decline was scattered throughout the county, Douglas-fir mortality was more prevalent in the southeast corner of the county, and lodgepole pine mortality was mapped in the northeast corner of the county. In 2003, large pockets of subalpine fir mortality occurred around Duchesne Ridge while scattered subalpine fir mortality continued throughout the rest of the county. Most of the Douglas-fir mortality was mapped in the southeast corner of the county and lodgepole pine mortality was reported in the northeast corner of the county. However, the pockets lodgepole pine and Douglas-fir mortality have increased in area. In 2004, large areas of subalpine fir mortality were prevalent in the Currant Peak/Duchesne Ridge area. Heavy lodgepole pine mortality was mapped along the Summit and Duchesne borders. Heavy Douglas-fir mortality continued in the southeast corner of the county. Fir engraver beetle-caused tree mortality was mapped south of Round Valley.

WASATCH COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Aspen blight		329				
Aspen decline		2,406				
Douglas-fir beetle	3,942	1,556	4,382	1,920	18,268	4,143
Fir engraver beetle	320	95	1,480	782	26,509	2,661
Forest tent caterpillar				60		1,963
Mountain pine beetle	8,179	2,882	39,923	6,910	73,799	9,437
Pinyon engraver beetle	70	35				
Spruce beetle	410	204	150	75	1,650	500
Subalpine fir mortality	25,598	4,390	19,305	5,524	59,347	10,778
Western spruce budworm		274		260		139

2002:

- Aspen blight- occurred in Right Fork Hobble Creek, at Burnt Stump Spring in Daniels Creek, and in Horse Creek near Strawberry Reservoir.
- Aspen decline- occurred between Daniels Creek and Coal Mine Hollow east of Currant Creek Reservoir. It was also mapped on private land north of Jones Reservoir.
- Douglas-fir beetle-Large pockets of mortality were mapped in the southeast corner of the county from Strawberry River south to the Utah and Duchesne County borders. Additional Douglas-fir mortality occurred in Daniels Creek, along the Provo River and in Nobletts Creek.
- Fir engraver beetle-Small spots of mortality were mapped in Main Creek, the Left Fork of Hobble Creek, and southeast of Witts Lake.
- Mountain pine beetle-A large area of lodgepole pine mortality was mapped along the Duchesne River continuing into Duchesne County. Mortality was also observed along the Provo River from Little South Fork to Provo River Falls Overlook..
- Pinyon engraver beetle-Small pockets of mortality occurred on private land by Strawberry River.

Wasatch County 2002 continued

- Spruce beetle-Most of the spruce mortality occurred between Current Creek Peak and Red Creek Mountain. Additional mortality was mapped in Beaver Canyon and French Hollow, and in the Hobble Creek, and Wolf Creek drainages.
- Subalpine fir mortality- was concentrated along Strawberry Ridge, west of Currant Creek Reservoir to the Utah County border and south to Water Hollow, along Duchesne Ridge, east of Jones Reservoir, and between Raspberry Knoll and Bobby Duke Ridge.
- Western spruce budworm-Light defoliation was mapped in the vicinity of Currant Creek Reservoir.

2003:

- Douglas-fir beetle-Most of the tree mortality occurred southeast of Strawberry Reservoir. Additional tree mortality occurred in Sams Canyon; along Daniels, Willow, and Currant Creeks; Duchesne, West Fork Duchesne, Provo, and South Fork Provo Rivers.
- Fir engraver beetle- several areas of mortality were mapped between the Right Fork of Hobble Creek and Maple Creek and between Boomer Canyon and Carver Creek along Hogsback Ridge. Additional tree mortality occurred in the South Fork of the Provo River drainage, in Bear Canyon west of Deer Creek Reservoir, and along Snake Creek west of Heber Valley.
- Forest tent caterpillar-Heavy aspen defoliation occurred in the Bench Creek drainage, a tributary of the Provo River.
- Mountain pine beetle- Lodgepole pine mortality increased along the Provo and Duchesne Rivers. Additional lodgepole pine mortality was mapped along the Strawberry River.
- Spruce beetle-Most of the spruce mortality occurred in small pockets along the Duchesne Ridge. Additional tree mortality was mapped in Bear Canyon west of Deer Creek Reservoir and between Willow Creek and Strawberry River.
- Subalpine fir mortality-Most of the tree mortality occurred in the area bounded by the Utah and Duchesne County borders, Strawberry Reservoir and Provo River. In this area, large areas of tree mortality were mapped between Dip Vat and Mill Hollows on the Duchesne Ridge and along Wolf Creek near the Duchesne County border. Scattered tree mortality occurred southeast of Strawberry Reservoir to the county border and along the ridge west of Deer Creek Reservoir.
- Western spruce budworm- Light tree defoliation continued between Currant Creek and Strawberry Reservoirs and light tree defoliation occurred along the ridge on the north side of Willow Creek.

2004:

- Douglas-fir beetle- Tree mortality continued to increase from Strawberry Reservoir southeast to the county border. Additional tree mortality occurred in the South Fork of Deer Creek drainage, along Daniels Creek, south and east of Currant Creek Reservoir, and along the South Fork Provo and Duchesne Rivers.
- Fir engraver beetle-Most of the tree mortality occurred between Daniels Creek and the Utah County border with mortality between Hobble and Maple Creek increasing significantly. Additional tree mortality occurred in the Snake Creek drainage and east of Bald Mountain.
- Forest tent caterpillar-Large areas of heavy aspen defoliation were mapped between Snake and Pine Creeks west of Heber Valley and along Buck Hollow Ridge north of Heber Mountain. A small area of defoliation was observed in Mill Hollow north of Duchesne Ridge.
- Mountain pine beetle-Lodgepole mortality continued to expand along the Provo and Duchesne River drainages. Additional tree mortality occurred in Pass Creek west of Currant Creek Reservoir and in the West Fork of Duchesne and the South Fork of Provo river drainages.

Wasatch County 2004 continued

- Spruce beetle-Most of the spruce mortality occurred between Bryants Fork and Jones Hollow west of Strawberry Reservoir. Additional tree mortality occurred around Strawberry Peak, and in the Willow Creek and the Little West Fork of Duchesne River drainages.
- Subalpine fir mortality-Large areas of tree mortality were mapped in the area bounded by the Utah and Duchesne County borders, Strawberry Reservoir and Provo River. Scattered tree mortality occurred in the vicinity of Silver Lake in the northwest corner of the county and from Strawberry Reservoir to the Utah border particularly along Reservation Ridge and the Strawberry River.
- Western spruce budworm-Heavy subalpine fir defoliation occurred in small pockets along Willow Creek and the Utah County border near the Wheeler Fork of Main Creek drainage.

WASHINGTON COUNTY

Washington County was surveyed in 2003 and 2004 only. In 2003, 15% of the county was surveyed in two areas; the Pine Valley Mountain Wilderness on the Dixie National Forest and the Kolob Reservoir area north and east of Zion National Park. In 2004, 18% of the county was surveyed expanding into Zion National Park to Shunesburg Mountain.

WASHINGTON COUNTY	2003		2004	
	Trees	Acres	Trees	Acres
Douglas-fir beetle	1,510	669	2,709	733
Douglas-fir tussock moth		949		3
Fir engraver beetle	1,769	659	51,403	10,846
Mountain pine beetle	22	11		
Oak mortality				1,691
Pinyon engraver beetle	400	144	20,675	2,314
Subalpine fir mortality	659	307	550	120

Pine Valley Mountain Wilderness: In 2003, only scattered insect damage was mapped. In 2004, fir engraver beetle-caused tree mortality and topkill increased significantly in affected area and number of trees killed.

2003:

- Douglas-fir beetle- Tree mortality occurred in scattered small pockets from Timber Mountain to Burger Peak.
- Fir engraver beetle-A large pocket of tree mortality was mapped in Dam Canyon, additional tree mortality occurred in the hills around Pine Valley.
- Pinyon engraver beetle- Pinyon pine mortality occurred in two areas, in the Indian Spring drainage and Mill Canyon.
- Subalpine fir mortality-subalpine fir mortality was mapped from Saddle Mountain to Mount Baldy along the Pine Valley Mountain Range.

2004:

- Douglas-fir beetle- tree mortality decreased occurring as small pockets in the Left Fork of Clara River drainage with one larger pocket in White Rocks Draw.

Washington County, Pine Valley 2004 continued

- Fir engraver beetle-Large areas of tree mortality were mapped from Saddle Mountain northeast to Mount Baldy.
- Pinyon engraver beetle-Two large areas of mortality were mapped in the Cottonwood Creek drainage and in Big Hollow.
- Subalpine fir mortality- tree mortality was mapped in the Left Fork of Clara River drainage and adjacent to Burger Peak.

Kolob Reservoir to Zion National Park: In 2003, heavy Douglas-fir tussock moth defoliation was mapped in this area. In 2004, an increase in fir engraver beetle-caused tree mortality and topkill occurred, especially in sites previously defoliated by tussock moth. In Zion National Park, large areas of pinyon engraver beetle-caused pinyon pine mortality were mapped. Also mapped in Zion National Park were several 100-tree Douglas-fir mortality pockets.

2003:

- Douglas-fir beetle- mortality occurred west and south of Kolob Reservoir and in La Verkin Creek.
- Douglas-fir tussock moth-One large area of heavy defoliation was mapped south of Kolob Reservoir with two smaller areas occurring in the Kolob and Blue Creek drainages.
- Fir engraver beetle-One large pocket of tree mortality occurred in the West Fork of Deep Creek.
- Subalpine fir mortality-One large area of subalpine fir mortality was mapped near Little Mountain.

2004

- Douglas-fir beetle- tree mortality was mapped in the La Verkin Creek drainage. Larger pocket of tree mortality occurred along the North Fork of Virgin River from Temple Point to Simon Gulch.
- Fir engraver beetle-Large areas of tree mortality were mapped from Hop Valley to the West Fork of Deep Creek in the northeast corner of the county.
- Pinyon engraver beetle-A large area of tree mortality was mapped south of Zion Lodge along the North Fork of the Virgin River.

WAYNE COUNTY

In 2002, 13% of the county was surveyed encompassing the Boulder, Miners and Thousand Lake Mountain areas in the western portion of the county. In 2003, 11% of the county was surveyed covering the 2002 survey area except for the Fremont River area of Miners Mountain. In 2004, 15% of the county was surveyed including the 2003-surveyed area. The extended survey included the area around Thousand Lake Mountain into Water Pocket Fold and the foothills between Lyman and Fremont.

In 2002, spruce and subalpine fir mortality was evident in the higher elevations around Thousand Lake Mountain. Subalpine fir mortality and budworm caused tree defoliation occurred in the Boulder Mountain area. In 2003, most of the insect damage was mapped in the Boulder Mountains where subalpine fir mortality and budworm defoliation continued. A large area of pinyon pine mortality was mapped east of Lyman. In 2004, subalpine fir mortality and budworm defoliation increased in the Boulder Mountains. Fir engraver beetle-caused tree mortality and topkill in addition to pinyon pine mortality was also mapped in this area.

Wayne County continued

WAYNE COUNTY	2002		2003		2004	
	Trees	Acres	Trees	Acres	Trees	Acres
Douglas-fir beetle			200	100	19	41
Fir engraver beetle					2,893	645
Pinyon engraver beetle			10,680	2,136	813	163
Spruce beetle	640	190	180	60	105	145
Subalpine fir mortality	6,700	653	1,060	342	2,227	489
Western spruce budworm		1,018		2,615		5,223

WESTERN SPRUCE BUDWORM
Christoneura occidentalis
Hosts: Douglas-fir, true firs.

Adult western spruce budworm with pupal case.

Western spruce budworm is the most widely distributed and destructive defoliator of coniferous forests in western North America. Trees may be extensively defoliated during outbreaks, resulting in strass that can directly kill the tree or make it susceptible to disease and secondary insect pests, such as the Douglas-fir beetle.

2002:

- Spruce beetle-All the tree mortality was mapped along Flat Top on Thousand Lake Mountain.
- Subalpine fir mortality-Two large pockets of tree mortality occurred in the Bullberry and Deep Creek drainages near Waterpocket Fold. Smaller pockets of tree mortality occurred near Donkey Reservoir and Donkey Point in the Boulder Mountains.
- Western spruce budworm-A large area of light defoliation occurred between Donkey and Spring Creeks and a smaller area mapped at the head of Birch Creek near Boulder Mountain.

2003:

- Douglas-fir beetle- In the Thousand Lake Mountain area, small pockets of tree mortality were mapped in Salt Gulch, Pole Canyon, and the Reese Creek drainage above Mill Meadow Reservoir. In the Boulder Mountain area, small pockets of tree mortality were mapped between the upper portions of Pine and Government Creeks.
- Pinyon engraver beetle-A large area of pinyon pine mortality was mapped between Shingle Mill Creek and Cedar Creek east of Lyman.
- Spruce beetle-Small pockets of spruce mortality were mapped along Flat Top on Thousand Lake Mountain.
- Subalpine fir mortality-A large area of tree mortality was mapped near Donkey Reservoir and a small pocket of tree mortality was recorded in the Fish Creek drainage near Boulder Mountain.
- Western spruce budworm- Heavy Douglas-fir defoliation was mapped in the area reported in 2002, from Birch Creek extending east past Fish Creek.

Wayne County continued

2004:

- Douglas-fir beetle-One small pocket of tree mortality was mapped along the Sevier County border near Fish Lake.
- Fir engraver beetle-Most of the tree mortality occurred in the Boulder Mountain area between the head of Pine and Bullberry Creeks. In the Thousand Lake Mountain area, tree mortality was mapped between Pole Canyon and Reese Creek.
- Pinyon engraver beetle-One pocket of pinyon pine mortality was mapped east of Sam Legg Hollow in the Boulder Mountain area.
- Spruce beetle- Pockets of spruce mortality were mapped along Flat Top on Thousand Lake Mountain.
- Subalpine fir mortality- was mapped at Donkey Point and near Fish Creek Lake in the Boulder Mountain area.
- Western spruce budworm- Heavy Douglas-fir defoliation occurred in areas previously mapped in 2003, from west of Birch Creek to Fish Creek.

WEBER COUNTY

Weber County was not surveyed in 2002. In 2003, 40% of the county was surveyed encompassing the area east of Ogden except for Ogden Valley and the Highway 39 corridor to Rock Creek. In 2004, 48% of the county was surveyed including the 2002 survey area and the Highway 39 corridor.

In 2003, insect damage was minimal and scattered throughout the surveyed area. In 2004, fir engraver beetle-caused tree mortality and topkill was observed in the Wasatch Range and along the north-facing slope of the South Fork drainage of the Ogden River. Subalpine fir mortality was heavy in the tributaries of the Right Fork of the South Fork drainage of the Ogden River. Forest tent caterpillar caused defoliation affected a large area of aspen in the Bear River Range.

WEBER COUNTY	2003		2004	
	Trees	Acres	Trees	Acres
Douglas-fir beetle	73	37	400	143
Fir engraver beetle			4,200	900
Forest tent caterpillar		152		4,929
Subalpine fir mortality	870	207	2,138	395

2003:

- Douglas-fir beetle-Small pockets of tree mortality occurred along Chicken Creek in the Wasatch Range, in Sawmill Canyon in the Left Fork of the South Fork of the Ogden River and Pete Nelson Hollow in the Right Fork of the South Fork of the Ogden River.
- Forest tent caterpillar- Aspen defoliation occurred along Chicken Creek west of Ogden Valley, in the South Fork of Wolf Creek drainage east of Ogden Valley and in Dry Bread Hollow near Monte Cristo Peak.
- Subalpine fir mortality-Most of the small pockets of subalpine fir mortality occurred in the tributaries of the Right Fork of the South Fork of the Ogden River near the Morgan County border. Additional tree mortality occurred along Burch and Cutler Creeks in the Wasatch Range.

Weber County continued

2004:

- Douglas-fir beetle-Small, scattered pockets of Douglas-fir mortality occurred in the following drainages: Chicken Creek, South Fork of Wolf Creek, Right Fork of the Middle Fork of the Ogden River, Right Fork of the South Fork of the Ogden River, and in Wheat Grass Canyon.
- Fir engraver beetle-A large area of tree mortality and topkill occurred in the upper portion of Critian Hollow and Magpie Canyon off the South Fork of the Ogden River. Other fir mortality and topkill was mapped in the Wasatch Range between North Ogden Canyon and the Snow Basin ski area.
- Forest tent caterpillar-Heavy aspen defoliation occurred in the Bear River Range from Cache Valley Creek to Dry Bread Hollow. A large area of defoliation was mapped between Beaver Creek and Dry Bread Hollow.
- Subalpine fir mortality- tree mortality continued in the tributaries of the Right Fork of the South Fork of the Ogden River near the Morgan County border. Small pockets of tree mortality were also mapped in the Right Fork of the Middle Fork of the Ogden River.

Other Insects:

Fall cankerworm
Alsophila pometaria

Host: Various deciduous species

Fall cankerworm outbreaks that occurred from 1998 to 2001 have been declining. No new defoliation was detected in 2002. In 2003, small areas were detected on the Manti National Forest. In 2004, fall cankerworm populations were increasing in northern Utah, particularly along the Wasatch Front affecting gamble oak and maple.

European gypsy moth
Lymantria dispar

Host: Various deciduous species

The gypsy moth was first detected in Utah in 1988. Since then, male moths have been captured in various locations nearly every year. Between 1989 and 1993 almost 72,000 acres of Federal, State, and private lands were treated with *Bacillus thuringiensis* (Bt). In 1997, 46 moths were captured in Salt Lake City and one moth on the adjacent Wasatch-Cache National Forest. In 1998, the Utah Department of Agriculture, in cooperation with the USDA Forest Service, treated 801 acres. In 1999, 764 acres in Salt Lake City County were aerially treated using Bt. In 2000, a ten-acre mass-trapping grid was installed around each positive catch using nine pheromone traps per acre; only one moth was caught. In 2001, the general pheromone trap detection grid scheme was resumed throughout Utah, with the exception of delimitation trapping in Salt Lake and Duchesne counties. One male moth was caught within the detection grid in Duchesne County in 2001; delimitation trapping was conducted at this site in 2002.

In 2002, one male gypsy moth was trapped near a housing facility at Hill Air Force Base, located just south of Ogden. APHIS field personnel installed delimitation traps at the site in 2003; no moths were caught. In 2003, two individual male moths were caught in traps on the North Slope of the Uintas east of Elizabeth Pass in an area visited by the Rainbow Family of Living Light. In June 2004, two 1000-foot delimitation grids of 81 traps were placed in this area; no moths were captured. In 2004, three male moths were captured in Utah. The captures occurred in either residential or campground areas with one adult male moth each in Salt Lake, Summit, and Duchesne Counties. Delimitation trapping in 2005 will occur at the Salt Lake and Summit County sites in Utah. The Duschene County site will not be delimited because the high elevation at which the adult moth was caught is not conducive to gypsy moth development.

Gypsy moth adults, female above, male below.

STATUS OF DISEASES

Stem and Branch Diseases

Dwarf mistletoes
Arceuthobium spp.

Host: Douglas-fir, Pines, True Firs

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 overmature tree stands. The percentage of infection by major host species in Utah is estimated as follows: Lodgepole pine 50%, ponderosa pine 20 %, and Douglas-fir 20% infected. These numbers represent the percentage of host stands having some level of infection. Dwarf mistletoe on pinyon pine can be found throughout the state, but it has never been comprehensively surveyed.

White pine blister rust
Cronartium ribicola

Range: West-wide including California, Idaho, Nevada, and Wyoming
Hosts: limber, whitebark, bristlecone, western white and sugar pines

This introduced disease is common throughout its hosts range in southern Idaho and western Wyoming. It is present in the western portion of the Intermountain Region in California and Nevada near Lake Tahoe and in the Jarbidge Mountains. No infection has been found or reported in Utah, but the disease has been found one canyon to the north of the Utah border in southern Idaho. Five-needled pine trees are of low occurrence and frequency in the Utah. Often relegated to high alpine areas, these pines grow slowly but provide important ecosystem functions such as providing shade and stabilization of snow retention for watershed integrity, recreation, aesthetics, and wildlife habitat and usage. An outbreak of white pine blister rust in a stand of 5-needle pines has the potential to devastate these ecologically important species. Please alert a forest health professional if you detect this disease in any five-needle pine in Utah.

Root Diseases

When present, root diseases spread from the roots of one tree to another and to a limited extent through the soil. Root diseases are often called "diseases of the site", indicating that once present in a forest they tend to be present for the entire lifespan of the trees involved. Susceptibility of the trees and virulence

of the pathogens involve varies from one area to another. In Utah, root diseases are less damaging than in other areas with a moister climate and forests that have been impacted by exotic pathogens. True "root disease centers", areas with a high concentration of root disease, are rare in the state. More commonly, evidence of root disease is scattered throughout many forests, with varying degrees of impact. Root diseases are intimately involved with populations of bark beetles, particularly when bark beetle populations are at endemic levels.

Several symptoms on individual trees are common to all root diseases. The symptoms can vary if the trees are killed rapidly and with size of the tree. Small trees that have been killed rapidly often turn red. On older trees many of these agents can act as butt or root decays without killing the tree. Trees that have a portion of their root system impacted by root diseases often exhibit several symptoms including thinning in the crown from the lowest part towards the highest, and from older foliage towards the younger. In general, the production of conspicuous fruiting bodies of root diseases is rare in Utah, occurring most often in relatively moist years. Several of these diseases can also act as a saprophyte, decaying dead material.

Annosum root disease
Heterobasidion annosum

Host: Douglas-fir, Lodgepole pine, Ponderosa pine, Spruce, True firs

This disease can be found throughout the state, but is most common in older fir and Douglas-fir stands. It frequently acts as a butt decay organism 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 on dry soils. Symptomatic small trees can frequently be found around stumps that had 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 ostoyae

Host: Douglas-fir, Pines, Spruce, Subalpine fir

Armillaria fruiting bodies.

Evidence of Armillaria root disease can be found throughout the state, often functioning as a weak parasite, killing trees experiencing environmental stress. In southern Utah, it may act as a primary pathogen, killing mature and immature ponderosa pine and mature fir and spruce on cool sites at higher elevations. It often acts as a thinning agent in young stands or in areas with thin, poor soils. Symptoms of Armillaria include heavy resinosis at the root collar, and thick fan-shaped mats of white fungus tissue under the bark where root and root collar tissue are dying. The fungus produces rhizomorphs, black

stringy structures that can move through the soil a few feet to infect other roots. When present, mushroom type fruiting bodies grow in clusters from the roots or at the base of the tree. The decay caused by the fungus is yellowish and stringy/spongy and often contains black lines called zone lines.

Blackstain root disease
Leptographium wageneri

Host: Pinyon pine

Black stain root disease is an important disease of several hosts, but it is only found on pinyon pine in the State of Utah. 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 hosts for low-level populations of engraver beetles (*Ips confuses*). The current outbreak of pinyon Ips beetles has obscured almost all previously visible blackstain root disease centers, and the status of these centers will be difficult to determine until this outbreak subsides.

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 2 is the list of plants declared noxious weeds by the state of Utah or specific counties.

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

http://cdfa.ca.govphpps/ipc/encycloweedia_hp.htm
California Department of Food and Agriculture has a very comprehensive webpage. Information includes description, biology, distribution, habitat, management of plants and control methods. Pictures of the plants in various stages are just a click away.

http://www.nwcb.wa.gov
State of Washington's noxious weed control board webpage has information on buffalobur, camelthorn, hoary cress, goatsrue, houndstongue, johnsongrass, diffuse, Russian and spotted knapweed, purple loosestrife, silverleaf nightshade, yellow nutsedge, perennial pepperweed, puncturevine, leafy spurge, St. Johnswort, yellow starthistle, Canada thistle, musk thistle, scotch thistle, Dalmation toadflax, velvetleaf, and dyer's woad. 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
University of California pest management webpage has information on bermudagrass, field bindweed, yellow nutsedge, and yellow starthistle. Topics include identification and management through cultural and chemical control options.

http://www.ext.colostate.edu/pubs/natres/pubnatr.html#range
Colorado State University Cooperative Extension webpage has factsheets on musk thistle, leafy spurge, Canada thistle, toadflaxes, and diffuse, Russian, and spotted knapweeds. Information includes description, distribution, phenology, and management options such as cultural, chemical and biological.

http://www.nps.gov/plants/alien/common.htm
The National Park Service hosts the Plant Conservation Alliances weed webpage. Currently they have information on Canada thistle, leafy spurge, purple loosestrife, Russian olive, and musk thistle. Information includes native range, description, ecological threat, distribution, habitat, background, methods of reproduction and dispersal, and current management approaches.

http://www.fs.fed.us/pnw/bmnri/weeds.htm
The Blue Mountain Natural Research Institute for the USDA Forest Service website focuses on control and identification. Invasive plant species included are diffuse, Russian, and spotted knapweed, purple loosestrife, perennial pepperweed, puncturevine, medusahead, yellow starthistle, Canada thistle, musk thistle, scotch thistle, dalmation toadflax, St. Johnswort, leafy spurge, hoary cress and dyer's woad.

http://weedcenter.org/info/weedlist.html
An interagency website housed at the Montana State University. It has information on Field Bindweed, Canada Thistle, Dalmatian Toadflax, Diffuse Knapweed, Leafy Spurge, musk thistle, poison hemlock, puncturevine, purple loosestrife, Russian knapweed, spotted knapweed, squarrose knapweed, St. johnswort, and yellow starthistle. Topics include biology, distribution, habitat, and history.

http://www.dcr.state.va.us/dnh/invlist.htm

The Virginia Department of Conservation and Recreation webpage has fact sheets on Russian Olive, Canada thistle, Johnsongrass, purple loosestrife, and spotted knapweed. Information is in PDF format with line drawings of the plant with description, distribution, control,

The following webpages have links to other sites with information on invasive and noxious weeds.

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.

http://www.invasivespecies.gov/profiles/main.shtml#terplants
National Biological Information Infrastructure website has links to other websites with information on leafy spurge, musk thistle, Russian knapweed, Russian olive, scotch thistle, spotted knapweed, and yellow star thistle.

Table 2. Utah noxious weeds by county

	State Declared Noxious Weeds [1]																	
County	Bermudagrass*	Field Bindweed*	Hoary Cress*	Johnsongrass*	Diffuse Knapweed*	Russian Knapweed*	Spotted Knapweed*	Squarrose Knapweed*	Purple Loosestrife*	Medusahead*	Perennial Pepperweed*	Quackgrass*	Leafy Spurge*	Yellow Starthistle*	Canada Thistle*	Musk Thistle*	Scotch Thistle*	Dyer's Woad*
Beaver	+	+	+	+			+				+	+			+		+	
Box Elder		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+
Cache	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+
Carbon		+	+			+	+					+	+		+	+	+	+
Daggett											+	+			+	+		+
Davis	+	+	+	+	+		+		+		+	+	+	+	+	+	+	+
Duchesne		+	+			+	+		+		+	+	+		+	+	+	+
Emery	+	+	+			+	+		+		+	+	+		+	+	+	
Garfield		+	+		+	+						+			+	+	+	
Grand	+	+	+		+	+	+		+		+				+	+	+	+
Iron		+	+		+	+	+		+		+	+			+	+	+	+
Juab	+	+	+	+	+	+	+	+	+		+	+	+		+	+	+	+
Kane		+		+		+											+	
Millard		+	+		+	+	+	+			+	+			+	+	+	+
Morgan	+	+	+		+	+	+				+	+	+		+	+	+	+
Piute		+	+	+								+			+	+	+	
Rich		+	+			+	+				+	+	+	+	+	+	+	+
Salt Lake	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
San Juan		+	+	+	+	+	+	+			+				+	+	+	+
Sanpete		+	+			+		+			+	+	+		+	+	+	+
Sevier		+	+			+	+	+			+	+	+		+	+	+	
Summit		+	+			+	+				+	+	+		+	+	+	+
Tooele	+	+	+			+	+	+			+	+	+		+	+	+	
Uintah		+	+			+	+		+		+	+	+		+	+	+	+
Utah	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
Wasatch		+	+			+	+	+			+	+	+	+	+	+	+	+
Washington		+	+	+	+	+	+	+			+	+		+			+	
Wayne		+	+	+		+						+	+		+			
Weber	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+

	County Declared Noxious Weeds [2] (Invading Weeds)																
County	Buffalobur	Camelthorn*	Goatsrue*	Jointed Goatgrass*	Poison Hemlock*	Black Henbane*	Houndstongue*	Blue-flowering Lettuce	Western Whorled Milkweed	Silverleaf Nightshade	Yellow Nutsedge*	Russian Olive*	Puncturevine*	St. Johnswort*	Dalmatian Toadflax*	Yellow Toadflax*	Velvetleaf*
Beaver																	
Box Elder														+			
Cache	+		+		+						+		+				
Carbon												+					
Daggett																	
Davis	+				+						+						
Duchesne												+					
Emery																	
Garfield																	
Grand																	
Iron									+								
Juab								+									
Kane									+								
Millard	+																
Morgan																	
Piute																	
Rich						+											
Salt Lake																	
San Juan	+	+		+					+	+							
Sanpete							+										+
Sevier												+					
Summit																	
Tooele																	
Uintah												+					
Utah																	
Wasatch							+								+	+	
Washington									+								
Wayne												+					
Weber													+				

[1] List of where the weed is reported as noted in county year-end reports.

[2] List of counties that have declared the specific weed noxious. The weed may or may not be present in other counties.

* Exotic plant introduced from another country

Appendix A: Tables of Damage by County:

2002 Insect-caused Tree Mortality by County.

County	Douglas-fir Beetle		Fir Engraver Beetle		Mountain Pine Beetle		Pinyon Engraver Beetle		Spruce Beetle		Subalpine Fir Mortality	
	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Beaver	150	75	209	76	450	157	154	49	7,789	1,236	1,168	261
Cache	401	154	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -
Carbon	2,097	742	150	75	320	88	331	209	1,840	539	580	141
Duchesne	7,327	2,500	- 0 -	- 0 -	59,190	20,517	649	303	200	68	4,670	602
Emery	1,450	538	210	55	30	15	- 0 -	- 0 -	18,377	3,938	540	114
Garfield	430	169	230	67	81	40	84	42	28,104	6,881	84,134	12,861
Grand	27	13	100	50	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	1,330	426
Iron	20	10	260	91	30	15	2,166	2,166	170	45	430	86
Juab	300	49	721	240	- 0 -	- 0 -	- 0 -	- 0 -	2,161	251	- 0 -	- 0 -
Kane	200	36	- 0 -	- 0 -	978	455	20	10	150	75	- 0 -	- 0 -
Millard	1,320	611	127	63	250	113	40	20	- 0 -	- 0 -	540	153
Morgan	- 0 -	- 0 -	493	228	- 0 -	- 0 -	- 0 -	- 0 -	130	86	360	87
Piute	110	55	1,051	464	- 0 -	- 0 -	20	10	- 0 -	- 0 -	12,709	1,491
Salt Lake	- 0 -	- 0 -	0	0	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -
San Juan	440	219	200	31	454	191	- 0 -	- 0 -	310	82	8,832	1,463
Sanpete	360	111	1,551	638	180	90	3,270	1,099	61,038	12,374	2,210	638
Sevier	1,168	514	437	220	50	25	2,119	702	12,473	2,972	38,393	5,455
Summit	- 0 -	- 0 -	277	137	6,133	2,280	- 0 -	- 0 -	500	237	17,161	2,602
Uintah	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	260	93	- 0 -	- 0 -	- 0 -	- 0 -
Utah	2,513	976	2,239	726	- 0 -	- 0 -	3,357	1,416	50	25	3,873	519
Wasatch	3,942	1,556	320	95	8,179	2,882	70	35	410	204	25,598	4,390
Wayne	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	640	190	6,700	653
Total	22,255	8,328	8,575	3,256	76,325	26,868	12,540	6,154	134,342	29,203	209,228	31,942

Note: Box Elder, Davis, Rich and Salt Lake Counties had less than one percent of the total county surveyed and may not be represented on this table.

2002 Tree Defoliation by County.

County	Aspen Decline	Aspen Leaf Blight	Forest Tent Caterpillar	Needle Cast-Elytroderma	Western Spruce Budworm
	Acres	Acres	Acres	Acres	Acres
Beaver	- 0 -	- 0 -	25	- 0 -	529
Garfield	- 0 -	672	- 0 -	1,005	1,009
Iron	- 0 -	38	- 0 -	- 0 -	1,829
Juab	- 0 -	- 0 -	245	- 0 -	30
Piute	- 0 -	- 0 -	- 0 -	- 0 -	1,084
San Juan	- 0 -	- 0 -	64	- 0 -	- 0 -
Sanpete	- 0 -	- 0 -	- 0 -	- 0 -	964
Sevier	- 0 -	- 0 -	32	- 0 -	180
Summit	155	- 0 -	- 0 -	- 0 -	- 0 -
Utah	- 0 -	80	36	- 0 -	46
Wasatch	2,406	329	- 0 -	- 0 -	274
Wayne	- 0 -	- 0 -	- 0 -	- 0 -	1,018
Total	2,561	1,119	402	1,005	6,963

2003 Insect-caused Tree Mortality by County.

County	Douglas-fir Beetle		Fir Engraver Beetle		Mountain Pine Beetle		Pinyon Engraver Beetle		Spruce Beetle		Subalpine Fir Mortality	
	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Beaver	629	322	996	766	360	138	101,085	10,934	1,545	676	2,422	532
Box Elder	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	20	10	50	25
Cache	2,374	875	- 0 -	- 0 -	251	102	- 0 -	- 0 -	30	15	2,230	718
Carbon	6,153	2,024	250	104	- 0 -	- 0 -	70,031	8,355	1,231	370	9,485	2,289
Daggett	1,277	530	- 0 -	- 0 -	14	3	- 0 -	- 0 -	- 0 -	- 0 -	50	25
Duchesne	11,119	3,685	- 0 -	- 0 -	202,500	34,581	154,746	16,777	12,742	4,214	9,930	2,797
Emery	3,872	1,398	- 0 -	- 0 -	- 0 -	- 0 -	100	50	14,848	3,320	405	145
Garfield	4,126	1,696	864	283	680	493	202,636	27,039	6,434	1,079	29,063	8,096
Grand	3,232	1,187	120	48	- 0 -	- 0 -	46,064	5,834	- 0 -	- 0 -	3,880	521
Iron	1,847	760	588	309	348	160	377,261	31,523	1,265	861	20	10
Juab	754	497	3,183	1,372	- 0 -	- 0 -	- 0 -	- 0 -	800	195	130	66
Kane	2,150	961	1,019	292	362	870	501	72	850	698	2,280	788
Millard	1,344	627	1,180	403	- 0 -	- 0 -	1,891	387	87	45	- 0 -	- 0 -
Morgan	- 0 -	- 0 -	350	63	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	400	89
Piute	1,705	785	608	395	- 0 -	- 0 -	35,596	7,179	97	48	5,890	1,534
Rich	- 0 -	- 0 -	- 0 -	- 0 -	13	3	- 0 -	- 0 -	- 0 -	- 0 -	310	127
Salt Lake	80	40	410	146	20	10	- 0 -	- 0 -	- 0 -	- 0 -	2,334	443
San Juan	2,740	1,113	100	50	341	169	534,622	78,650	61	31	5,251	1,336
Sanpete	1,258	511	5,422	2,921	131	66	5,182	1,084	56,383	10,782	1,470	490
Sevier	3,763	1,741	1,881	948	- 0 -	- 0 -	16,716	3,694	4,321	1,749	17,933	4,142
Summit	1,200	522	750	143	61,389	10,725	- 0 -	- 0 -	781	249	22,405	4,933
Uintah	2,575	959	- 0 -	- 0 -	38	19	125,113	14,509	200	48	870	304
Utah	4,430	2,205	5,980	2,486	- 0 -	- 0 -	10,179	2,040	270	84	2,595	622
Wasatch	4,382	1,920	1,480	782	39,923	6,910	- 0 -	- 0 -	150	75	19,305	5,524
Washington	1,510	669	1,769	659	22	11	400	144	- 0 -	- 0 -	659	307
Wayne	200	100	- 0 -	- 0 -	- 0 -	- 0 -	10,680	2,136	180	60	1,060	342
Weber	73	37	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	870	207
Total	62,793	25,164	26,950	12,170	306,392	54,260	1,692,803	210,407	102,295	24,609	141,297	36,412

2003 Defoliation by County.

County	Douglas-fir Tussock Moth	Forest Tent Caterpillar	Needle Cast - Elytroderma	Western Spruce Budworm
	Acres	Acres	Acres	Acres
Beaver	- 0 -	49	- 0 -	767
Cache	- 0 -	60	- 0 -	- 0 -
Carbon	- 0 -	195	- 0 -	364
Davis	- 0 -	47	- 0 -	- 0 -
Garfield	- 0 -	- 0 -	618	3,716
Grand	- 0 -	464	- 0 -	- 0 -
Iron	- 0 -	- 0 -	- 0 -	2,715
Kane	- 0 -	- 0 -	7,572	888
Millard	- 0 -	- 0 -	- 0 -	33
Piute	- 0 -	21	- 0 -	1,349
Rich	- 0 -	41	- 0 -	- 0 -
Salt Lake	- 0 -	120	- 0 -	- 0 -
Sanpete	- 0 -	294	- 0 -	852
Sevier	- 0 -	152	- 0 -	1,165
Summit	- 0 -	122	- 0 -	- 0 -
Utah	- 0 -	44	- 0 -	65
Wasatch	- 0 -	60	- 0 -	260
Washington	949	- 0 -	- 0 -	- 0 -
Wayne	- 0 -	- 0 -	- 0 -	2,615
Weber	- 0 -	152	- 0 -	- 0 -
Total	949	1,821	8,190	14,789

2004 Insect-caused Tree Mortality by County.

County	Douglas-fir Beetle		Fir Engraver Beetle		Mountain Pine Beetle		Pinyon Engraver Beetle		Spruce Beetle		Subalpine Fir Mortality	
	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Beaver	2,601	534	4,013	1,200	- 0 -	- 0 -	1,311	270	1,724	886	996	258
Box Elder	195	162	77	38	110	51	- 0 -	- 0 -	60	30	5,018	1,595
Cache	6,169	1,890	- 0 -	- 0 -	689	169	- 0 -	- 0 -	60	30	6,042	1,203
Carbon	16,911	5,063	1,631	349	- 0 -	- 0 -	30,622	6,124	1,256	450	12,196	2,787
Daggett	22,273	5,700	- 0 -	- 0 -	5,291	1,058	- 0 -	- 0 -	- 0 -	- 0 -	13,709	4,147
Davis	- 0 -	- 0 -	900	234	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	100	24
Duchesne	38,393	8,846	- 0 -	- 0 -	719,501	68,421	283,028	36,123	14,889	6,123	3,010	706
Emery	8,127	2,536	5,793	1,224	50	25	7,284	1,446	13,008	3,258	500	73
Garfield	9,809	2,316	43,419	8,738	2,197	890	403,230	69,801	34,935	6,671	73,909	14,017
Grand	249	79	125	28	- 0 -	- 0 -	43,645	8,099	40	20	900	108
Iron	3,576	936	21,835	4,906	228	103	25,618	4,757	4,192	1,917	160	54
Juab	36	18	19,196	5,764	- 0 -	- 0 -	- 0 -	- 0 -	500	97	- 0 -	- 0 -
Kane	4,370	1,521	112,153	21,079	2,750	904	250	113	1,746	793	400	114
Millard	824	397	4,268	1,822	- 0 -	- 0 -	- 0 -	- 0 -	35	17	112	56
Morgan	- 0 -	- 0 -	10,562	1,067	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	3,534	630
Piute	4,432	790	2,623	1,002	50	25	8,642	1,792	260	88	6,200	2,177
Rich	505	141	- 0 -	- 0 -	622	121	- 0 -	- 0 -	150	40	4,239	1,010
Salt Lake	870	190	12,844	1,842	80	40	- 0 -	- 0 -	250	77	4,776	799
San Juan	2,049	411	4,010	1,104	528	151	238,335	32,945	408	143	5,001	967
Sanpete	2,359	869	44,494	12,598	400	169	892	178	23,491	5,908	5,276	1,317
Sevier	2,971	828	20,298	4,555	401	92	799	160	8,266	3,454	14,772	5,198
Summit	2,751	813	26,963	3,087	434,422	58,773	- 0 -	- 0 -	4,435	1,745	60,076	10,663
Toole	1,799	448	1,365	252	20	10	17,166	1,989	- 0 -	- 0 -	400	65
Uintah	25,408	6,750	- 0 -	- 0 -	19,806	4,309	- 0 -	- 0 -	11,086	5,094	300	106
Utah	19,018	4,690	110,564	17,781	100	50	551	142	791	286	11,617	2,360
Wasatch	18,268	4,143	26,509	2,661	73,799	9,437	- 0 -	- 0 -	1,650	500	59,347	10,778
Washington	2,709	733	51,403	10,846	- 0 -	- 0 -	20,675	2,314	- 0 -	- 0 -	550	120
Wayne	19	41	2,893	645	- 0 -	- 0 -	813	163	105	144	2,227	489
Weber	400	143	4,200	900	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	- 0 -	2,138	395
Total	197,091	50,988	532,138	103,722	1,261,044	144,798	1,082,861	166,416	123,337	37,771	297,505	62,216

2004 Defoliation by County.

County	Douglas-fir Tussock Moth	Forest Tent Caterpillar	Western Spruce Budworm
	Acres	Acres	Acres
Beaver	- 0 -	- 0 -	902
Box Elder	- 0 -	214	- 0 -
Cache	- 0 -	2,423	- 0 -
Carbon	- 0 -	125	245
Garfield	- 0 -	1,071	4,577
Iron	- 0 -	260	6,503
Kane	24	62	62
Piute	- 0 -	38	604
Rich	- 0 -	139	- 0 -
Salt Lake	- 0 -	54	- 0 -
San Juan	- 0 -	193	- 0 -
Sanpete	- 0 -	379	509
Sevier	- 0 -	- 0 -	1,116
Summit	- 0 -	55	- 0 -
Utah	- 0 -	298	111
Wasatch	- 0 -	1,963	139
Washington	3	- 0 -	- 0 -
Wayne	- 0 -	- 0 -	5,223
Weber	- 0 -	4,929	- 0 -
Total	27	12,203	19,991

Appendix B: Table of Survey Acres by County

Area Surveyed by County by Year.

County	Total Acres in the County	2002		2003		2004	
		Acres Surveyed	% of County	Acres Surveyed	% of County	Acres Surveyed	% of County
Beaver	1,688,891	190,359	11.3	213,434	12.6	212,858	12.6
Box Elder	4,327,334	98	T	14,713	T	296,627	6.9
Cache	766,238	59,787	7.8	471,215	61.5	478,511	62.5
Carbon	985,294	260,006	26.4	493,531	50.1	306,780	31.1
Daggett	452,438	- 0 -	- 0 -	184,349	40.8	177,929	39.3
Davis	407,711	3,782	1.0	52,664	12.9	53,821	13.2
Duchesne	2,080,952	1,040,641	50.0	1,156,490	55.6	941,401	45.2
Emery	2,823,430	289,366	10.3	284,549	10.1	416,263	14.7
Garfield	3,339,030	1,064,276	31.9	1,292,256	38.7	1,213,903	36.4
Grand	2,342,079	327,861	14.0	591,328	25.3	159,418	6.8
Iron	2,106,247	179,861	8.5	372,894	17.7	430,005	20.4
Juab	2,218,215	197,232	8.9	201,875	9.1	252,435	11.4
Kane	2,609,267	67,514	2.6	319,720	12.3	308,809	11.8
Millard	4,339,806	397,714	9.2	392,509	9.0	529,934	12.2
Morgan	390,948	68,752	17.6	79,563	20.4	152,042	38.9
Piute	493,363	250,945	50.9	291,438	59.1	319,519	64.8
Rich	657,247	248	T	31,950	4.9	79,463	12.1
Salt Lake	508,123	2,457	0.5	152,717	30.1	153,664	30.2
San Juan	5,065,358	499,556	9.9	993,099	19.6	571,435	11.3
Sanpete	1,003,407	556,592	55.5	620,253	61.8	860,654	85.8
Sevier	1,232,357	896,940	72.8	885,513	71.9	1,096,417	89.0
Summit	1,202,818	464,155	38.6	708,925	58.9	518,993	43.2
Toole	4,648,052	- 0 -	- 0 -	- 0 -	- 0 -	93,721	2.0
Uintah	2,892,637	510,926	17.7	967,886	33.5	264,188	9.1
Utah	1,387,836	592,897	42.7	657,430	47.4	693,866	50.0
Wasatch	779,659	671,983	86.2	657,505	84.3	556,443	71.4
Washington	1,536,110	- 0 -	- 0 -	235,350	15.3	269,229	17.5
Wayne	1,590,610	199,707	12.6	175,234	11.0	234,334	14.7
Weber	421,458	- 0 -	- 0 -	167,326	39.7	201,255	47.8
Total	54,296,915	8,793,655	16.2	12,665,716	23.3	11,843,917	21.8

Appendix C: Tables of Damage by Ownership

Bark Beetle Damage by Ownership

OWNERSHIP	2002		2003		2004		2002		2003		2004		2002		2003		2004	
	Douglas-fir Beetle		Douglas-fir Beetle		Douglas-fir Beetle		Fir Engraver Beetle		Fir Engraver Beetle		Fir Engraver Beetle		Mountain Pine Beetle		Mountain Pine Beetle		Mountain Pine Beetle	
	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Ashley NF Total	4573	1040	9455	2742	53301	12014	0	0	0	0	0	0	49488	16950	142588	26182	605086	63352
Duchesne RD	4573	1040	7414	2024	20163	4218	0	0	0	0	0	0	11509	2673	35333	7610	221977	20136
Flaming Gorge RD	NF	NF	1461	536	18962	4300	NF	NF	0	0	0	0	NF	NF	924	102	15450	2759
Roosevelt RD	0	0	60	20	554	105	0	0	0	0	0	0	37979	14277	97894	16855	332248	35633
Vernal RD	NF	NF	520	162	13622	3391	NF	NF	0	0	0	0	NF	NF	8437	1615	35411	4824
Dixie NF Total	634	141	6759	2066	13651	3240	397	114	2778	1016	174243	34208	1055	471	1282	1382	3386	1191
Cedar City RD	0	0	1629	495	9238	2166	397	114	857	352	40075	8299	14	10	932	1059	1687	606
Escalante RD	0	0	200	40	100	20	0	0	300	92	36152	7308	40	20	330	313	370	161
Pine Valley RD	NF	NF	1251	346	763	191	NF	NF	1621	572	33890	7305	NF	NF	20	10	0	0
Powell RD	634	141	3539	1125	3550	863	0	0	0	0	61056	10695	1001	441	0	0	1294	399
Teasdale RD	0	0	140	60	0	0	0	0	0	0	3070	601	0	0	0	0	35	25
Fishlake NF Total	2621	761	7210	2263	10469	2670	1590	377	3775	1992	25590	7560	729	205	351	133	50	10
Beaver RD	260	80	1887	638	6845	1298	1182	238	1486	1084	7367	2406	449	107	351	133	50	10
Fillmore RD	2037	581	2335	711	1114	551	74	20	1278	467	4561	2000	250	88	0	0	0	0
Loa RD	104	40	1379	423	430	307	0	0	0	0	272	106	0	0	0	0	0	0
Richfield RD	220	60	1609	491	2080	514	334	119	1011	441	13390	3048	30	10	0	0	0	0
Manti-LaSal NF Total	2460	615	9119	2946	16247	3961	3155	1015	3658	2134	65393	14559	512	185	330	163	1282	202
Ferron RD	711	179	2647	798	3861	1117	231	45	0	0	4632	752	200	90	131	65	851	
Moab RD	0	0	684	195	1944	402	100	20	73	22	775	156	232	65	88	43	253	71
Monticello RD	440	90	2471	735	1995	327	199	31	0	0	3230	730	50	20	111	55	178	69
Price RD	1088	280	3120	1163	7666	1762	1557	394	211	62	23203	3474	0	0	0	0	0	0
Sanpete RD	221	66	197	55	781	353	1068	525	3374	2050	33553	9447	30	10	0	0	0	0
Uinta NF Total	3475	896	4117	1488	15274	3536	1262	361	7262	2958	113368	17486	0	0	50	20	4040	862
Heber RD	220	60	346	97	3670	756	60	10	900	472	21953	1980	0	0	50	20	3990	852
Pleasant Grove RD	110	45	370	123	2672	793	40	10	695	227	4555	846	0	0	0	0	50	10
Spanish Fork RD	3145	791	3401	1268	8932	1987	1162	341	5667	2259	86860	14660	0	0	0	0	0	0
Wasatch Cache NF Total	711	268	2445	803	9021	1927	0	0	558	149	14290	2295	23323	8498	154640	24674	659426	72692
Evanston RD	0	0	0	0	295	133	0	0	0	0	0	0	1074	173	3428	901	181075	20105
Kamas RD	340	149	864	354	1197	232	0	0	235	55	2544	471	22249	8325	150923	23676	382477	44498
Logan RD	371	119	1042	288	2543	463	0	0	0	0	0	0	0	0	134	60	438	97
Mountain View RD	0	0	369	91	1685	411	0	0	0	0	0	0	0	0	135	27	95416	7982
Ogden RD	NF	NF	90	35	741	115	NF	NF	0	0	859	176	NF	NF	20	10	0	0
Salt Lake RD	0	0	80	35	2560	573	0	0	323	94	10887	1648	0	0	0	0	20	10
Bureau of Land Management	1157	276	5700	1814	23149	7007	0	0	1036	299	4366	896	300	78	0	0	165	55
National Parks & Monuments Total	0	0	747	187	2922	1676	0	0	0	0	9426	1892	0	0	0	0	264	63
Bryce Canyon	0	0	617	136	183	40	0	0	0	0	8882	1805	0	0	0	0	264	63
Capital Reef	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cedar Breaks	NF	NF	0	0	84	19	NF	NF	0	0	27	7	NF	NF	0	0	0	0
Glen Canyon	NF	NF	30	10	712	1101	NF	NF	0	0	0	0	NF	NF	0	0	0	0
Timpanogos Cave	NF	NF	0	0	0	0	NF	NF	0	0	367	50	NF	NF	0	0	0	0
Zion	NF	NF	100	41	1943	516	NF	NF	0	0	150	30	NF	NF	0	0	0	0
Uinta & Ouray IR	450	120	1606	550	1614	640	0	0	0	0	0	0	30	10	866	433	2484	627
Utah State Lands Total	1349	428	2935	950	11084	2445	562	80	575	172	7359	1770	194	70	217	80	1045	226
Wasatch Mtn State Park	0	0	0	0	0	0	0	0	149	75	1520	163	0	0	0	0	0	0
Private	4805	1170	12571	4217	42578	10422	1595	453	7149	2513	117475	22127	584	195	1239	333	70342	11205

Bark Beetle Damage by Ownership (continued)

OWNERSHIP	2002		2003		2004		2002		2003		2004		2002		2003		2004	
	Spruce Beetle		Spruce Beetle		Spruce Beetle		Subalpine Fir Mortality		Subalpine Fir Mortality		Subalpine Fir Mortality		Pinyon Engraver Beetle		Pinyon Engraver Beetle		Pinyon Engraver Beetle	
	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Ashley NF Total	30	10	4886	2920	15633	8102	6460	840	6380	1295	23028	6154	140	40	34385	3804	153600	10240
Duchesne RD	30	10	2476	1238	647	122	6061	765	5400	922	8582	1665	140	40	34385	3804	153600	10240
Flaming Gorge RD	NF	NF	50	10	0	0	NF	NF	50	10	10179	3046	NF	NF	0	0	0	0
Roosevelt RD	0	0	2161	1624	1886	870	399	75	100	79	251	170	0	0	0	0	0	0
Vernal RD	NF	NF	199	48	13100	7110	NF	NF	830	284	4016	1273	NF	NF	0	0	0	0
Dixie NF Total	28271	6838	8347	2501	40277	9166	86699	13027	30635	8514	76877	14654	684	634	104601	17112	200366	33249
Cedar City RD	0	0	1784	1446	5215	2503	350	52	20	10	0	0	594	594	56637	8079	15275	2205
Escalante RD	17579	4387	2332	556	33462	6353	69073	10987	23860	6623	65146	12246	0	0	0	0	33815	5194
Pine Valley RD	NF	NF	0	0	0	0	NF	NF	60	10	551	105	NF	NF	354	133	18520	1867
Powell RD	10662	2441	4231	499	1498	298	0	0	558	183	381	110	90	40	47610	8900	130741	23570
Teasdale RD	30	10	0	0	102	12	17276	1988	6137	1688	10799	2193	0	0	0	0	2015	413
Fishlake NF Total	19834	4046	5945	2378	9875	4261	53115	6940	23265	4945	19563	6884	2246	704	52111	10261	4829	985
Beaver RD	7758	1170	1544	665	1770	805	6524	1302	3923	868	2112	626	158	42	34180	6425	4314	882
Fillmore RD	0	0	87	25	35	20	400	100	0	0	112	56	131	55	4830	980	0	0
Loa RD	2926	847	1317	358	2281	1220	34586	4213	13542	2144	10922	4009	0	0	8420	1688	270	54
Richfield RD	9150	2029	2997	1330	5789	2216	11605	1325	5800	1933	6417	2193	1957	607	4681	1168	245	49
Manti-LaSal NF Total	76907	15419	70213	13638	33563	8377	11528	2221	8861	2034	15619	3457	80	20	96154	11712	122176	20283
Ferron RD	42874	8367	52438	8563	6384	2576	100	20	701	127	1818	464	0	0	50	10	6625	1325
Moab RD	70	20	40	20	248	119	2048	617	1737	247	1101	168	0	0	615	144	29430	5886
Monticello RD	239	47	21	15	202	40	6898	1003	4168	958	4300	793	0	0	95428	11540	86020	13050
Price RD	10782	2426	6325	1706	23442	4765	1233	286	1698	530	5687	1416	0	0	51	13	101	22
Sanpete RD	22942	4559	11389	3334	3287	877	1249	295	557	172	2713	616	80	20	10	5	0	0
Uinta NF Total	410	135	501	179	1138	303	18157	2557	16035	4694	55046	9852	3231	1353	8270	1654	0	0
Heber RD	360	115	130	50	998	273	16988	2355	13680	4139	49568	8861	0	0	0	0	0	0
Pleasant Grove RD	0	0	20	10	0	0	160	30	1336	249	4252	712	0	0	0	0	0	0
Spanish Fork RD	50	20	351	119	140	30	1009	172	1019	306	1226	279	3231	1353	8270	1654	0	0
Wasatch Cache NF Total	489	207	8784	1503	15482	4867	8318	1581	11748	2551	35191	8144	0	0	0	0	375	75
Evanston RD	30	10	50	10	1510	605	7143	1379	2034	485	19118	5303	0	0	0	0	0	0
Kamas RD	459	197	8684	1473	13649	4188	468	87	5280	1109	5665	841	0	0	0	0	0	0
Logan RD	0	0	30	10	20	10	0	0	1268	277	4063	806	0	0	0	0	0	0
Mountain View RD	0	0	0	0	0	0	99	37	1705	341	671	136	0	0	0	0	0	0
Ogden RD	NF	NF	20	10	161	25	NF	NF	707	146	2456	545	NF	NF	0	0	0	0
Salt Lake RD	0	0	0	0	142	39	608	78	754	193	3218	513	0	0	0	0	375	75
Bureau of Land Management	5	3	117	85	474	215	216	34	1286	279	1842	384	1585	1342	584461	82941	301321	49384
National Parks & Monuments Total	0	0	0	0	0	0	1787	251	0	0	100	24	0	0	0	0	14420	2884
Bryce Canyon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12250	2450
Capital Reef	0	0	0	0	0	0	1787	251	0	0	0	0	0	0	0	0	0	0
Cedar Breaks	NF	NF	0	0	0	0	NF	NF	0	0	100	24	NF	NF	0	0	0	0
Glen Canyon	NF	NF	0	0	0	0	NF	NF	0	0	0	0	NF	NF	0	0	0	0
Timpanogos Cave	NF	NF	0	0	0	0	NF	NF	0	0	0	0	NF	NF	0	0	0	0
Zion	NF	NF	0	0	0	0	NF	NF	0	0	0	0	NF	NF	0	0	2170	434
Uinta & Ouray IR	0	0	0	0	0	0	80	10	3326	817	211	91	195	65	200050	21537	96981	19408
Utah State Lands Total	3268	656	429	142	1352	307	1397	203	3486	1016	2026	362	805	510	121103	17704	101815	16456
Wasatch Mtn State Park	0	0	0	0	0	0	40	10	102	19	164	18	0	0	0	0	0	0
Private	5157	1268	2977	742	5201	1459	21538	2941	36034	8803	64831	10553	3561	1338	103284	14540	82936	12518

Defoliators and Miscellaneous Damage Agents by Ownership

OWNERSHIP	2002 Forest Tent Caterpillar Acres	2003 Forest Tent Caterpillar Acres	2004 Forest Tent Caterpillar Acres	2002 Western Spruce Budworm Acres	2003 Western Spruce Budworm Acres	2004 Western Spruce Budworm Acres	2003 Douglas-fir Tussock Moth Acres	2004 Douglas-fir Tussock Moth Acres	2002 Aspen Defoliation Acres	2002 Aspen Leaf Blight Acres	2002 Elytro-derma Acres	2003 Elytro-derma Acres	2003 Wind-throw Acres	2004 Oak Mortality Acres
Ashley NF Total	NF	0	0	NF	0	0	0	0	NF	NF	NF	0	0	0
Duchesne RD	NF	0	0	NF	0	0	0	0	NF	NF	NF	0	0	0
Flaming Gorge RD	NF	0	0	NF	0	0	0	0	NF	NF	NF	0	0	0
Roosevelt RD	NF	0	0	NF	0	0	0	0	NF	NF	NF	0	0	0
Vernal RD	NF	0	0	NF	0	0	0	0	NF	NF	NF	0	0	0
Dixie NF Total	0	0	1327	3747	8966	14861	0	0	0	710	1004	7435	0	291
Cedar City RD	0	0	220	2331	3496	5548	0	0	0	38	0	5389	0	52
Escalante RD	0	0	877	398	2338	3945	0	0	0	464	1004	415	0	0
Pine Valley RD	NF	0	0	NF	0	0	0	0	NF	NF	NF	0	0	0
Powell RD	0	0	38	0	0	0	0	0	0	0	0	1541	0	0
Teasdale RD	0	0	192	1018	3132	5368	0	0	0	208	0	0	0	239
Fishlake NF Total	54	97	0	1792	3087	2467	0	0	0	0	0	0	76	0
Beaver RD	22	49	0	528	965	1144	0	0	0	0	0	0	0	0
Fillmore RD	0	0	0	0	33	0	0	0	0	0	0	0	0	0
Loa RD	32	0	0	0	323	0	0	0	0	0	0	0	76	0
Richfield RD	0	48	0	1264	1766	1323	0	0	0	0	0	0	0	0
Manti-LaSal NF Total	64	464	347	768	1263	613	0	0	0	0	0	0	0	1112
Ferron RD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Moab RD	0	0	54	0	0	0	0	0	0	0	0	0	0	0
Monticello RD	64	0	20	0	0	0	0	0	0	0	0	0	0	1112
Price RD	0	464	273	223	1187	608	0	0	0	0	0	0	0	0
Sanpete RD	0	0	0	545	76	5	0	0	0	0	0	0	0	0
Uinta NF Total	0	0	1365	291	228	248	0	0	2084	408	0	0	10	0
Heber RD	0	0	637	245	211	184	0	0	2084	354	0	0	0	0
Pleasant Grove RD	0	0	577	0	0	0	0	0	0	42	0	0	10	0
Spanish Fork RD	0	0	151	46	17	64	0	0	0	12	0	0	0	0
Wasatch Cache NF Total	0	292	1522	0	0	0	0	0	155	0	0	0	87	0
Evanston RD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kamas RD	0	0	55	0	0	0	0	0	155	0	0	0	0	0
Logan RD	0	60	685	0	0	0	0	0	0	0	0	0	0	0
Mountain View RD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ogden RD	NF	104	727	NF	0	0	0	0	NF	NF	NF	0	0	0
Salt Lake RD	0	128	55	0	0	0	0	0	0	0	0	0	87	0
Bureau of Land Management	0	252	63	0	0	0	0	27	0	0	0	0	0	3960
National Parks & Monuments Total	0	0	0	0	0	0	26	0	0	0	0	727	0	37
Bryce Canyon	0	0	0	0	0	0	0	0	0	0	0	727	0	0
Capital Reef	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cedar Breaks	NF	0	0	NF	0	0	0	0	NF	NF	NF	0	0	0
Glen Canyon	NF	0	0	NF	0	0	0	0	NF	NF	NF	0	0	0
Timpanogos Cave	NF	0	0	NF	0	0	0	0	NF	NF	NF	0	0	0
Zion	NF	0	0	NF	0	0	26	0	NF	NF	NF	0	0	37
Uinta & Ouray IR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utah State Lands Total	4	226	539	58	130	54	0	0	27	0	0	0	0	1232
Wasatch Mtn State Park	0	0	308	0	0	0	0	0	0	0	0	0	0	0
Private	280	490	7034	305	1109	1736	923	1736	293	0	0	115	56	9796

Appendix D: Publications

Ross, D.W., G.E. Daterman and A.S. Munson. 2004. Evaluation of the antiaggregation pheromone, 3-methylcyclohex-2-en-1-one (MCH), to protect live spruce from spruce beetle (Coleoptera:Scolytidae) infestation in southern Utah. J. Entomol. Soc. Brit. Columbia Vol. 101, pp. 145-146.

Ross, D.W., G.E. Daterman and A.S. Munson 2005. Spruce beetle (Coleoptera:Scolytidae) response to traps baited with selected semiochemicals in Utah. Western North American Naturalist 65(1), pp 123-126.