

Part 2: Historical Highlights

Insect Conditions Highlights

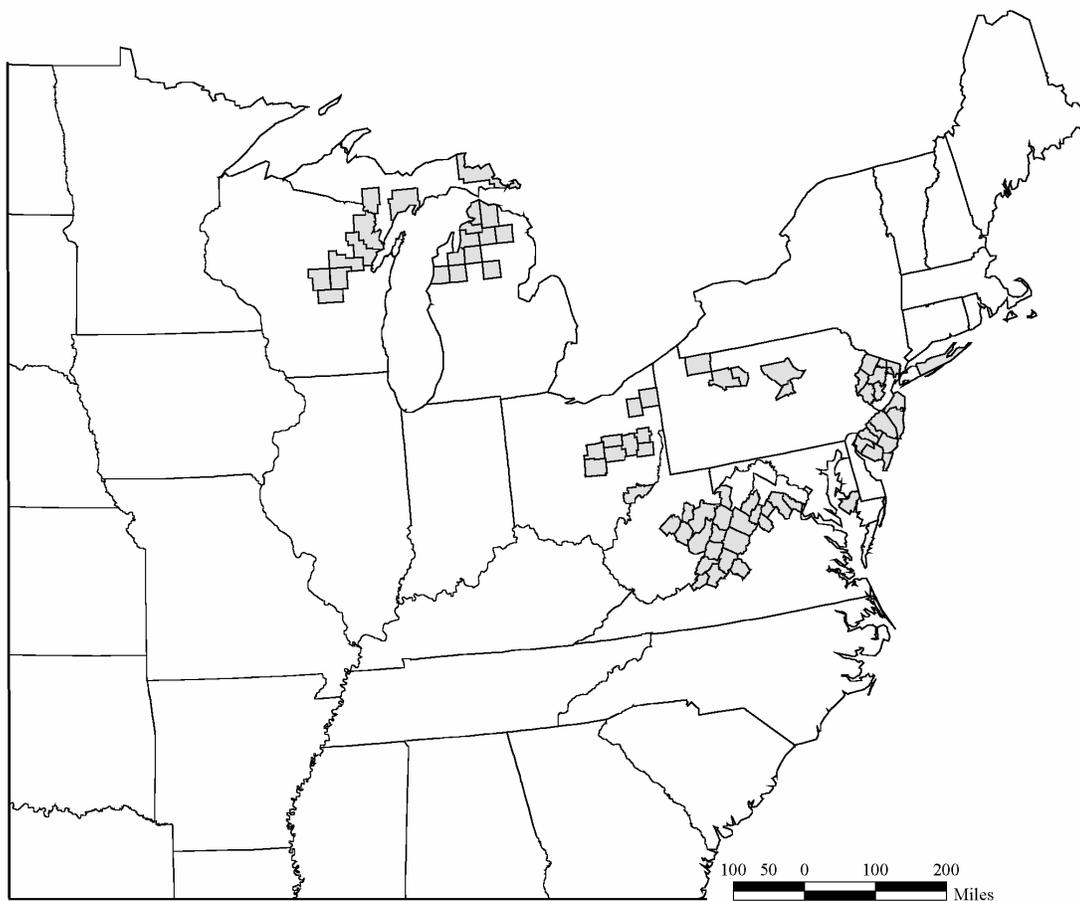
Gypsy moth

Lymantria dispar was intentionally brought into the Boston, Massachusetts, area from France in 1869 to start a silk industry. The moth escaped and continues to spread south and west. In 2002, all or parts of 15 States and the District of Columbia were considered infested. The infested States extend from Maine to Virginia, West Virginia, Ohio, and Michigan.

Defoliation in the East decreased from 410,700 acres in 2002 to 250,900 acres in 2003. Slow The Spread and

other suppression/eradication projects appear to be successful in 12 Eastern and Southern States. Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont reported no defoliation. Maryland, New Jersey, New York, Pennsylvania, Virginia, and West Virginia all report significantly fewer acres of defoliation by gypsy moth. Defoliation increased in Wisconsin from 37,400 acres in 2002 to 99,000 acres in 2003, and for the first time, oak forests on Michigan's upper peninsula were defoliated enough to be included in aerial surveys.

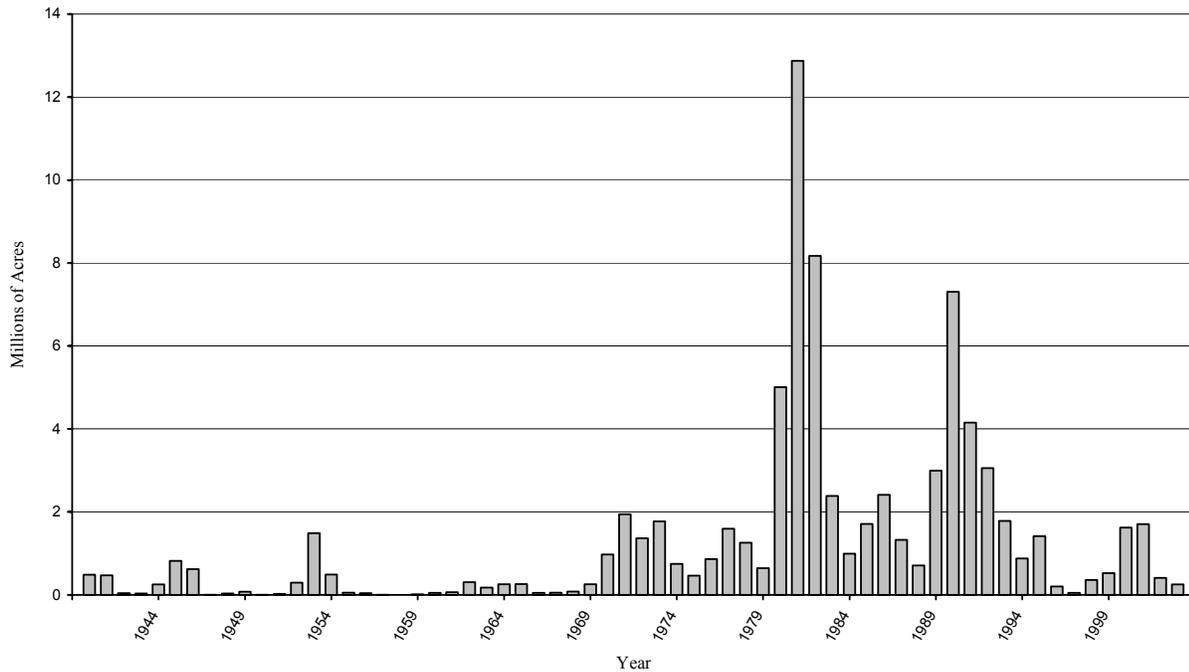
Eastern Counties Where Gypsy Moth (European) Defoliation Was Reported, 2003



Acres of Aerially Detected Gypsy Moth (European) Defoliation, 1999-2003

State	1999	2000	2001	2002	2003
Connecticut	0	200	400	0	0
Delaware	0	0	0	0	0
Maine	0	2,500	29,500	51,500	0
Maryland	1,200	23,200	46,200	14,000	100
Massachusetts	9,800	64,100	48,000	4,700	0
Michigan	176,600	106,300	0	0	46,800
New Hampshire	0	100	8,500	11,800	0
New Jersey	1,400	133,300	140,800	41,900	5,100
New York	6,000	27,500	50,900	7,100	200
Ohio	48,200	23,600	42,500	2,500	4,100
Pennsylvania	281,600	843,000	283,700	55,800	1,800
Rhode Island	0	5,500	8,000	0	0
Vermont	0	0	100	0	0
Virginia	0	71,000	440,000	51,900	79,900
Washington, DC	0	0	0	0	0
West Virginia	0	323,100	603,800	132,100	13,900
Wisconsin	0	100	3,700	37,400	99,000
Total	524,800	1,623,500	1,706,100	410,700	250,900

Gypsy Moth (European) Defoliation, 1940-2003



Southern pine beetle

Dendroctonus frontalis, a native insect, is the most destructive of the eastern species of bark beetles. Southern pine beetle populations are epidemic in some parts of the South almost every year. Infestations usually start in trees weakened by disease, lightning strikes, excessive age, storm damage, or other stress factors. Populations can build quickly as there are three to seven generations per year. Shortleaf, loblolly, Virginia, and pitch pines are preferred hosts.

Southern pine beetle activity declined dramatically over much of the South in 2003 with the affected acreage decreasing from 13,455,900 acres in 2001 to 2,403,000 in 2003. Lingering beetle activity continued in western South Carolina and eastern Tennessee. South Carolina reported 18 counties still in outbreak status. Tennessee reported 12 counties.

Maryland and Ohio reported no beetle activity in 2003. New Jersey reported activity in three counties causing approximately 2,500 acres of mortality.

*Outbreak level is defined as having one or more multi-tree infestations per 1,000 acres of host type.

Counties Where Southern Pine Beetle Outbreaks Were Reported, 2003

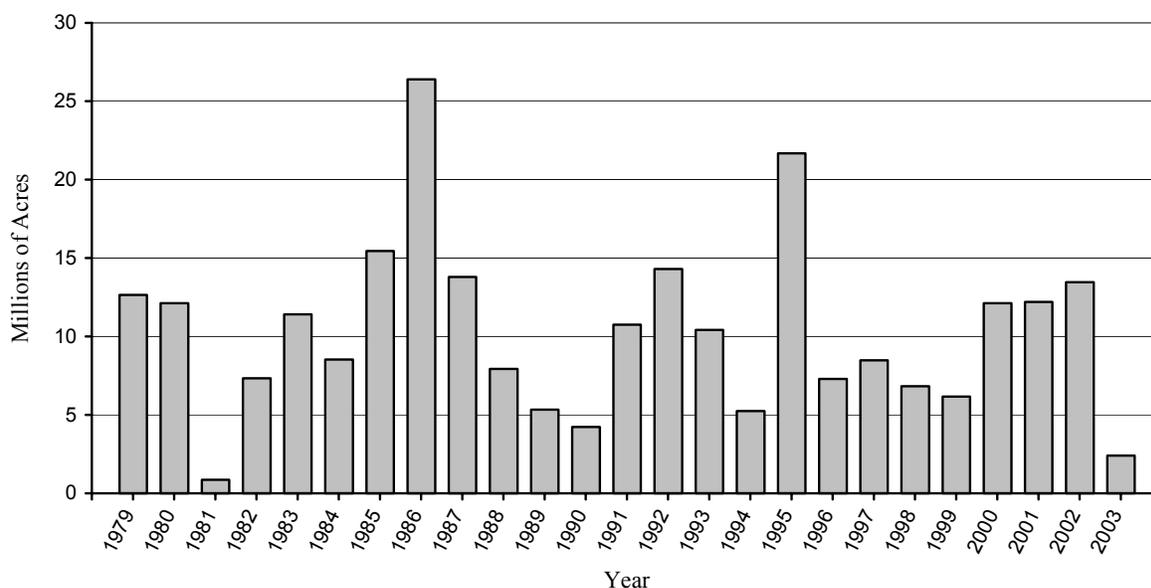


Acres (in thousands) of Southern Pine Beetle Outbreaks, 1999-2003*

State	1999	2000	2001	2002	2003
Alabama	5,002.0	6,936.1	4,876.0	5,077.0	0.0
Arizona	0.0	11.6	0.0	0.0	0.0
Arkansas	0.0	0.0	0.0	0.0	0.0
Florida	40.0	321.3	916.0	916.0	0.0
Georgia	171.0	1,067.0	1,407.0	2,424.0	85.8
Kentucky	0.0	220.6	767.0	0.0	0.0
Louisiana	0.0	0.0	0.0	0.0	0.0
Mississippi	0.0	210.6	0.0	265.0	0.0
New Jersey	0.0	0.0	0.0	1.9	2.5
North Carolina	252.0	437.9	797.0	935.0	9.2
Oklahoma	0.0	0.0	0.0	0.0	0.0
South Carolina	8.7	1,218.3	1,727.0	2,574.0	1,789.0
Tennessee	685.0	1,441.0	1,425.0	1,197.0	516.9
Texas	0.0	0.0	0.0	0.0	0.0
Virginia	0.0	268.0	276.0	66.0	0.0
Total	6,158.7	12,132.4	12,191.0	13,455.9	2,403.4

* Acres of outbreak are acres of host type having one or more multi-tree spots per 1,000 acres.

Southern Pine Beetle Outbreaks, 1979-2003

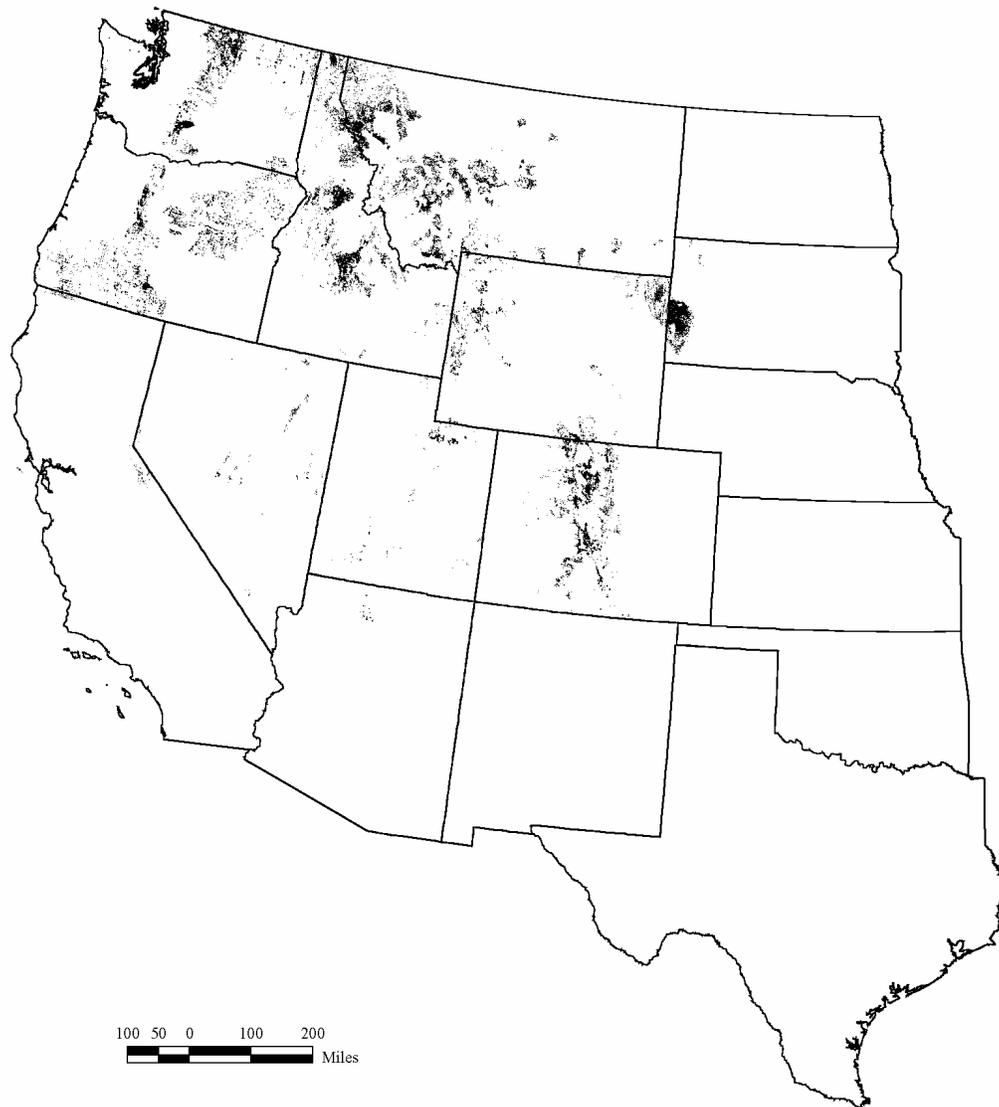


Mountain pine beetle

Dendroctonus ponderosae is a native bark beetle that attacks lodgepole, ponderosa, sugar, western white, whitebark, and limber pines. The beetle ranges throughout western pine forests from Canada into Mexico. Beetles infest mature, dense stands of pines.

Mountain pine beetle populations increased in every State throughout the West with affected acreage increasing from 1,564,600 acres in 2002 to 2,219,100 acres in 2003. Several areas with large mountain pine beetle outbreaks and epidemics are California, Colorado, Idaho, Montana, Oregon, South Dakota, Washington, and Wyoming. Beetle population increase was particularly high in southern California where the number of infested acres increased from 186,800 acres in 2002 to 614,800 acres in 2003.

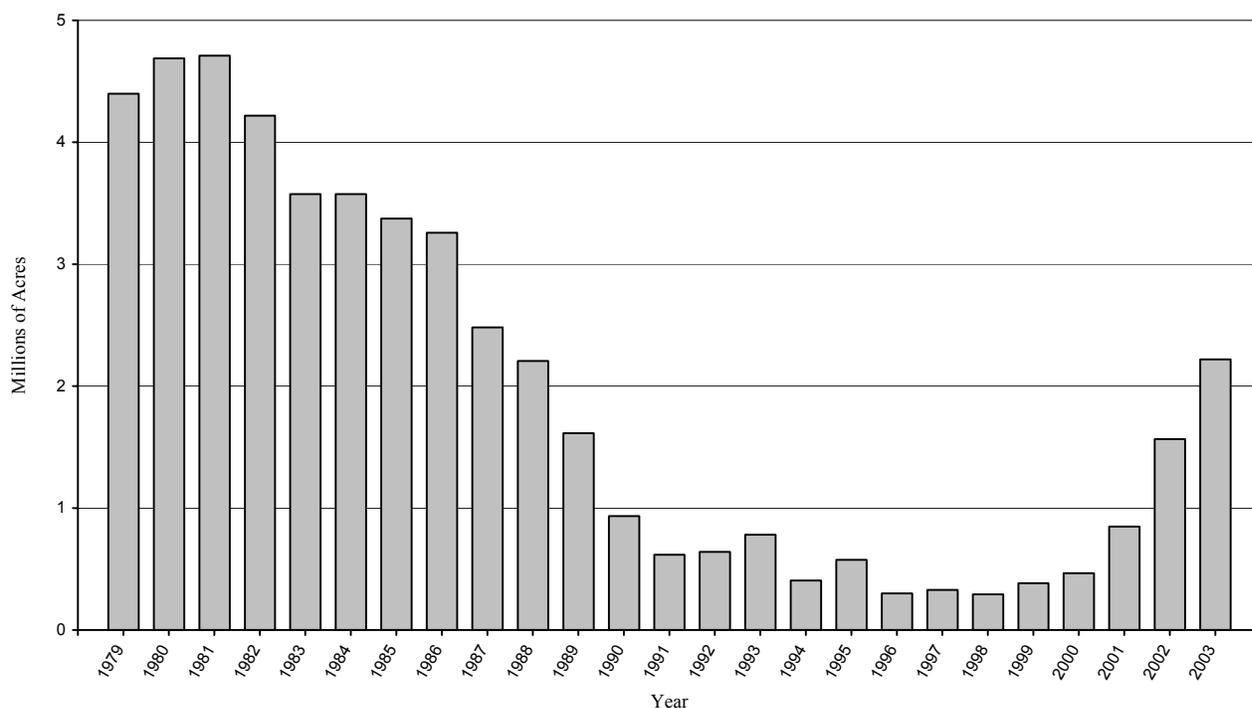
Mountain Pine Beetle Outbreak Areas, 2003



Acres (in thousands) of Mountain Pine Beetle Outbreak, 1999-2003

State	1999	2000	2001	2002	2003
Arizona	0.0	0.0	0.0	0.0	0.0
California	9.7	30.4	29.6	186.8	614.8
Colorado	71.8	139.5	151.2	209.6	227.1
Idaho	84.3	122.3	170.0	339.3	341.9
Montana	77.4	40.6	111.7	249.5	291.2
Nevada	1.4	0.8	1.2	2.6	2.4
New Mexico	0.0	0.0	0.0	3.8	0.0
Oregon	46.2	43.6	76.3	182.3	186.0
South Dakota	19.0	13.9	102.2	102.9	189.6
Utah	3.7	2.2	17.3	26.7	53.4
Washington	65.0	63.1	134.8	173.1	223.8
Wyoming	6.2	9.5	55.0	88.0	88.9
Total	384.7	465.9	849.3	1,564.6	2,219.1

Mountain Pine Beetle Outbreaks, 1979-2003



Spruce budworm

Choristoneura fumiferana is a native insect found in northern New England, New York, Pennsylvania, the Great Lakes Region, and Alaska. Balsam fir is the preferred host, but the insect also feeds on white, red, and black spruce. Topkill and tree mortality may result from budworm feeding. Outbreaks generally begin in extensive and continuous areas of mature and overmature balsam fir.

Populations of spruce budworm in 2003 were low in the Eastern States. However, defoliation was noticeable in portions of Minnesota, Michigan, and on national forest land in Wisconsin. Damage by this insect decreased in Minnesota from 80,300 acres in 2002 to 34,900 acres in 2003. However, defoliation increased in Michigan, from 500 acres in 2002 to 11,800 acres in 2003, and in Wisconsin, from 400 acres in 2002 to 4,000 acres in 2003.

No noticeable defoliation was found in Alaska for the fourth straight year.

Eastern Counties Where Spruce Budworm Defoliation Was Reported, 2003



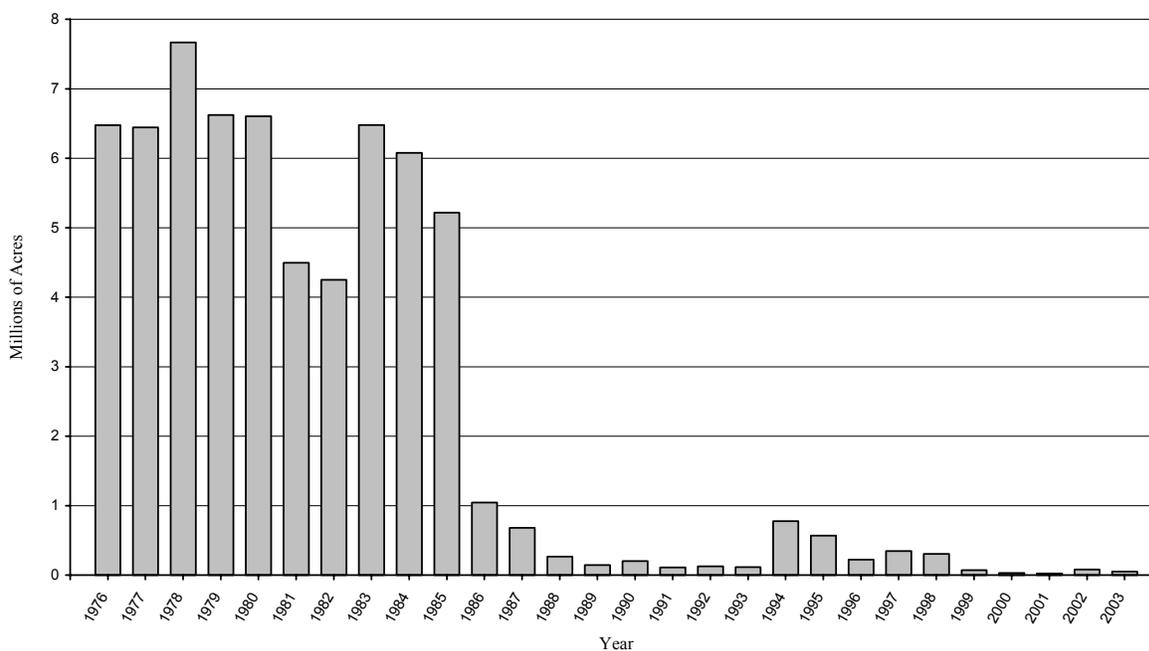
Acres (in thousands) of Aerially Detected Spruce Budworm Defoliation in the Eastern United States, 1999-2003

State	1999	2000	2001	2002	2003
Maine	0.0	0.0	0.0	0.0	0.0
Michigan	0.0	0.0	3.3	0.5	11.8
Minnesota	70.0	28.5	18.9	80.3	34.9
New Hampshire	0.0	0.0	0.0	0.0	0.0
New York	0.0	0.0	0.0	0.0	0.0
Pennsylvania	0.0	0.0	0.0	0.0	0.0
Vermont	0.0	0.0	0.0	0.0	0.0
Wisconsin	0.0	0.0	0.8	0.4	4.0
Total	70.0	28.5	23.0	81.2	50.7

Acres (in thousands) of Aerially Detected Spruce Budworm Defoliation in Alaska, 1999-2003

State	1999	2000	2001	2002	2003
Alaska	0.7	0.0	0.0	0.0	0.0

Spruce Budworm Defoliation in the Eastern United States, 1976-2003



Insect Conditions Highlights

Western spruce budworm

Choristoneura occidentalis is a native insect occurring in the Rocky Mountains from Arizona and New Mexico north to Idaho and Montana and also in Washington and Oregon. The insect causes topkill, growth loss, and some tree mortality. The budworm feeds primarily on Douglas-fir and true firs.

Many of the Western States had minimal impacts from low population levels of western spruce budworm.

Overall, acres of defoliation increased slightly from 617,200 acres in 2002 to 630,700 acres in 2003. Colorado and Wyoming saw significant decreases in budworm defoliation. However, Washington, Idaho, and Montana reported seeing significant increases in acres with budworm defoliation. With much of the West experiencing warm and drier weather conditions, western spruce budworm populations are expected to continue to increase.

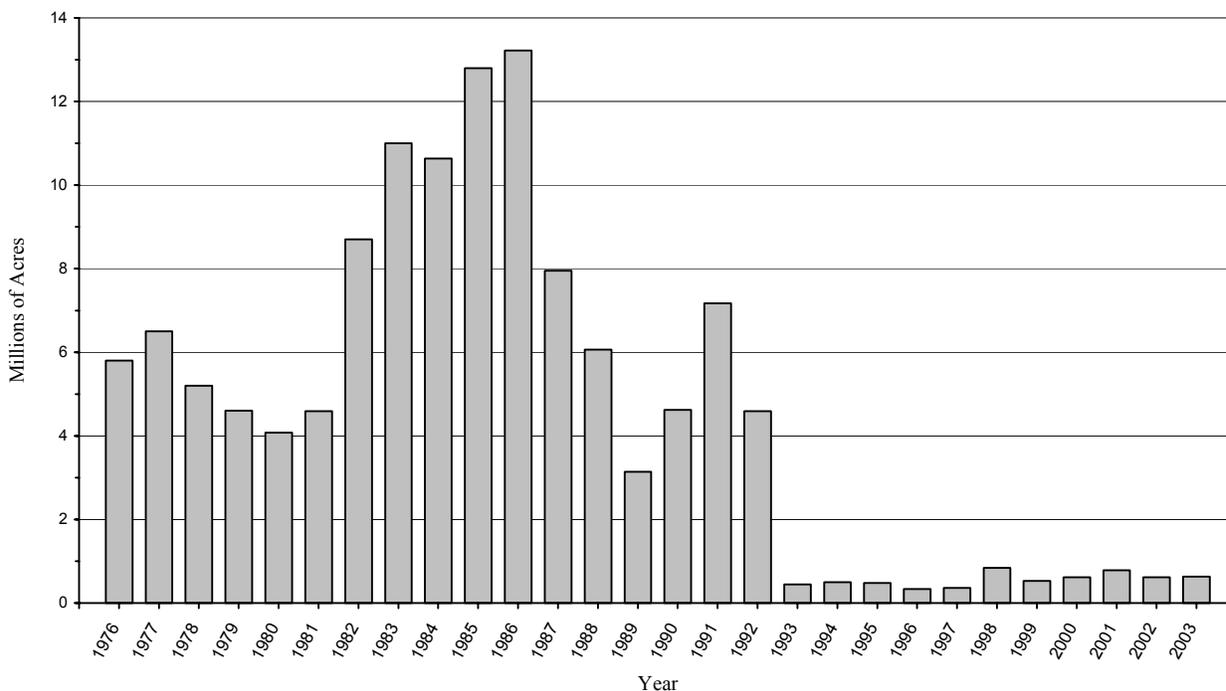
Western Spruce Budworm Defoliation Areas, 2003



Acres (in thousands) of Aerially Detected Western Spruce Budworm Defoliation, 1999-2003

State	1999	2000	2001	2002	2003
Arizona	10.2	25.8	14.1	11.3	24.0
California	0.0	0.0	0.0	0.0	0.0
Colorado	41.0	20.6	35.8	131.1	20.0
Idaho	3.6	4.4	4.2	22.6	204.1
Montana	0.0	0.4	1.2	52.4	66.0
New Mexico	282.6	165.0	445.3	198.8	143.2
Oregon	0.0	0.9	0.2	1.9	5.5
Utah	1.2	16.7	10.2	7.0	14.7
Washington	189.7	383.7	271.9	57.5	139.9
Wyoming	0.6	0.8	0.8	134.6	13.3
Total	528.9	618.3	783.7	617.2	630.7

Aerially Detected Western Spruce Budworm Defoliation, 1976-2003



Hemlock woolly adelgid

Adelges tsugae was introduced into the east coast near Richmond, Virginia, in 1950. The adelgid poses a serious threat to eastern hemlock and Carolina hemlock; tree mortality usually occurs 3 to 5 years after attack. By the early 1990s, the adelgid had spread into 11 States from North Carolina to Massachusetts, causing extensive hemlock decline and tree mortality. The adelgid continues to spread in the North and South with new townships and counties added every year to the list of those with infested hemlock. Its first

observed occurrence in eastern Tennessee was reported in 2003. The influence of northward-migrating songbirds helps in the spread of this insect to new sites in the Southeast. Shipments of infested hemlocks can be linked to other infestations in the Northeastern States.

The adelgid was introduced into the west coast from Asia in 1924 and is now found in British Columbia, Washington, Oregon, and California. The adelgid appears to be innocuous in the West as little damage is reported.

Eastern Counties Where Hemlock Woolly Adelgid Was Reported, 2003



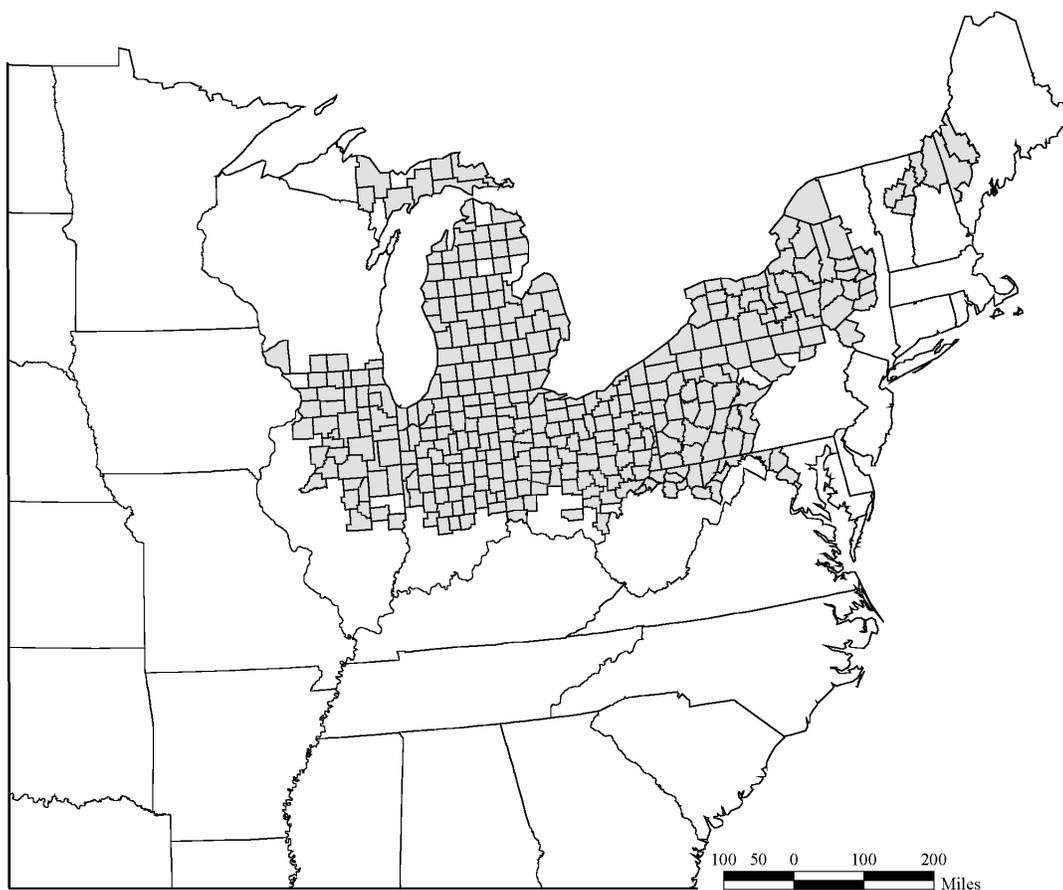
Common European pine shoot beetle

Tomicus piniperda is an introduced insect discovered in a Christmas tree plantation near Cleveland, Ohio, in 1992. The beetle prefers Scotch pine, but feeds on other pines as well. The beetle damages weak and dying trees and feeds in the new growth (shoots) of

healthy trees. Thus far, the beetle is a problem mainly to Christmas tree growers. In its native Europe and Siberia, the beetle causes serious damage to trees in burned sites and areas experiencing severe drought.

State and Federal quarantines have been imposed to reduce the movement of this beetle, which was found in 12 States during 2003.

Eastern Counties Where The Common European Pine Shoot Beetle Was Reported, 2003



Spruce beetle

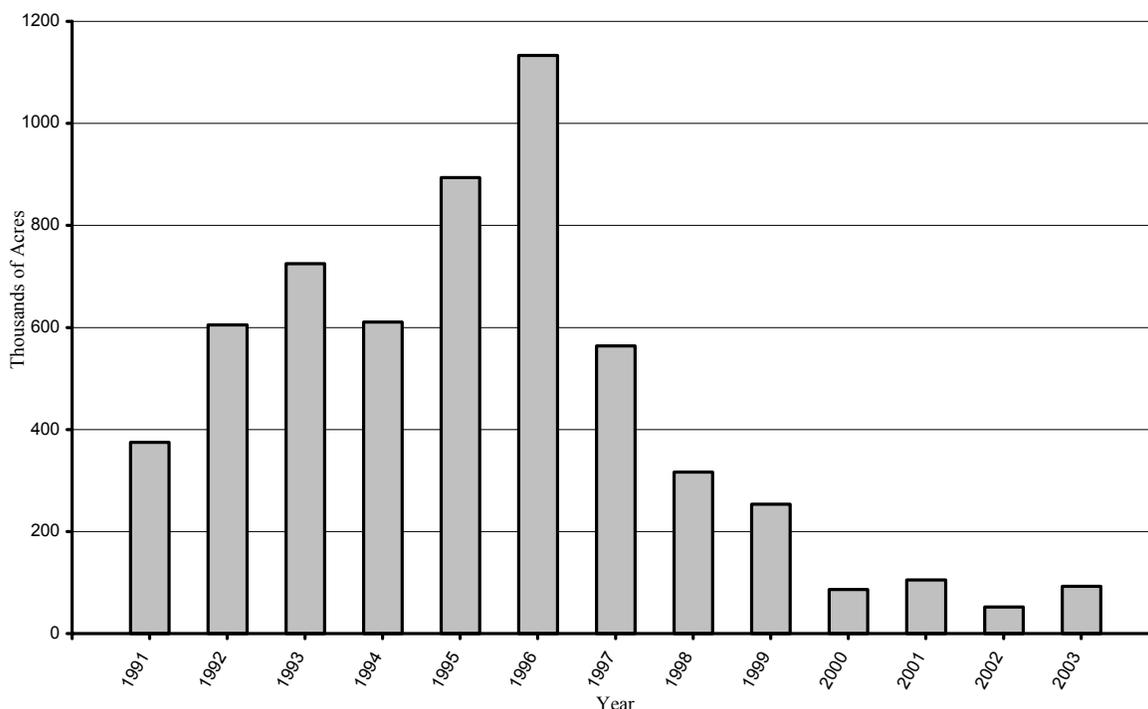
Dendroctonus rufipennis is a native insect that occurs across North America from Maine to Alaska and south in the Rocky Mountains to Arizona. Spruce beetle is the most significant mortality agent of mature spruce. Populations usually build up in windthrown trees. Besides killing merchantable trees, infestations affect habitat quality for wildlife and fish, reduce scenic quality, and increase fire hazard.

Spruce beetle activity has decreased in Alaska to normal, endemic population levels. In the 1990's, Alaska's spruce beetle epidemic saw rapid acceleration

from an endemic level (approx. 150,000 acres) of active beetle caused mortality to a peak of 1.1 million acres in 1996 and then rapidly declined due to lack of suitable host material. This intensive epidemic resulted in mortality exceeding 90 percent of all trees in many drainages and the resulting fuel hazard and fire risk is requiring continued efforts to mitigate.

Outbreaks continue in a few forests in Arizona, Colorado, Montana, Utah, and Wyoming. Throughout much of the West, weather conditions in 2002 were conducive to increases in spruce beetle. Mild winters and warm dry summers have created a situation that has allowed the various populations to significantly increase.

Acres (in thousands) of Aerially Detected Spruce Beetle Active and Newly Infested Areas in Alaska, 1991-2003



Disease Conditions Highlights

Dogwood anthracnose

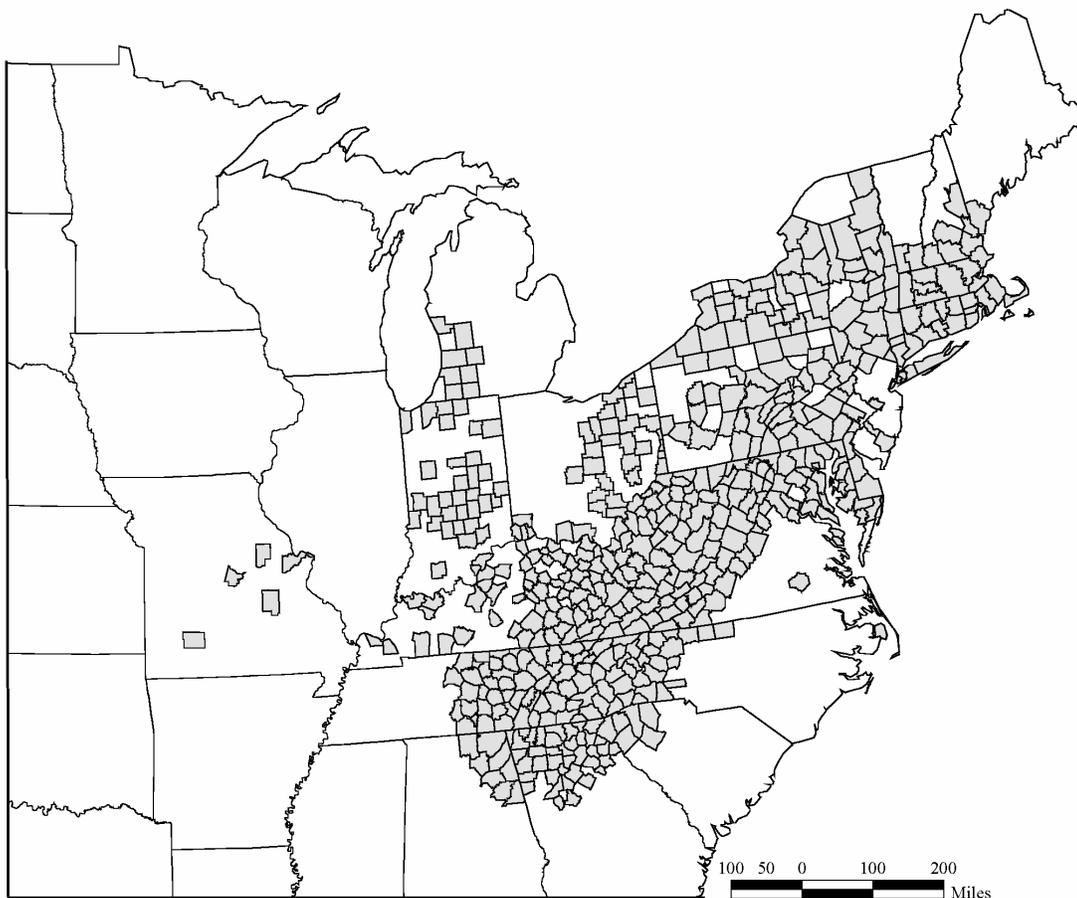
Discula destructiva, the fungus that causes dogwood anthracnose, is of unknown origin. First discovered in the Pacific Northwest in 1976, the disease is confirmed in Idaho, Oregon, and Washington. Although the Pacific dogwood is more susceptible to the fungus than the eastern dogwood, drier summers in the West reduce the number of infection cycles. Significant mortality has occurred, but the problem is not as severe as it is in the East.

In the East, the fungus was first found in southeastern New York in 1978. By 1994, this disease was found in

22 States from Maine to Georgia and west to Indiana and Missouri. The range of dogwood extends from southern Maine to Florida and west to Michigan and eastern Texas.

Dogwood anthracnose continues to intensify at the disease front within the infested counties in the South, although in areas long infested, mortality has declined with the decrease in susceptible host. In the Northeast, diseased dogwoods have been found in every county in Connecticut, Delaware, Maryland, Massachusetts, Rhode Island, and West Virginia. New infestations have been reported in Kentucky.

Eastern Counties Where Dogwood Anthracnose Was Reported, 2003



Beech bark disease

Beech bark disease is caused by the interaction of the beech scale, *Cryptococcus fagisuga* and one or more fungi in the genus *Nectria*. The scale insect creates wounds in the tree that are colonized by fungi such as *Nectria coccinea* var. *faginata*. The scale, and probably the fungus, was accidentally brought to Nova Scotia, Canada, in about 1890. Native fungi, *Nectria galligena* and *Nectria ochroleuca*, can also invade wounds caused by the scale, inciting the disease. By 1932, the disease was killing trees in Maine. It continued to advance south and west into northeastern Pennsylvania.

In 1981, a large area of infested American beech was found in West Virginia, well ahead of the advancing front of the disease. In 1994, the disease was found affecting approximately 100 acres in three counties on the North Carolina-Tennessee border (within the Great Smoky Mountains National Park). This infestation was

about 300 miles southwest of its previously known distribution. In 2003, mortality continued to intensify, and was spreading downslope toward the Cherokee and Pisgah National Forests at a rate faster than predicted. In 2000, the scale was found in Michigan, more than 200 miles from its nearest previously known location in northeastern Ohio. Both *Nectria galligena* and *Nectria coccinea* var. *faginata* have been found in Michigan, causing disease and killing an estimated 7.5 million beech trees. Although the scale has been present in Ohio for some time, the disease, which requires both the scale and the presence of the canker-causing *Nectria* fungi, has not yet been identified in Ohio.

Tree mortality continues within affected areas, and at a greater rate than predicted. The range of American beech extends from Maine to northwest Florida, and west to eastern parts of Wisconsin and Texas.

Eastern Counties Where Beech Bark Disease Was Reported, 2003



Butternut canker

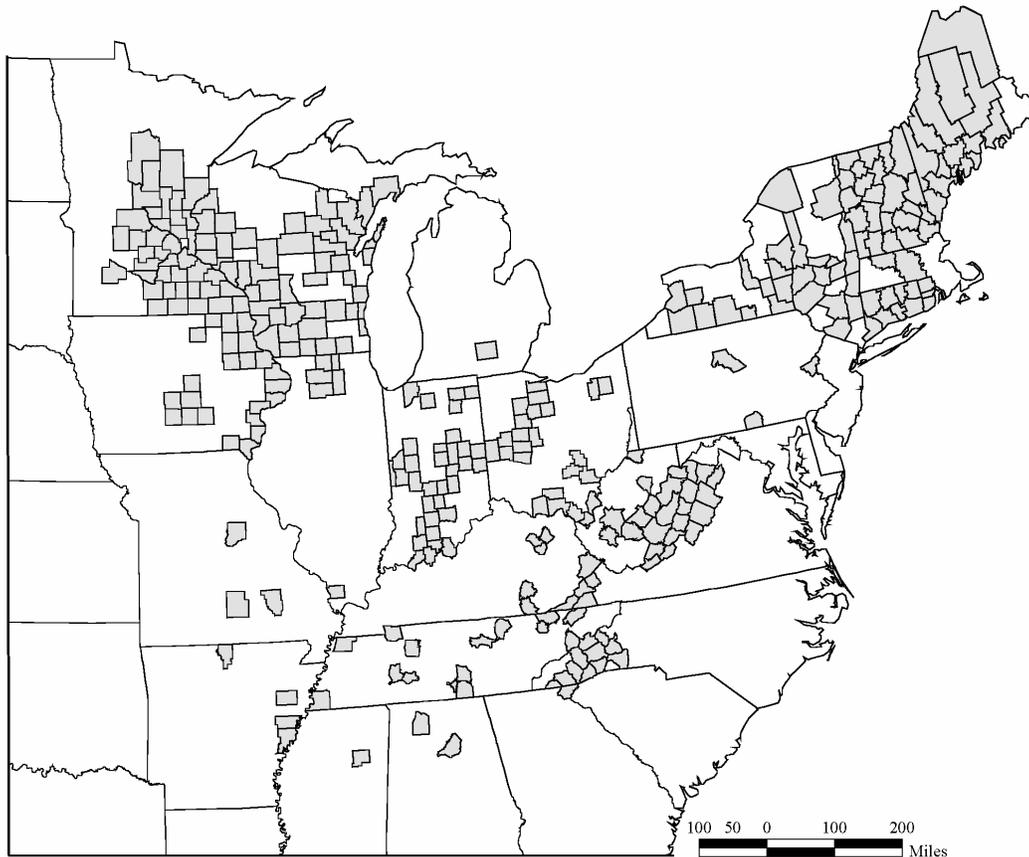
Butternut canker is caused by the fungal pathogen *Sirococcus clavigignenti-juglandacearum*. The origin of the pathogen is unknown, but because of its severe impact on butternut, it is likely that it was introduced into North America. Symptoms of the disease were recognized and reported in 1967 in Wisconsin, but the causal fungus was not identified until the late 1970s. The native range of butternut extends from Maine to Georgia and west to Minnesota and Arkansas. Butternut is usually found scattered in a variety of cover types, and is not abundant in any part of its range.

The disease is found throughout the range of butternut, and is a serious threat to the survival of the species. The pathogen kills large trees, saplings, and

regeneration, causing multiple cankers under the bark that merge and girdle the tree. It is estimated that 77 percent of the butternut trees in North Carolina and Virginia have been killed and in the northeastern area most of the monitored trees are infected. Trees that appear to exhibit resistance to the disease have been found in most States where the trees grow. Many of these trees are being propagated for host resistance studies.

Several States have implemented harvesting guidelines or moratoriums in an attempt to preserve genetic variability in the species and to ensure that potentially resistant trees are not removed. There are no viable control measures for this disease.

Eastern Counties Where Butternut Canker Was Reported, 2003



Disease Conditions Highlights

Fusiform rust

Cronartium quercuum f. sp. *fusiforme*, a native fungus, continues to be the most damaging disease agent of loblolly and slash pines in the South. The disease disfigures and kills trees up to pole size and results in much stem breakage. The disease is damaging in both plantations and natural stands.

An estimated 13.9 million acres of pines are affected. Acres are classified as affected if more than 10 percent of the trees have potentially lethal cankers. Georgia has the greatest amount of the disease, with 4.6 million acres (49 percent) of the host type affected. Genetic selection of resistant planting stock is leading to significant improvement in field survival and stand quality.

Acres (in thousands) Affected by Fusiform Rust*

State (survey year)	National Forest System	Other Federal	State and Private	Total
Alabama (90)	7.1	0.0	1,704.2	1,711.3
Arkansas (95)	4.9	0.0	280.5	285.4
Florida (95)	35.3	6.8	1,426.3	1,468.4
Georgia (89)	38.0	102.8	4,452.9	4,593.7
Louisiana (91)	85.0	18.4	1,554.9	1,658.3
Mississippi (94)	118.0	60.0	1,043.0	1,221.0
North Carolina (90)	4.9	7.8	956.2	968.9
Oklahoma (93)	0.0	0.0	33.9	33.9
South Carolina (95)	46.0	59.0	1,332.2	1,437.2
Texas (92)	21.8	0.0	397.3	419.1
Virginia (92)	0.0	0.0	59.3	59.3
Total	361.0	254.8	13,240.7	13,856.5

* Acres with greater than 10 percent infection.

Dwarf mistletoes

Arceuthobium spp. are parasitic plants that infect the aerial portions of host trees. They affect most conifer species in the West and spruces in the Northeast, causing branch distortions, reduced stem growth, and decreased longevity. Infection by these native plants is generally considered to be the most widespread and economically damaging tree disease in the West. Dwarf mistletoe infection does appear to benefit some wildlife species.

Commercial trees most affected include Douglas-fir, lodgepole pine, true fir, western hemlock, western larch, and ponderosa pine. Dwarf mistletoes are usually host-specific and have patchy distributions within stands and across larger landscapes. Over 28 million acres of western forests have some level of infection. Losses are estimated at around 164 million cubic feet of wood annually.

Dwarf mistletoes are amenable to cultural treatments, although infected areas are often more difficult to manage than uninfected areas. The overall incidence and severity of this disease are thought to have increased over the past century due to fire suppression.

Acres (in thousands) in the West Affected by Dwarf Mistletoes

State (survey year)	National Forest System	Other Federal	State and Private	Total
Alaska*	3,060.0	0.0	340.0	3,400.0
Arizona (85-89)	1,040.0	674.0	25.0	1,739.0
California (80-90)	2,283.0	69.0	1,911.0	4,263.0
Colorado (96)	638.0			638.0
Idaho - North (70-80)**	478.0	10.0	244.0	732.0
Idaho - South (94)**	2,600.0			2,600.0
Montana (70-80)	1,694.0	123.0	600.0	2,417.0
New Mexico (97)	1,140.0	348.0	581.0	2,069.0
Nevada (94)	49.0			49.0
Oregon (67)	1,137.0	43.0	2,760.0	3,940.0
Utah (94)	410.0			410.0
Washington (97)	2,703.3	505.0	2,470.0	5,678.3
Wyoming (97)	560.1			560.1
Total	17,792.4	1,772.0	8,931.0	28,495.4

* Commercial acreage only in Alaska.

** Idaho-North is in Region 1, and Idaho-South is in Region 4.

