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Forest Service

**Southwestern Region**

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# Forest Insect and Disease Conditions in the Southwestern Region, 1999

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# Introduction

Many scientists, forest managers, and even some groups previously opposed to all management now agree that the forests of the Southwest are in crisis. A GAO report issued in April 1999 (GAO/RCED-99-65) describes "overaccumulation of vegetation" as "the most extensive and serious problem related to the health of national forests in the interior West." The implications for catastrophic wildfire are obvious; however, such conditions are also favorable for insect epidemics since the stress trees endure when competing for very limited moisture and nutrients also increases their susceptibility. Reduced harvesting on the national forests has meant reduced opportunity for thinning these stands and thus has precluded moving them to a healthier condition.

While conventional thinking would lead to expectations of vast bark beetle epidemics in the Southwest, pine bark beetle-caused mortality actually declined from 1998 to 1999. Tree-ring analysis by Henri Grissino-Mayer of the University of Arizona suggests that the past 200 years have been the wettest period of the last 1,500 years in west-central New Mexico, and precipitation during the last 20 years has been 23 percent higher than the long-term average. Under such conditions, understory regeneration (tree seedlings and saplings) could be expected to survive in greater abundance than normally would be sustainable. Historically, fire was the primary disturbance agent of most of the forest ecosystems of the Southwest. The normal fire return interval in ponderosa pine is 2-10 years, but research indicates optimum fuel loading for a low intensity burn is probably closer to 4 years. Because of grazing effects and human success in suppressing wildfire for many decades, low intensity fire and its role in thinning have been removed from the system. In Mexico, there are at least two *Dendroctonus* pine bark beetle species which attack trees as small as 5 cm (about 2 inches) in diameter. One of these species is also native to the southwestern U.S., yet we do not see attacks of such small diameter trees in our forests. Could our high densities of small diameter trees be so far out of the historic range of variability that no insect species has evolved to exploit them?

Most of our forests are now too dense for prescribed burning without mechanical thinning as a pre-treatment to reduce ladder fuels. Smoke management is another issue affecting the re-establishment of historical fire return intervals, particularly in our wildland-urban interface or where weather patterns put the air quality of metropolitan areas at risk. While we argue these points, the forests in the Southwest continue to accumulate woody volume at the rate of 190 million cubic feet per year. Ecologically unsustainable densities will be reduced in one or more of these three ways: 1) Insects and disease will colonize the trees (the subject of this report) and natural decomposition or fire will follow; 2) Wildfire will consume the trees; or 3) Some of the trees will be harvested. The last option is the only one that allows humans to select where, when, how and to what extent the reduction will take place.

The winter of 1998-1999 was warm and dry, with mountain snow pack ranging from 50 percent to as little as 10 percent of normal. Late spring snows across northern New Mexico provided relief to that area, but other parts of the Southwest remained well below average in precipitation. The winter of 1999-2000 unfortunately appears to be following the same pattern. Drought not only exacerbates the moisture stress of these crowded stands, but also heightens fire risk by producing tinder-dry conditions in the fuel-choked understory. An early and long wildfire season is forecast, and some areas normally covered by snow experienced fire activity as early as February. High-intensity wildfire can have catastrophic effects including erosion, loss of seed sources for natural regeneration of tree species, wildlife habitat loss, a breakdown in the proper functioning of watersheds, and reduced future site productivity. Insects are often attracted to fire-damaged or killed trees and their build-up in weakened hosts can threaten adjacent, unburned stands. Less intense fire can beneficially reduce dwarf mistletoe by scorching infected areas of the lower crown and is most likely the primary limiting factor of this parasitic plant in a naturally functioning system.

Forest ecosystems are dynamic, and insects and disease respond to forest conditions and weather accordingly. The purpose of this document is to report on forest insect and disease population trends in the Southwest, particularly with regard to insect and disease activity observed during 1999. This report is derived from annual aerial detection results as well as ground observations. Information on state and private lands is provided through our Cooperative Forest Health Program by Bob Celaya, Forest Pest Specialist, Arizona State Land Department, and Bob Cain, Forest Entomologist,

New Mexico State University Cooperative Extension Service. We have also included a list of staff technical assistance activities and summaries of special projects. As advocates of healthy, productive, and sustainable forests, we trust this report reflects our commitment to provide expertise and assistance to Federal, Tribal, and state resource managers seeking to monitor, assess, or reduce the adverse impacts of forest insects and disease.

# Conditions in Brief

In the Southwest, significant tree mortality from bark beetles was detected on approximately 20,000 acres in 1999, down from around 44,000 acres in 1998. Ponderosa pines were killed by western pine beetles (2,605 acres), Ips engraver beetles (2,520 acres), roundheaded pine beetles (1,700 acres), and mountain pine beetles (165 acres). In the mixed conifer and spruce-fir cover types, trees were killed by spruce beetles (5,415 acres), fir engraver beetles (4,170 acres), and Douglas-fir beetles (3,315 acres). Note that while ponderosa pine mortality from bark beetles decreased substantially in 1999, Douglas-fir beetle and spruce beetle activity increased.

Western spruce budworm defoliation decreased slightly in 1999 to around 293,000 acres, from about 321,000 acres the previous year. Additional defoliation of spruce and fir was caused by *Nepytia janetae*, detected on about 10,000 acres in 1999, up considerably from 1998. Aspen defoliation increased to over 171,000 acres in 1999, compared to about 86,000 acres the previous year; note that the majority of the 1999 aspen defoliation was attributed to a late spring frost event in Arizona.

Ponderosa pine needle miner activity was observed in many parts of the region in 1999, with 57,000 acres detected by aerial survey in Arizona.

Dwarf mistletoes continue to be the primary forest pathogens in the Southwest. The estimated annual volume loss from these parasites is approximately 25 million cubic feet. Their incidence changes little from year to year, but is thought to have increased over the past century.

Root diseases continue to cause an estimated 5 million cubic feet of volume loss annually. Armillaria and annosus are the most common root diseases in most areas. Incidence is usually higher in mixed-conifer and spruce-fir forests than in ponderosa pine forests. Like other native diseases including mistletoes, root diseases have both beneficial and damaging effects.

The incidence of white pine blister rust continues to increase in the Sacramento and adjoining White Mountains of southern New Mexico. In 1999, infected white pines were found on Gallinas Peak, Cibola National Forest, 50+ miles north of the main outbreak area.

# Status of Insects

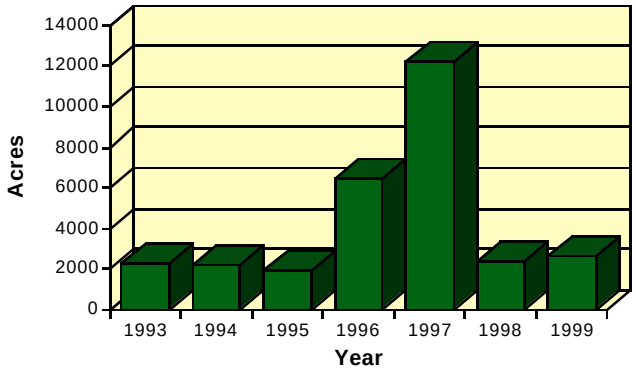
## Bark Beetles

### Western Pine Beetle

*Dendroctonus brevicomis*
Primary Host: Ponderosa pine

Tree mortality in the region attributed to this insect increased slightly in 1999 to 2,605 acres vs. 2,340 acres the previous year. In Arizona, it occurred on the Apache-Sitgreaves (165 acres), Coconino (55 acres), Coronado (20 acres), Kaibab (310 acres), Prescott (10 acres), and Tonto (5 acres) National Forests; the Fort Apache (135 acres), Navajo (45 acres), and San Carlos (50 acres) Indian Reservations; about 5 acres each in Walnut Canyon National Monument, Grand Canyon National Park, and BLM lands; and 30 acres of private land. In New Mexico, significant activity was detected only on the Gila National Forest (1,765 acres).

**Western Pine Beetle Activity in Arizona and New Mexico**

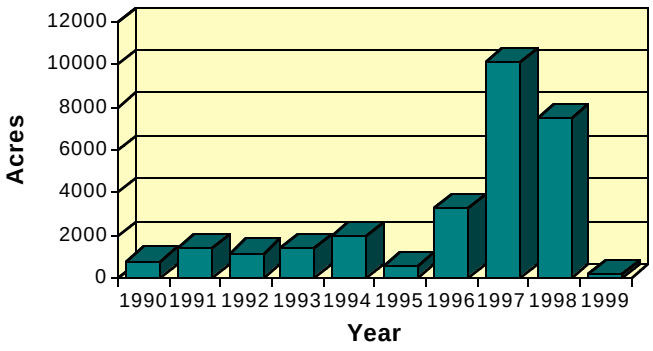



### Mountain Pine Beetle

*Dendroctonus ponderosae*
Primary Host: Ponderosa pine

Total mortality in the region dropped sharply in 1999, with only 165 acres detected compared to 7,500 acres in 1998. In Arizona, 25 acres of activity was detected in Grand Canyon National Park, where over 7,000 acres of activity had been observed in 1998. In New Mexico, mortality was detected on 140 acres in the Santa Fe National Forest.

**Mountain Pine Beetle Activity in Arizona and New Mexico**

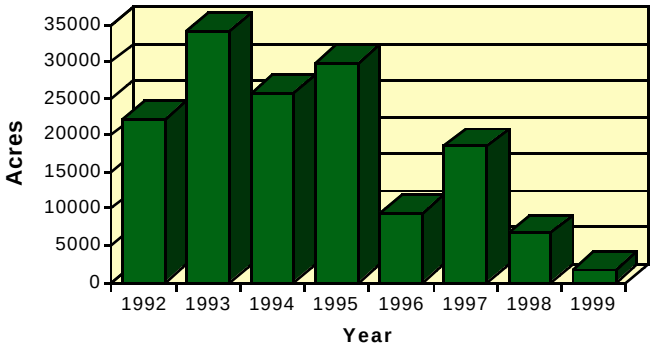



### Roundheaded Pine Beetle

*Dendroctonus adjunctus*
Primary Host: Ponderosa pine

Tree mortality in the region dropped significantly, from 6,730 acres in 1998 to 1,700 acres in 1999. In Arizona, mortality occurred on the Apache Sitgreaves (280 acres) and Coronado (30 acres) National Forests, and on the Fort Apache Indian Reservation (20 acres). In New Mexico, activity continued, but at much reduced levels, on the Lincoln National Forest (730 acres) and the Mescalero Apache Indian Reservation (640 acres), indicating that the large outbreak in the Sacramento Mountains may be subsiding.

**Roundheaded Pine Beetle Activity in Arizona and New Mexico**

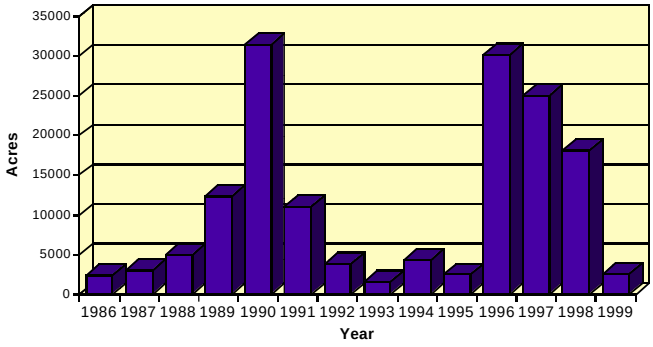


## Ips Beetles

*Ips* spp.
Primary Hosts: Ponderosa pine, Pinyon pine

Ponderosa pine mortality caused by Ips beetles decreased greatly in 1999, with only 2,520 acres detected compared to 18,165 acres the previous year. In Arizona, activity occurred on the Apache Sitgreaves (95 acres), Coconino (75 acres), Coronado (15 acres), Kaibab (45 acres), Prescott (55 acres), and Tonto (985 acres) National Forests; the Fort Apache (85 acres), San Carlos (900 acres), Navajo (35 acres), and Hualapai (5 acres) Indian Reservations; Grand Canyon National Park (10 acres), and 30 acres of state and private lands. In New Mexico, mortality was detected on 185 acres in the Carson National Forests; significant activity (acreage undetermined) was also reported on state and private lands in and around the village of Ruidoso, and on the eastern foothills of Mt. Taylor.

**Ponderosa Pine Mortality from Ips Engraver Beetles in Arizona and New Mexico**



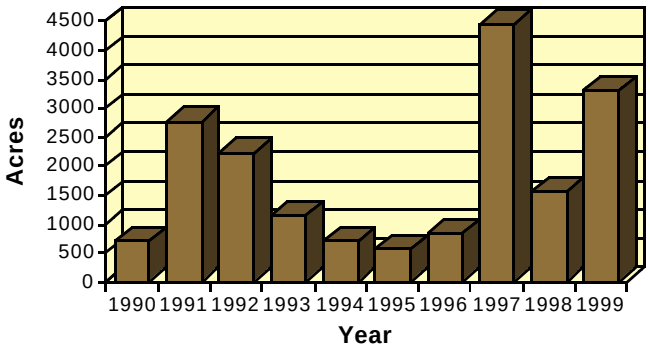

No significant pinyon ips activity was detected during aerial surveys in either state in 1999. A large build-up of pinyon ips was noted on a ranch south of Edgewood, New Mexico, in an area of new road construction.

## Douglas-fir Beetle

*Dendroctonus pseudotsugae*
Host: Douglas-fir

Tree mortality increased in the region in 1999, with 3,315 acres affected compared to 1,555 acres in 1998. All significant mortality detected in 1999 occurred in Arizona, as follows: Apache-Sitgreaves (360 acres), Coconino (2,680 acres), Kaibab (60 acres), Prescott (5 acres), and Tonto (15 acres) National Forests; the Fort Apache Indian Reservation (175 acres), Grand Canyon National Park (15 acres), and 5 acres of private land.

**Douglas-fir Beetle Activity in Arizona and New Mexico**

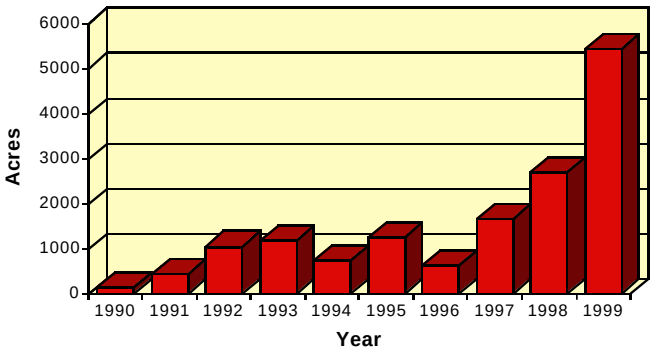



## Spruce Beetle

Dendroctonus rufipennis
Host: Spruce

Overall activity in the region increased considerably for the third straight year, with 5,415 acres of mortality detected in 1999 vs. 2,690 acres in 1998. In Arizona, mortality occurred on the Apache-Sitgreaves (35 acres), Coconino (5 acres), Coronado (400 acres), and Kaibab (5 acres) National Forests; and on the Fort Apache (15 acres) and Navajo (2,170 acres) Indian Reservations. In New Mexico, mortality was detected on the Carson (1,235 acres), Santa Fe (1,420 acres), and Gila (90 acres) National Forests; and on the Mescalero Apache Indian Reservation (40 acres).

**Spruce Beetle Activity in Arizona and New Mexico**

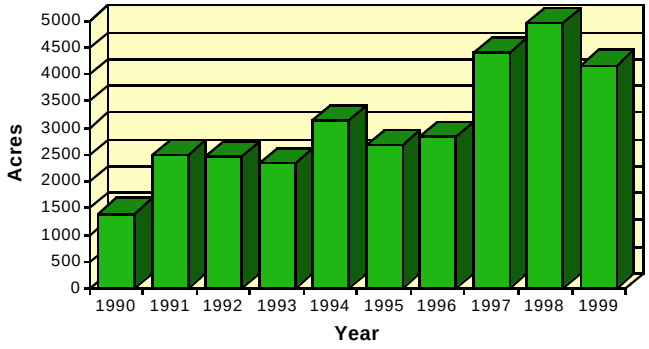


### True Fir Beetles

**Fir Engraver Beetle**, *Scolytus ventralis*
**Western balsam bark beetle**, *Dryocoetes confusus*
Hosts: White and Subalpine/Corkbark fir

Tree mortality in the region decreased somewhat in 1999 to 4,170 acres vs. 4,835 acres in 1998. In Arizona, activity was detected on the Apache-Sitgreaves (835 acres), Coconino (885 acres), Coronado (525 acres), Kaibab (550 acres), Prescott (5 acres), and Tonto (70 acres) National Forests; the Fort Apache (140 acres) and Navajo (45 acres) Indian Reservations; Grand Canyon National Park (15 acres); and 10 acres of private land. In New Mexico, mortality was reported on the Carson (135 acres), Gila (835 acres), and Santa Fe (120 acres) National Forests.

**Fir Engraver and Western Balsam Bark Beetle Activity in Arizona and New Mexico**



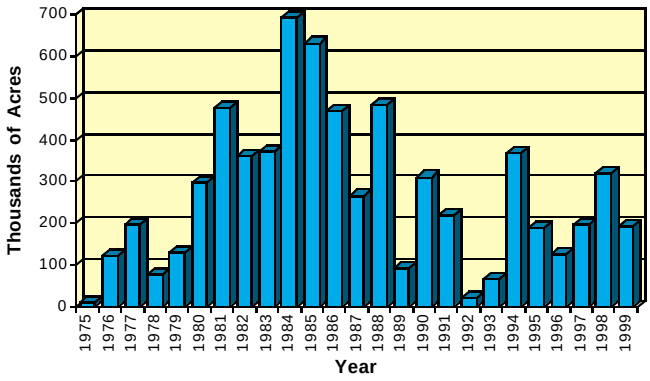

## Defoliators

### Western Spruce Budworm

Choristoneura occidentalis
Host: True firs, Douglas-fir, Spruce

Regional defoliation decreased slightly to 293,000 acres in 1999, compared with 321,000 acres in 1998. In Arizona, activity was heaviest in the northeastern part of the state, with defoliation occurring on the Apache-Sitgreaves National Forests (250 acres), and the Navajo (10,145 acres) and San Carlos (60 acres) Indian Reservations. In New Mexico, defoliation was detected on the Carson (130,000 acres), Cibola (5,270 acres), and Santa Fe (82,480 acres) National Forests; on the Santa Clara

**Western Spruce Budworm Defliation in Arizona and New Mexico**




(1,215 acres), Taos (13,150 acres), and Picuris (190 acres) Indian Reservations; and on about 50,000 acres of state and private lands. Activity within the main outbreak area of northern New Mexico shifted somewhat to the south.

### Douglas-fir Tussock Moth

*Orgyia pseudotsugata*
Hosts: White fir, Douglas-fir, Spruce

In Arizona, pheromone trap surveys indicate that a small outbreak is developing in the Pinal Mountains, Tonto National Forest, and that populations are rising on West Peak, Pinaleno Mountains, Coronado National Forest. The insect continues to be primarily an urban problem in northern New Mexico, with continued activity in Santa Fe and Los Alamos Counties. Defoliation was also noted in the southern New Mexico communities of Alto and Ruidoso in 1999.

### *Nepytia janetae*

Host: Spruce and True Firs

Defoliation by this looper (inchworm) with no common name was detected on about 10,000 acres in Arizona in 1999, vs. about 1,400 acres in 1998. Most of the activity observed in 1999 occurred on the Fort Apache Indian Reservation (8,630 acres), with the remainder on the Apache Sitgreaves (985 acres) and Coronado (400 acres) National Forests. Insect populations appeared to collapse in the fall of 1999. See "Other Entomology and Pathology Activities in 1999" section for additional information.

### Spruce Aphid

Elatobium abietinum
Host: Spruce

No activity was detected by aerial survey in Arizona or New Mexico in 1999. In Arizona, some defoliation was noted during ground surveys on the Fort Apache Indian Reservation and on Mt. Graham.

### Ponderosa Pine Needle Miner

*Coleotechnites ponderosae*

In Arizona, activity was detected during aerial surveys on about 57,000 acres in 1999, as follows: Apache-Sitgreaves (9,715 acres), Coconino (9,375 acres), Kaibab (28,070 acres), Prescott (2,080 acres), and Tonto (265 acres) National Forests; the Navajo Army Depot (180 acres); and 7,225 acres of state and private land. Heavy discoloration of ponderosa pines was reported on private land around Nutrioso, Parks, and Clints Well, Arizona. In New Mexico, light to moderate activity was observed from the ground at many locations in the northern part of the state, particularly in the Jemez Mountains. Activity was detected aerially on about 1,600 acres of state and private land in the eastern foothills of the Sangre de Cristo Mountains in 1999; this represents a continued decline in the population in this area.

### Pinyon Sawfly

Zadiprion rohweri

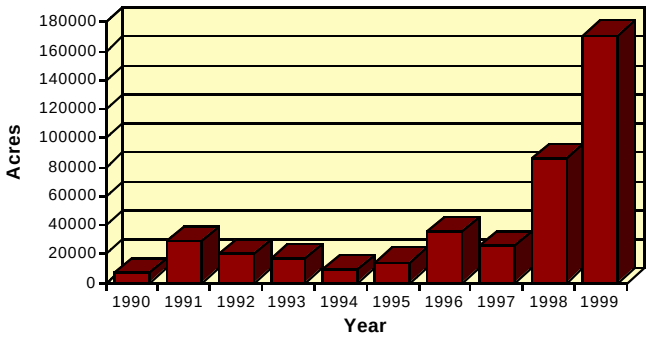
Activity decreased dramatically on the Navajo Indian Reservation, with only 145 acres of pinyon defoliation detected in 1999 vs. 52,000 acres in 1998. Minor defoliation was observed at several locations in New Mexico in 1999, with a notable outbreak on the east side of the Manzano Mountains.

### Pinyon Needle Scale

*Matsucoccus acalyptus*

Scale continues to affect pinyon at several locations in Arizona and New Mexico, although no major activity was detected during aerial surveys in 1999. Damage to landscape pinyons continues to be common statewide in New Mexico.

**Aspen Defoliation in Arizona and New Mexico**




## Aspen Defoliation

**Western Tent Caterpillar**, *Malacosoma californicum*
**Large Aspen Tortrix**, *Choristoneura conflictana*
**Black Leaf Spot**, *Marssonina populi*
Weather-related damage

Aspen defoliation, caused by a combination of insects, disease, and abiotic factors, increased greatly for the second straight year, with about 171,000 acres detected by aerial survey in 1999, compared to 86,000 acres in 1998. In Arizona, much of the damage was from a late spring frost, and is reported as follows: Apache-Sitgreaves (3,285 acres), Coconino (6,045 acres), and Kaibab (77,560 acres) National Forests; Fort Apache (3,180 acres) and Navajo (20,755 acres) Indian Reservations; Grand Canyon National Park (37,150 acres); and about 680 acres of state and private land. In New Mexico, defoliation was detected on the Carson (4,700 acres), Cibola (1,560 acres), Gila (245 acres), Lincoln (260 acres), and Santa Fe (4,785 acres) National Forests; the Taos Pueblo Indian Reservation (805 acres); and about 10,190 acres of state and private lands in New Mexico.

## Miscellaneous Insects

**Ash bark beetles** (*Hylesinus aculeatus*), native to the eastern U.S., are causing serious damage to green and white ash ornamentals in several New Mexico communities. In 1999 they were confirmed in Curry and Chavez Counties in addition to Bernalillo County.

**Banded clearwing ash borers** (*Podosesia aureocincta*) are damaging all species of ash in the Albuquerque area.

**Bagworms** (family *Psychidae*) continue to be a problem in the Albuquerque area on junipers, cypress, and a number of hardwoods, particularly sycamores. Sycamore bagworm (*Oiketicus* sp.) caused heavy defoliation near Sunflower and throughout lower Oak Creek Canyon in Arizona.

**Bull pine sawfly** *(Zadiprion townsendii)* continued to cause minor defoliation of ponderosa pine in several chronically infested areas of New Mexico, including Santa Fe and Mountainair.

**Conifer aphids** *(Cinara* spp.) were abundant in central Arizona in 1999, following the mild, dry winter. Wooly aphids were noted in Alpine, Arizona on Douglas-fir and white pine.

**Cottonwood leaf beetles** (*Chrysomela scripta*) returned to endemic levels along the Rio Grande bosque in New Mexico, following an outbreak in 1998.

**Elm leaf beetles** (*Xanthogaleruca luteola*) continued at high levels throughout New Mexico in 1999. In Arizona, they caused extensive defoliation of Siberian elms in the communities of Sedona, Star Valley, Young, and Eager.

**Smaller European elm bark beetle** (*Scolytus multistriatus*) caused extensive mortality of Siberian elms in the Clovis/Portales areas of eastern New Mexico in the spring of 1999.

**Fall webworm** (*Hyphantria cunea)* was found throughout Gila County, Arizona in 1999, and was observed for the first time above the Mogollon Rim, in Heber. Defoliation continued to be common in New Mexico on landscape and lower riparian hardwoods, especially elms and cottonwoods. Populations were reported to be at higher levels in the Las Cruces area in 1999.

**Genista caterpillar** (*Uresiphita reversalis*) populations were reported to be at higher levels in the Las Cruces area in 1999.

**Juniper spittlebugs** (*Clastoptera juniperina*) were at outbreak levels in 1999 on the east side of the Sandia and Manzano Mountains in New Mexico.

**Locust borer** (*Megacyllene robiniae*) is causing increased dieback and mortality of ornamental black locust and the popular cultivar "purple robe" in northern New Mexico communities.

**Nantucket pine tip moth** (*Rhyaciona frustrana*) was found in Harding County on ponderosa pines along the Canadian River in eastern New Mexico in 1999. Damage from this insect continues to increase in Santa Fe and is now reported in Espanola. Specimens identified as *R. frustrana* were collected from several sites in Arizona in 1999, including Payson (on ponderosa and Austrian pines), Prescott (on ponderosa pine), and Willcox (on Eldarica pine); similar specimens were also collected on the San Carlos Indian Reservation.

**Pinyon pine tip moth (***Dioryctria albovittella)* was widespread in the Red Lake area north of Williams, Arizona in 1999.

**Prescott scale** *(Matsucoccus vexillorum)* continues to cause branch dieback at several locations in Arizona, including Happy Jack, Heber, Strawberry, and along Highway 260 west of Sunrise. Twenty-five acres of defoliation were recorded on the Apache-Sitgreaves National Forests in 1999.

# Status of Diseases

## Dwarf Mistletoes

*Arceuthobium* spp.
Hosts: most conifers, especially pines and Douglas-fir

Dwarf mistletoes are the most significant tree pathogens (disease-causing organisms) in forests of the Southwest. There are eight species in the region, each with a different primary tree host. Three species—those affecting ponderosa pine, pinyon pine, and Douglas-fir—are found throughout most of the ranges of their hosts, while the other species have more limited distributions. Regionally, over one-third of the ponderosa pine acreage has some level of infection, with roughly 4 million acres affected (see Table 1).

On both the stand and landscape level, the distribution of dwarf mistletoes is usually patchy, with more or less discrete infection centers surrounded by areas without the disease. Infection centers expand very slowly, and overall incidence changes little from year to year. Thus, infestation is best described as a chronic situation rather than an outbreak or epidemic. Infection reduces tree growth and longevity; severe infection can kill trees directly, or predispose them to other agents such as bark beetles.

## True Mistletoes

*Phorodendron* spp.
Hosts: numerous

Seven different species of true mistletoe occur on trees and shrubs in the Southwest. They are especially common on junipers throughout the woodland type in the region, and are often found on cottonwoods, sycamores, and other hardwoods in lower riparian areas, as well as on oak, palo verdes, and mesquite in desert shrublands. Although generally thought to be less damaging to their hosts than dwarf mistletoes, heavy infections do develop over time, weakening the host and eventually leading to death.

In 1999, a true mistletoe (presumably *P. macrophyllum*) was found on Siberian Elm in Sedona, Arizona. To our knowledge, this is the first report of mistletoe infection on this host in the region.

## Root Diseases

Root diseases are associated with roughly one-third of the conifer mortality in the region each year. They kill some trees outright and are often associated with bark beetle attack. They can also predispose trees to windthrow, an obvious concern in heavily-used areas. Root diseases are generally more common in mixed conifer and spruce-fir forests than in ponderosa pine forests. Like mistletoes, the incidence of most root diseases changes little from year to year.

### Armillaria Root Disease

*Armillaria* spp.
Hosts: most conifers, aspen

Armillaria is the most common root disease in the Southwest, and may account for up to 80 percent of the root disease mortality in the region. Recent surveys on the North Kaibab Ranger District found the fungus in about 30 percent of the standing live trees. In addition to causing disease, the fungus is a common decayer of dead woody material (a saprophyte).

### Annosus Root Disease

Heterobasidion annosum
Hosts: most conifers

Annosus root disease is probably the second most common root disease in the Southwest. It is found most often on true firs, although most conifers are succeptible. Like *Armillaria*, *Heterobasidion* is a common decayer of dead, woody material as well as a pathogen.

**Other common root diseases** in the Southwest include **Schweinitzii root/butt rot**, *Phaeolus schweinitzii*, often found on older Douglas-fir and occassionally ponderosa pine; **Tomentosus root/butt rot**, *Inonotus tomentosus*, on spruce; and **Ganoderma butt rot**, *Ganoderma applanatum*, found in many aspen stands. **Black Stain root disease**, caused by varieties of the fungus *Leptographium wageneri*, appears to be rare in the Southwest.

## Stem Decays

Stem decays are common in older trees throughout the region. Decay represents an economic loss in terms of timber production, and can increase hazard on developed sites. Conversely, decayed trees provide important habitat for some wildlife species, particularly cavity nesters. The most common stem decays in the Southwest include **red rot**, *Dichomitus squalens*, of ponderosa pine; **red ring rot**, *Phellinus pini*, affecting most conifers; **rust-red stringy rot**, *Echinodontium tinctium*, on white fir; and **aspen trunk rot**, *Phellinus tremulae*.

## Aspen Stem Cankers

Several different canker diseases affect aspen in the Southwest. One or more of these fungal diseases are common in most aspen stands. They damage the living bark and cambium and are one reason that aspens are a relatively short-lived tree.

## Stem Rusts

### White Pine Blister Rust

Cronartium ribicola
Host: Southwestern white pine

This very damaging, non-native disease occurs throughout most of the range of its host in the Sacramento and adjoining White Mountains of southern New Mexico. It has also been found in the nearby Capitan Mountains, which are separated from the main outbreak area by about 20 miles of high desert. Altogether, roughly one-half million acres are affected. See "Other Entomology and Pathology Activities in 1999" section for additional information.

In June 1999, rust cankers were found on two white pines near the summit of Gallinas Peak, approximately 50 miles north of the Capitan Mountains. The infections appeared to be 4 or 5 years old. A gooseberry bush (*Ribes inerme*) thought to be infected with blister rust had been found about one-half mile from this site the previous fall. This is the first confirmed siting of blister rust on the Cibola National Forest.

### Broom Rusts

### Melampsorella caryophyllacearum

Host: true firs

### Chrysomyxa arctostaphyli

Host: spruces

Broom rusts are found at low levels throughout much of the ranges of their hosts in the Southwest. High concentrations of fir broom rust occur in the Sandia Mountains of New Mexico and at a few other locations. The disease is often quite noticeable, although damage is usually minimal. Occasionally, falling brooms and stem breakage present a hazard to humans.

### Limb Rust

*Cronartium arizonicum*
Host: Ponderosa pine

This disease is fairly common in portions of northern Arizona, and can be quite damaging to individual trees. The fungus causes progressive branch mortality, usually from the center of the crown. Waves of new infection typically occur at intervals of several years.

### Comandra Blister Rust

Cronartium comandrae
Host: Pines

This disease has caused branch dieback and mortality on non-native Eldarica/Afghan pine in the Prescott, Payson, and Sedona areas. It occasionally infects ponderosa pines in this area, but has caused minimal damage.

## Foliage Diseases

(See also Aspen Defoliation in "Status of Insects" section.)

### Ponderosa Pine Needle Cast

*Lophodermella cerina* and other species

Discoloration and/or defoliation attributed to needle cast fungi was detected during aerial surveys on about 9,400 acres of Federal lands in the region in

1999, vs. only 425 acres in 1998. In Arizona, it was observed on 1,945 acres of BLM lands. In New Mexico, it was seen on the Gila (6,770 acres), Santa Fe (290 acres), and Carson (265 acres) National Forests, and the Santa Clara Indian Reservation (140 acres).

Nearly 2,000 acres of needle cast were observed on the Vermejo Ranch in northern Colfax County, New Mexico in 1999. Light needle cast was detected on the Baca Location (Jemez Mountains), where more dramatic outbreaks occurred in 1997 and 1998.

## Pinyon Pine Needle Cast

Species unknown

No observations were noted in 1999.

## Dieback on Common Juniper

Discoloration and death of common juniper (*Juniperus communis*) foliage was observed at several locations in northern New Mexico during the spring and summer of 1999. In many cases, major portions of the shrub appeared to have died, although usually some branches were producing new, apparently healthy foliage. Small dark fruiting bodies were consistently found on the underside of affected needles, strongly suggesting a fungal disease. Low snowpack the previous winter may have been a predisposing or contributing factor in this condition.

Table 1. Prominent 1999 Forest Insect and Disease Activity in Arizona and New Mexico

| Agent | State | National Forest | Tribal Lands | Other Federal | State & Private | Total |
|---|---|---|---|---|---|---|
| Roundheaded pine beetle | AZ | 310 | 20 | 0 | * | 330 |
| | NM | 730 | 640 | 0 | 0 | 1,370 |
| Ips beetles (ponderosa pine) | AZ | 1,270 | 1,025 | 10 | 30 | 2,335 |
| | NM | 185 | 0 | 0 | ** | 185 |
| Douglas-fir beetle | AZ | 3,120 | 175 | 15 | 5 | 3,315 |
| | NM | 0 | 0 | 0 | 0 | 0 |
| Mountain pine beetle | AZ | 0 | 0 | 25 | 30 | 55 |
| | NM | 140 | 0 | 0 | 0 | 140 |
| Spruce beetle | AZ | 445 | 2,185 | 0 | * | 2,630 |
| | NM | 2,745 | 40 | 0 | 0 | 2,785 |
| Western pine beetle | AZ | 565 | 230 | 15 | 30 | 840 |
| | NM | 1,765 | 0 | 0 | 0 | 1,765 |
| True fir beetles | AZ | 2,870 | 185 | 15 | 10 | 3,080 |
| | NM | 1,090 | 0 | 0 | 0 | 1,090 |
| Western spruce budworm | AZ | 250 | 10,205 | 0 | * | 10,455 |
| | NM | 217,750 | 14,555 | 0 | 50,000 | 282,305 |
| *Nepytia janetae* | AZ | 1,385 | 8,630 | 0 | 0 | 10,015 |
| | NM | 0 | 0 | 0 | 0 | 0 |
| Ponderosa pine needle miner | AZ | 49,505 | 0 | 180 | 7,225 | 56,910 |
| | NM | ** | ** | ** | 1,600 | 1,600 |
| Ponderosa pine needle cast | AZ | 0 | 0 | 1,945 | * | 1,945 |
| | NM | 7,325 | 140 | 0 | 2,000 | 9,465 |
| Aspen defoliation | AZ | 86,890 | 23,935 | 37,150 | 680 | 148,655 |
| | NM | 11,550 | 805 | 0 | 10,190 | 22,545 |
| Root disease | AZ | 219,000 | ** | ** | ** | 219,000 |
| | NM | 860,000 | ** | ** | ** | 860,000 |
| Dwarf mistletoes | AZ | 1,040,000 | 25,000 | ** | 674,000 | 1,739,000 |
| | NM | 1,114,000 | 581,000 | ** | 348,000 | 2,069,000 |

* No information available.

** Significant activity observed, but acreage not determined.

# Biological Evaluations and Technical Assistance

Our staff is "on call" to provide information on forest insect and disease activity, including input for resource planning and management activities. We provide these services to the Forest Service and other land management agencies. The following letters and/or reports document much of this work done during 1999.

## Arizona Zone

1. Douglas-fir Tussock moth monitoring results for Arizona, 1998. 1/99.
2. Biological evaluation of the Ritter prevention project, Mormon Lake Ranger District, Coconino National Forest. 2/99.
3. Review of proposed action for using naturally occurring and management ignited fire on the Coconino National Forest. 2/99.
4. Bark beetles and the Blue Ridge urban interface effects analysis. 4/99.
5. Mesquite dieback and ponderosa pine tip dieback at San Carlos Indian Reservation. 4/99.
6. Dwarf mistletoe and bark beetle input for Iron Mine/Maxwell 20K (IMAX) effects analysis. 5/99.
7. Causes of ponderosa pine needle discoloration in the Flagstaff area. 6/99.
8. Aspen defoliation on the San Francisco Peaks and Kendrick Mountain. 6/99.
9. The ideas for change document for the Flagstaff, Lake Mary Ecosystem Analysis. 7/99.
10. Technical assistance to Petrified Forest National Park. 7/99.
11. Biological evaluation of *Nepytia janetae* infestation on the Fort Apache Indian Reservation. 8/99.
12. Distribution of sensitive insects in Arizona. 9/99.
13. Insect activity in and around the Alpine Ranger District of the Apache Sitgreaves National Forests. 9/99
14. Functional assistance to the Peaks Ranger District, Coconino National Forest concerning spruce and fir blowdown at Snowbowl Ski Area and adjacent Kachina Peaks Wilderness. 12/99.
15. Biological evaluation of a spruce and western balsam bark beetle outbreak on Mt. Graham, Safford Ranger District, Coronado National Forest. 12/99.

## New Mexico Zone

1. Monitoring of the Whitetail A&B dwarf mistletoe control project, Mescalero Apache Indian Reservation. 1/99.
2. True mistletoe (*Phorodendron macrophyllum*) infection of cottonwoods in Rio Grande bosque, Santa Ana Pueblo. 2/99.
3. Tiger moth infestation of ponderosa pines, Mescalero Apache Indian Reservation. 3/25.
4. Silvicultural prescription alternatives for treatment of dwarf mistletoe infestation, Quemado Ranger District, Gila National Forest. 4/99.
5. Remeasurement of pinyon pine dwarf mistletoe plots, Ramah Navajo and Zuni Indian Reservations. 5/99.
6. Ips beetle mortality of ponderosa pine, Zuni Indian Reservation. 5/99.
7. Hazard tree survey in Redondo Campground, Jemez Ranger District, Santa Fe National Forest. 7/99.
8. Monitoring of the Whitetail 1 dwarf mistletoe control project, Mescalero Apache Indian Reservation. 7/99.
9. Proposed FY 2000 Malpais and Canada forest health projects, Tres Piedras and El Rito Ranger Districts, Carson National Forest. 8/99.
10. Groundchecking spruce budworm defoliation detected during aerial survey, Carson National Forest. 8/99.
11. Proposed FY 2000 La Jara Canyon forest health project, Jemez Indian Reservation. 9/99.
12. Proposed FY 2000 Snow Bear forest health projects, Mescalero Apache Indian Reservation. 11/99.
13. Proposed FY 2000 Rio Penasco landscape restoration project, Sacramento Ranger District, Lincoln National Forest. 12/99.

# Publications

Geils, B.W., Conklin, D.A., Van Arsdel, E.P. 1999. A preliminary hazard model of white pine blister rust for the Sacramento Ranger District, Lincoln National Forest. USDA Forest Service, Rocky Mountain Research Station. Research Note RMRS-RN-6. 6pp.

Negron, Jose F., Jill L. Wilson, and John A. Anhold. IN PRESS. Stand conditions associated with roundheaded pine beetle (Coleoptera: Scolytidae) infestations in Arizona and Utah. Environmental Entomology

Parks, C.G., Conklin, D.A., Bednar, L., Maffei, H. 1999. Woodpecker use and fall rates of snags created by killing ponderosa pine infected with dwarf mistletoe. USDA Forest Service, Pacific Northwest Research Station. Research Paper PNW-RP-515. 11pp.

# Other Entomology and Pathology Activities in 1999

## Training

The Forest Health Zone Offices offer annual training on forest insect and disease identification, biology, and management. These sessions are open to personnel from the USDA Forest Service, USDI Bureau of Indian Affairs and National Park Service, as well as other interested Federal and state agencies and Tribal resource managers. In the spring, we offer a workshop for recreation managers and their staffs which emphasizes hazard tree management. In the fall, we offer a workshop for resource managers and specialists covering the entire forest ecosystem. We also offer informal training on request, particularly for field crews.

***Aspen pathology and management discussed at a forest insect and disease training session.***

## Monitoring the Development of Cavity Nesting Habitat

Several years ago, personnel from the Coconino and Kaibab National Forests, AZ Zone, and the Pacific Northwest Research Station began a project to test different methods of creating cavity-nesting habitat in live ponderosa pine trees. The tops of 33 trees were blasted off with dynamite and 90 trees were inoculated with a stem decay fungus, *Dichomitus squalens*, or red rot. Three years after treatment, nearly 20 percent of the blasted trees are dead, two live trees have cavities, and two more show signs of active foraging. Just one of the inoculated trees has cavities (3). More activity is expected in the future.

## Impact Assessment of *Nepytia janetae* Defoliation on Spruce and Fir in Eastern Arizona

A little-known insect, thought to be native to Arizona and New Mexico, has been defoliating Engelmann spruce and corkbark fir at high elevations in eastern Arizona. Impact plots for *Nepytia janetae*, a moth in the family Geometridae, were established using evaluation monitoring funds from the Forest Health Monitoring program in two locations where the insect was in outbreak in 1999. One set of plots was established on Fort Apache Indian Reservation where 9,615 acres of spruce and fir were defoliated on the Reservation and an adjacent section of the Apache-Sitgreaves National Forests. Another set of plots was established on Mt. Graham on the Coronado National Forest, where 400 acres of defoliation was recorded in 1999. Defoliation on Mt. Graham was first noted in 1997; and on Fort Apache in 1998. On Mt. Graham, the stress of 3 years of heavy defoliation has caused some tree mortality, additionally, spruce beetle and western balsam bark beetle have both reached outbreak levels and are causing extensive mortality of larger diameter trees in the spruce-fir type. While the moth outbreak seems to have collapsed in both locations during the fall of 1999, plots will continue to be monitored to determine the impacts of secondary infestation by other agents, such as bark beetles. Data collected will be used to assess the impact that this defoliator is having on the high elevation spruce and fir forests; to gain additional knowledge on the biology of this insect; and to provide information that will assist land managers in the prediction and/or prevention of future outbreaks. Contact Bobbe Fitzgibbon for more information.

## White Pine Blister Rust Studies

### Monitoring Plots

Between 1991 and 1997, we established 12 white pine monitoring plots in easily accessible areas throughout the Sacramento and adjoining White Mountains. These plots are thought to be fairly representative of conditions in the outbreak area, and were designed to provide a general idea of the spread, intensification, and effects of the disease over time. The plots are indicating steady increases in the amount of blister rust on most sites. Three plots that had no rust when they were established now have low levels.

Based on the latest remeasurements, 36.2 percent of our 555 sample trees had visible rust infection by 1999, compared to 29.9 percent in 1997. On the 10 oldest plots, the percent of infected trees increased from 24.2 to 38.2 percent between 1995 and 1999, while the percent of trees with stem cankers—infections that have reached the trunk and can be expected to eventually kill the tree—increased from 7.6 to 16.2 percent. To date, about 1.5 percent of the sample trees have been killed by blister rust since the plots were installed.

Information from these plots, along with observations made on other sites, was used to develop a preliminary rust hazard rating system, discussed below.

### Hazard Rating System

An initial rust hazard rating system, based on elevation, slope position, and plant association (habitat type) is being tested and refined. In 1998 and 1999, we conducted random sampling of white pines in five study areas (airsheds) covering a wide range of site conditions. A total of 1889 trees over 4.5 feet tall and 663 seedlings were sampled on 180 plots. Overall, rust was found on 32.2 percent of the larger trees and 8.3 percent of the seedlings.

Preliminary analysis appears to support our initial model. Stands above 8,000 feet typically harbor more rust than lower elevation stands. On a given slope, rust incidence is generally higher near the bottom than on the middle and upper portions. At similar elevations, white fir and blue spruce habitat types usually have more rust than Douglas-fir habitat types. More in-depth analysis, with the assistance of the Forest Health Technology Enterprise Team, will help us determine the relative value of the three site factors, and may indicate additional factors, such as canopy cover, that can be used to predict hazard. In a related study, the Rocky Mountain Research Station is collecting meteorological data on several sites to correlate with rust severity.

As part of these efforts, information has been gathered on *Ribes*, the alternate host for blister rust fungus. Rust incidence and severity is closely related to the presence of *Ribes pinetorum*, the orange gooseberry. Other *Ribes* species that occur in this area appear to be much less important in the outbreak.

The rating system should be useful for management of particular sites within the current outbreak area, which contains the largest population of southwestern white pine in the region. It should also help us predict where the disease could eventually become a problem in other parts of the Southwest. The project has been funded through the Forest Health Technology Development Program.

For additional information on these studies contact Dave Conklin, New Mexico Zone Office, or Brian Geils, Rocky Mountain Research Station. Eugene Van Arsdel, Forest Service volunteer and retired research pathologist, has ably assisted in these efforts.

## Pinyon Pine Dwarf Mistletoe Plots

Remeasurements were conducted in 1999 on two plots designed to monitor the spread and intensification of pinyon dwarf mistletoe, *Arceuthobium divaricatum*. The plots are located on the Ramah Navajo and Zuni Indian Reservations in western New Mexico. Dwarf mistletoe ratings (DMR's) increased on about 7 percent of the infected pinyons over a 5-year period, compared with about 35 percent of infected ponderosa pines on similar plots on the Carson and Santa Fe National Forests. Although a longer monitoring period will be needed to more accurately determine the intensification rate of pinyon mistletoe, it appears that the rate is much slower than that of other dwarf mistletoes. It may well be that pinyon mistletoe develops slowly to keep pace with its slow-growing host, allowing it to persist on sites for long durations.

## Effects of Prescribed Fire on Dwarf Mistletoe

We have contined to monitor the effects of prescribed fire (underburns) on dwarf mistletoe infestation in ponderosa pine on the Santa Fe National Forest. In 1999, remeasurements were conducted on a set of plots in areas that were burned in 1995 and 1996 on the Espanola Ranger District. Reductions in plot DMR's—a result of tree mortality and scorch pruning—were documented. Crown scorch and mortality were also checked on several plots located in more recently burned areas on both the Jemez and Espanola districts. Results to date were presented at the 1999 Western International Forest Disease/ Western Forest Insect Work Conference.

***Pinyon dwarf mistletoe, a common pathogen in the woodlands of the Southwest.***

## Insect and Disease Risk Map Project

In 1996 the Forest Health Protection (FHP) staff in Washington initiated a project to develop maps and associated databases that could provide information needed for a strategic evaluation of forest health risks on all forested lands in the United States. Several layers were identified including insects and diseases, fire, threatened and endangered species, and wildland-urban interface. Within FHP a team was assembled composed of representatives from each of the Forest Service regions to develop the methodology for the insect and disease layers. The team defined "risk," identified insects and diseases to be analyzed, identified the process by which areas at risk would be delineated and created maps showing areas at risk to insects and diseases. These maps have since been updated several times and will continue to be updated over time as new information becomes available. In 1999, the Washington Office FHP staff directed FHP staff units to conduct further analysis using the insect and disease risk map in order to determine, from a strategic standpoint, where treatments might be appropriate in dealing with risks to forest health. Specifically each region was asked to conduct an analysis in order to allocate areas at risk into treatable and untreatable areas. The first draft of this product will be completed this fiscal year. The risk mapping effort is intended to help Forest Service managers allocate resources to where the greatest benefits can be achieved in a cost effective manner. If you have questions about this project, the Southwestern Region FHP Coordinator for it is Jill Wilson.

## Website

The Arizona Zone and New Mexico Zone offices continue to maintain an active web site on the internet. This site provides a public forum for reporting past and present insect and disease conditions, biology, training opportunities, and mission statement. Hosted by the Northern Arizona University School of Ecosystem Science and Management, it can be accessed at **http://www.for.nau.edu/usfs/r3_fpm.** It is linked to the USDA Forest Service, Region 3 homepage and the Washington Office Forest Health homepage. Steve Dudley of the Arizona Zone is the webmaster.