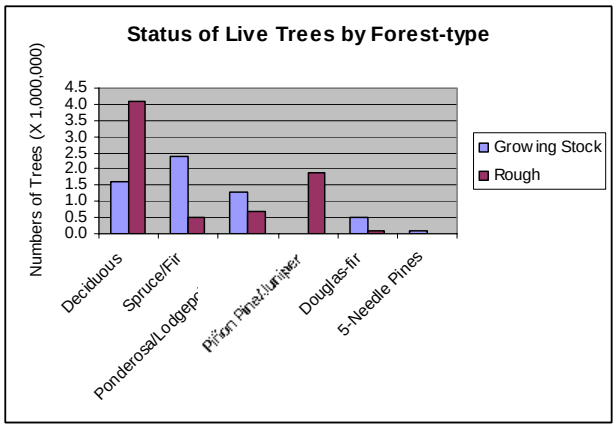
2003 Forest Health Highlights – Colorado

Autumn in the Rio Grande National Forest

The Resource

The most recent, complete measurement cycles of Colorado's forested lands were finished in 2002 by USDA Forest Service, Forest Inventory and Analysis (FIA) and Colorado State Forest Service. "Status" was evaluated for all living plot trees. "Growing Stock" trees were generally healthy trees with very few damages, while "Rough" trees were often declining due to one or more major damages. Almost ¾'s of the deciduous trees in Colorado were labeled "Rough" due to damages and difficult growing conditions. The majority of the 5-needle, ponderosa, and lodgepole pines, along with the spruce, fir, and Douglas-fir, are growing well but damaging bark beetles were becoming apparent during inventory surveys. Probably the most disturbing status result was observed in the Piñon-Juniper forests in Colorado; inventory surveys indicated serious decline in this forest-type.



Special Issues

Drought and bark beetles

Much of Colorado has suffered from drought conditions for the past several years. The drought was extreme during 2002 with many records being set in various categories of drought indices. Drought conditions were abated during 2003, but tree mortality continued to occur at a high level.

Very high levels of tree mortality due to bark beetle activity have also marked this period of drought. Lack of moisture contributes to increased bark beetle activity in two ways. First, the stress induced by a drought makes host trees more vulnerable to death by the beetles. The primary defense of trees against

bark beetle attack is production of resin and when moisture is unavailable to a host tree, it is unable to produce this resin for defense. Secondly, this lack of resistance in host trees allows attacking bark beetles to more easily colonize their hosts. The relative abundance of susceptible hosts allows the populations of damaging agents to increase dramatically. With large amounts of available food, bark beetles can increase their numbers and these large populations kill even more susceptible hosts. Thus, it is not surprising that large numbers of host trees can be killed in a relatively short period of time. While the extreme drought conditions of 2002 decreased during 2003, the large insect populations remained and tree mortality occurred on a large scale.

Virtually every species of conifer in all of the major Colorado forest types experienced a high degree of mortality in 2003. Overall, the distribution of the tree mortality was rather spotty, some forests suffered extensive, intense mortality, while other forested areas escaped relatively unscathed. However, if drought conditions continue, many experts predict that tree mortality will continue to increase over time. Long-term weather patterns will determine future forest conditions.

Douglas-fir beetle, *Dendroctonus pseudotsugae*, continued to kill mature trees in areas scattered throughout southern Colorado. An area north of Durango had several hundred trees killed by the beetle. In many cases, Douglas-fir beetle activity is occurring in areas of chronic defoliation by western spruce budworm.

Douglas-fir beetle was detected in fire-killed trees in the Haymen burn area of Colorado but has not yet been found in adjacent unburned Douglas-fir trees. Conditions are favorable for Douglas-fir beetle in this area. Douglas-fir beetle continues to cause some mortality in Douglas County in older burned and defoliated areas.

Douglas-fir pole beetle, *Pseudohylesinus nebulosus,* is rarely considered a major damaging bark beetle species, but this insect killed many hundreds of mature Douglas-fir in the eastern portion of the San Juan National Forest. Undoubtedly drought conditions have allowed this beetle to take advantage of large numbers of susceptible hosts. This insect most frequently attacks smaller diameter Douglas-fir, but trees up to 12 inches DBH were killed near Pagosa Springs. This beetle was also detected at high levels during ground surveys of Wet Mountain north of Durango, in the Southern San Juan Mountains.

Mountain pine beetle, *Dendroctonus ponderosae*, activity increased in lodgepole pine in north-central Colorado; it was first detected in 1997 and continues to expand. In Grand County three major outbreak areas located around Lake Granby continue to have high mortality. Mortality pockets above 10,000 feet were becoming evident and newly infested trees were noted on higher elevation sites. It appeared that recent warmer summers were pushing up the reported elevation ranges for greater mortality. High visibility areas in Summit County had expanding mountain pine beetle activity. Lower elevation lodgepole pine areas on the Routt National Forest had significant expansion of mountain pine beetle activity especially in the Rock Creek watershed on the Yampa Ranger District.

On the Front Range, there was notable mountain pine beetle activity on the Canyon Lakes District just north of Poudre Canyon in ponderosa pine. Scattered mortality in ponderosa pine and lodgepole pine throughout the Front Range was due to a combination of this beetle and *Ips* beetles.

In the southern portion of the state there were two major outbreaks of mountain pine beetle that have been occurring for the past several years. In Chaffee County, mountain pine beetle killed large numbers of ponderosa pine. This outbreak originated in the upper Arkansas river valley, and spread to the east, roughly following the course of the river, into the Wet Mountains and the Sangre de Cristo Mountains.

Another major outbreak occurred in the vicinity of Vail Valley along the Interstate 70 corridor. Here mountain pine beetle killed large numbers of their other primary host, lodgepole pine. Mortality was originally concentrated near the Vail ski area and adjacent urban interface areas, but this activity now appears to be moving north of the Interstate with areas of increasing mortality in the Redstone Canyon/Piney Lake area. Many of these lodgepole pine stands are at fairly high risk to mountain pine beetle activity, and significant mortality is expected into the future.

There were many areas with scattered, fairly intense pockets of mountain pine beetle activity. Portions of the San Juan, Rio Grande, Gunnison, and Uncompahgre Nat'l Forests all have areas of significant mortality due to this insect. While this bark beetle activity is not on a scale represented by either the Arkansas Valley or Vail Valley outbreaks, drought conditions encourage beetle activity and cause significant epidemics.

Pine engraver beetle, Ips *spp.* - *Photo by aerial surveyor Dustin Wittwer (US Forest Service) of dying piñon in southwest Colorado*

Perhaps the most dramatic, recent example of tree mortality in the central Rocky Mountains has been the extensive loss of piñon pine. This outbreak occurred on a huge scale, with piñon trees being killed in large numbers throughout their range. Several species of piñon were affected, from New Mexico to California and south into Mexico.

The mortality has been particularly intense in the southern portion of the state with many thousands of acres experiencing the loss of mature piñon. Again, the drought conditions of the past several years are the root of the situation, but fairly high tree densities and the overall even-age status of the piñon stands are contributing factors.

In the most highly affected, southern portion of the state, many stands have lost 90% of the mature piñon. The worst of this mortality occurs in the piñon stands around Durango, Cortez and Dolores. Moving further north, the mortality is more scattered with some sites of intense mortality.

The future of the outbreak depends greatly upon future weather conditions. Even with weather conditions favorable to healthy piñon, it may take some time before bark beetle numbers return to a more endemic level. In any case, the slow growth of piñon stands means that many areas will not regain a mature piñon component for some time to come. Aerial survey estimates for 2003 are that 4,193,900 piñon trees have died on approximately 937,000 acres in Colorado.

Other *Ips* spp. beetles caused mortality to other pines on drought stressed sites in Colorado. In addition to the massive piñon mortality in the southern and western areas of the state, there was significant damage caused by *Ips* beetles following a spring blizzard along the east slope of the Colorado Front Range. Many broken limbs and damaged tree tops from this storm created much suitable material for colonization by *Ips* beetles.

Mortality of ponderosa pine due to *Ips pini* and *Ips calligraphus* caused concern for resource managers at the Air Force Academy and Fort Carson. Ponderosa pines at lower elevations along drainages going into the grasslands were most affected. Jefferson, Boulder, Clear Creek and Gilpin Counties had higher levels of *Ips pini* on small diameter lodgepole pines. *Ips pini* was reported at high levels locally in small diameter lodgepole pine in Jefferson, Boulder, Clear Creek and Gilpin Counties.

Spruce beetle, *Dendroctonus rufipennis* - Aerial survey estimates for spruce tree mortality caused by spruce beetle were 519,700 trees killed on 70,900 acres throughout Colorado. In southern Colorado, the majority of spruce beetle activity occurred in scattered pockets of less than 100 acres, but there are a number of sites where large, mature spruce have been killed over extensive areas. In terms of the

scattered activity, there are about 30 known spruce beetle sites on the White River, Grand Mesa, Gunnison, Uncompahgre, San Juan, and Rio Grande National Forests.

Hundreds of thousands of spruce were killed in Routt and Jackson Counties as the spruce beetle outbreak continues to expand and intensify in the area of the Routt Divide Blowdown. Main areas affected are north of Rabbit Ears Pass to the Wyoming border on the Gore.

Western pine beetle, *Dendroctonus brevicomis* **-** This beetle killed large ponderosa pines in several locations on the San Juan National Forest. It is most frequently found in combination ("mixed broods") with *Ips pini* (pine engraver) and *Dendroctonus adjunctus* (the round headed pine beetle); these beetles have killed several hundred large mature ponderosa pine. These bark beetles are present at higher levels in south-central and southwest Colorado.

Subalpine fir mortality, caused mostly by the western balsam bark beetle, *Dryocoetes confuses,* and disease-causing fungi*,* continued at high levels in Colorado. The problems occurred on 482,000 acres and were significant in southern Colorado. On several ski areas, the loss of subalpine fir is a concern for managers. The widespread nature of the mortality, combined with the fact that tree death is caused by a combination of insect and fungal activity means there are few options for managerial response. Maintaining thrifty stands with a wide range of age classes is probably the most prudent course of action to reduce long-term perturbations.

New "Introduced" Pests and Weather-caused Forest Health Problems

Banded elm bark beetle, *Scolytus schevyrewi* - The banded elm bark beetle was first detected in Denver in an exotic bark beetle trap and has since been discovered in Colorado, Kansas, Nebraska, South Dakota, and Wyoming. Adults are active from early spring until fall freeze and the insects can complete a generation in four to six weeks depending on weather conditions.

This beetle was first observed in Aurora, Colorado in March 2003 and now found throughout lower elevations of Colorado and in 9 other nearby states. Of particular concern is when the beetles are found in elms with Dutch elm disease; banded elm bark beetle might be able to vector this disease to other American elm trees.

White pine blister rust, *Cronartium ribicola* – *(Photo taken by JLHarris of white pine blister rust cankers on a bristlecone pine branch in Colorado)*
White pine blister rust is found on limber pines in northern Colorado. In 2003, isolated infestations of the disease were newly discovered in the Sangre de Cristo and Wet Mountains of southern Colorado on limber pine. An infected Rocky Mountain bristlecone pine was also discovered in the Sangre de Cristo Mountains in the Great Sand Dunes National Monument. This discovery is very momentous in that the disease has never been reported on bristlecone pine in nature, and the implications of rust on bristlecone pine may be very significant both ecologically and culturally.

Drought - In 2003, moisture conditions improved over much of the state with the southwest corner still having severe drought conditions. Aspen and cottonwoods along ditches and riparian waterways died due to reduced stream flows. Gambel oaks were showing dieback in southern Colorado. Some conifer stands in the mountains were exhibiting stress cone crops due to the drought conditions.

Snow Damage - Heavy spring snowstorms throughout Colorado caused broken branches of thousands of ponderosa pines and Douglas-firs in the mountains. In the towns, junipers, piñons, Colorado blue spruces, elms, and cottonwoods suffered from many broken limbs. The broken limbs provided good habitat for several bark beetles.

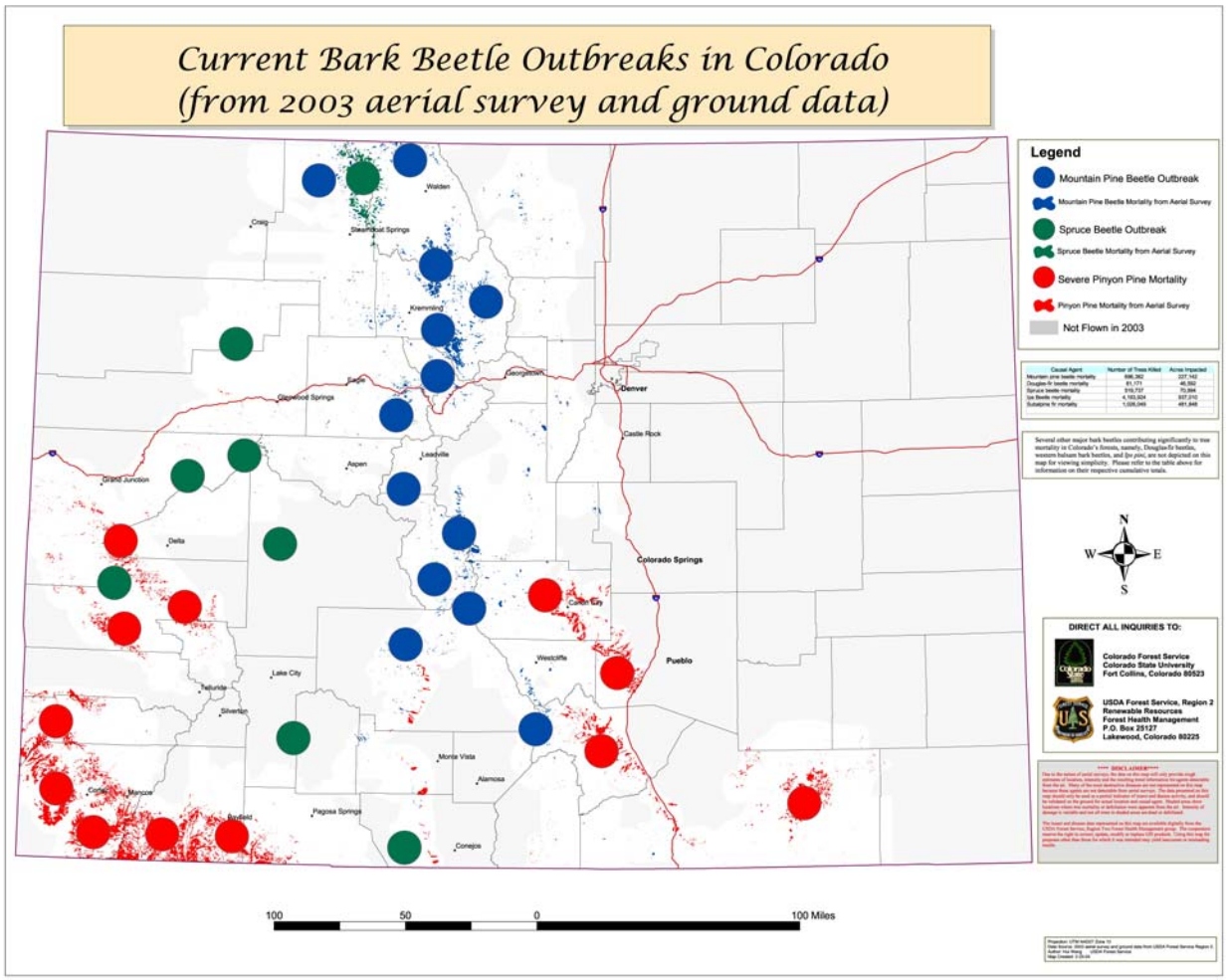
Chemical Damage - Ice and dust-control materials utilizing magnesium chloride were increasingly applied in the mountain road systems in Colorado, with corresponding increases in tree damage throughout the state.

Off Plot Survey – Over 30 million acres of forested lands were surveyed for insect and disease caused mortality in Colorado during 2003. Most of this area was surveyed using small aircraft flown at low elevation over the state's forests while recording tree mortality on maps. These aerial survey data are available for review at:

ftp://ftp2.fs.fed.us/incoming/r2/ro/aerial_survey/2003/

Aerial survey results are summarized in the following table:

Damaging Agents	**Number of Acres Affected (X 1000)**	**Counties with More Than 10,000 Acres of Damage**
Ips spp. Beetle	937.0	Archuletta, Conejos, Custer, Dolores, Fremont, Huerfano, La Plata, Larimer, Las Animas, Montezuma, Montrose, Pueblo, San Miguel
Subalpine Fir Mortality	481.8	Delta, Eagle, Garfield, Grand, Jackson, Mesa, Moffat, Pitkin, Rio Blanco, Routt
Mountain Pine Beetle	227.1	Chaffee, Eagle, Grand, Jackson, Park, Routt, Summit
Spruce Beetle	70.9	Jackson, Routt
Douglas-fir Beetle	46.6	Archuleta



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