

Aerial Survey Highlights for Colorado, 2016

Aerial detection surveys of tree-killing or damaging insects and diseases are conducted annually over Colorado's forestlands. This is a cooperative effort between the U.S. Forest Service and the Colorado State Forest Service. In 2016, 28 million acres were surveyed by six federal and state surveyors. Highlights of the survey are reported below. All reported agents are insects that kill and/or defoliate trees. This report includes only forest damage that is visible from the air.

Spruce Beetle

- Since 1996, spruce beetle has affected approximately 1,715,000 acres to varying degrees in Colorado.
- Spruce beetle activity was detected on 350,000 acres in Colorado in 2016. Of these, 136,000 acres are in areas not previously mapped as having spruce beetle activity (new acres*). This epidemic continues to expand (Figures 1 and 2). A heavily impacted stand with current beetle activity is shown in Figure 3.
- The spruce beetle epidemic is expanding most rapidly in southern Colorado's forests and impacts many thousands of acres. Areas affected are found from the New Mexico border to north of Cottonwood Pass. Aerial surveys in south-central Colorado showed spruce beetle epidemics expanded on the San Juan (12,000 new acres on 36,000 active acres**), Rio Grande (22,000 new acres on 93,000 active acres), Gunnison (30,000 new acres on 72,000 active acres) and San Isabel (24,000 new acres on 46,000 active acres) National Forests. Approximately 660 acres of new windthrown Engelmann spruce trees in the Wet Mountains will continue to provide ideal habitat for expanding spruce beetle populations (Figure 4).
- In northern Colorado, spruce beetle caused new tree mortality from the Rabbit Ears Range east through the southern Medicine Bow Mountains and into northern Rocky Mountain National Park. Spruce beetle was detected on 19,000 new acres and is active on 47,000 acres in Grand, Jackson and Larimer Counties.

* New acres are those with insect or disease activity not previously mapped during aerial detection survey.

** Active acres indicate the entirety of an area of current insect or disease activity, including areas that may have been impacted in previous years.

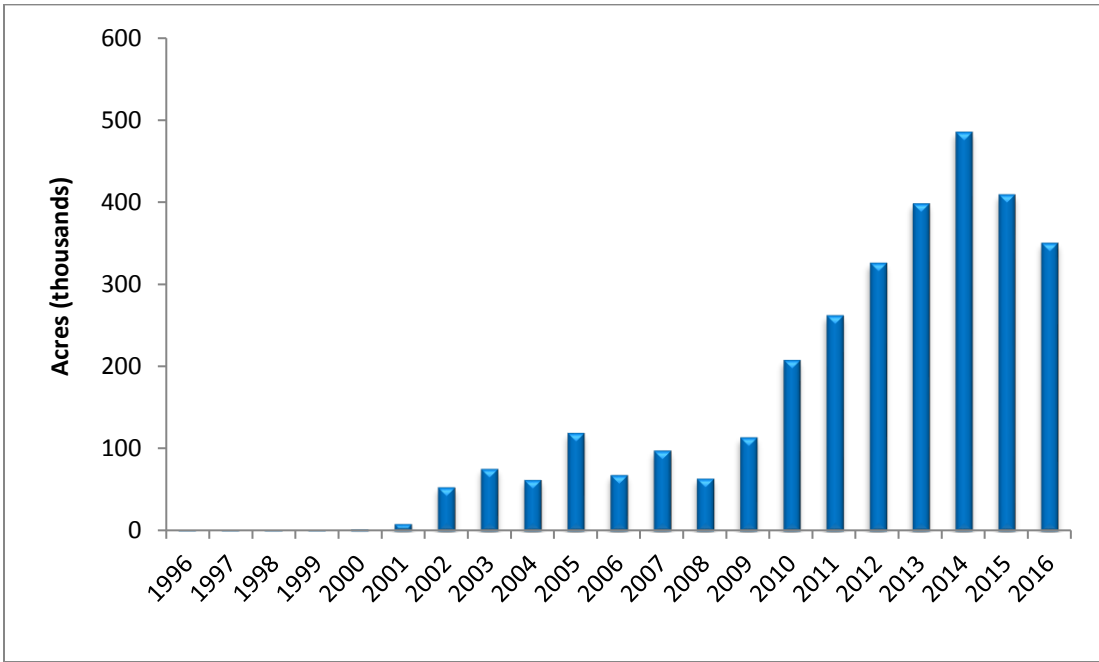


Figure 1. Annual acres affected by spruce beetle in Colorado.

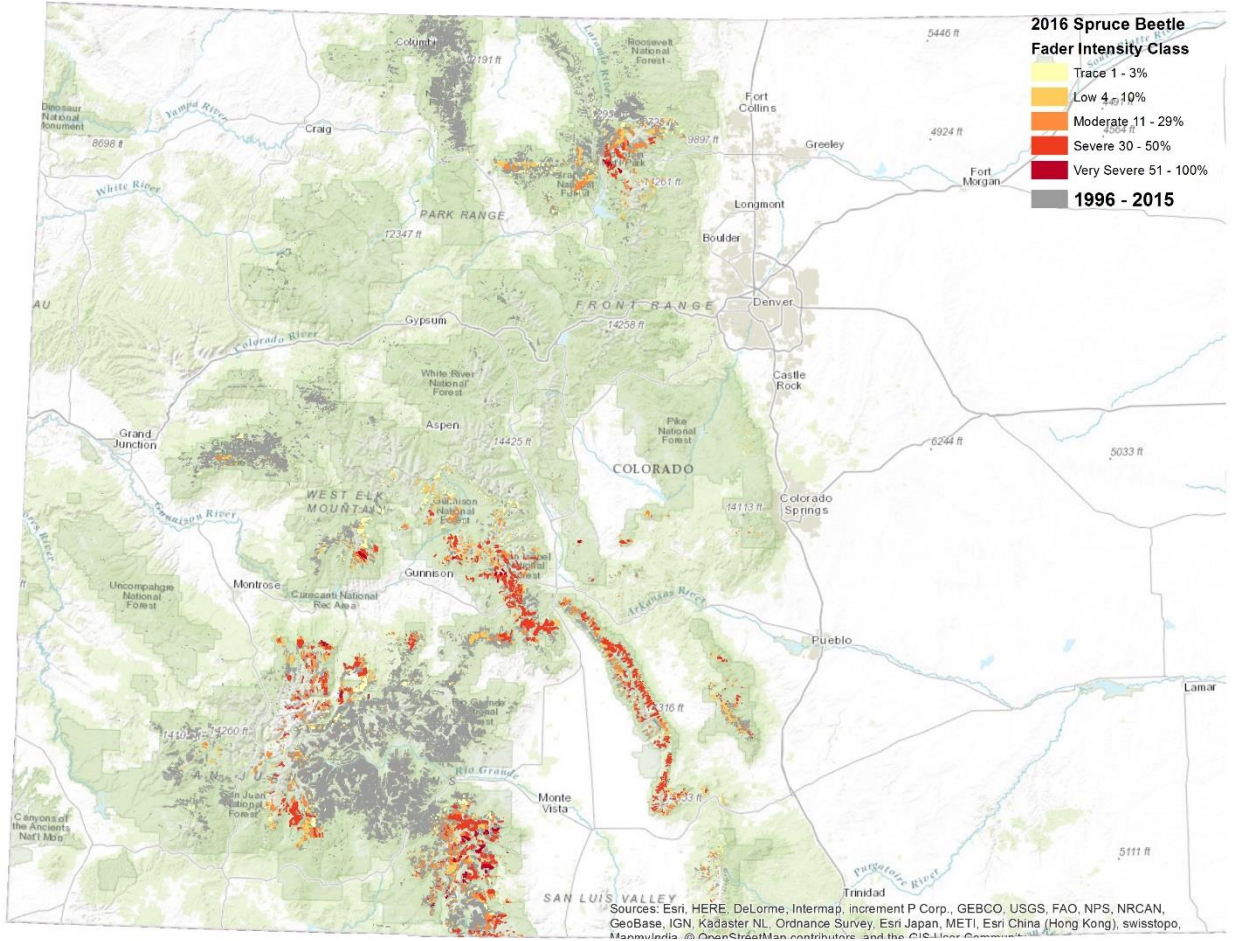


Figure 2. Spruce beetle activity in Colorado, 1996-2016.



Figure 3. A mix of recent and older mortality caused by spruce beetle on the Rio Grande National Forest. Photo: Justin Backsen



Figure 4. An October 2016 windstorm toppled spruce trees on 660 acres in the Wet Mountains, creating potential habitat for spruce beetles. Photo: Bob Cain

Mountain Pine Beetle

- The mountain pine beetle epidemic has ended in Colorado (Figure 5). Larger lodgepole pine trees have been depleted in the core outbreak areas, but smaller trees and new regeneration remain. Larger pines that were not infested are most abundant south and west of the main epidemic area (Figure 6). Mountain pine beetle affected approximately 3.4 million acres in Colorado since 1996.
- The mountain pine beetle-affected area in Colorado did not expand in 2016. Less than 1,000 acres of mountain pine beetle activity were observed statewide.

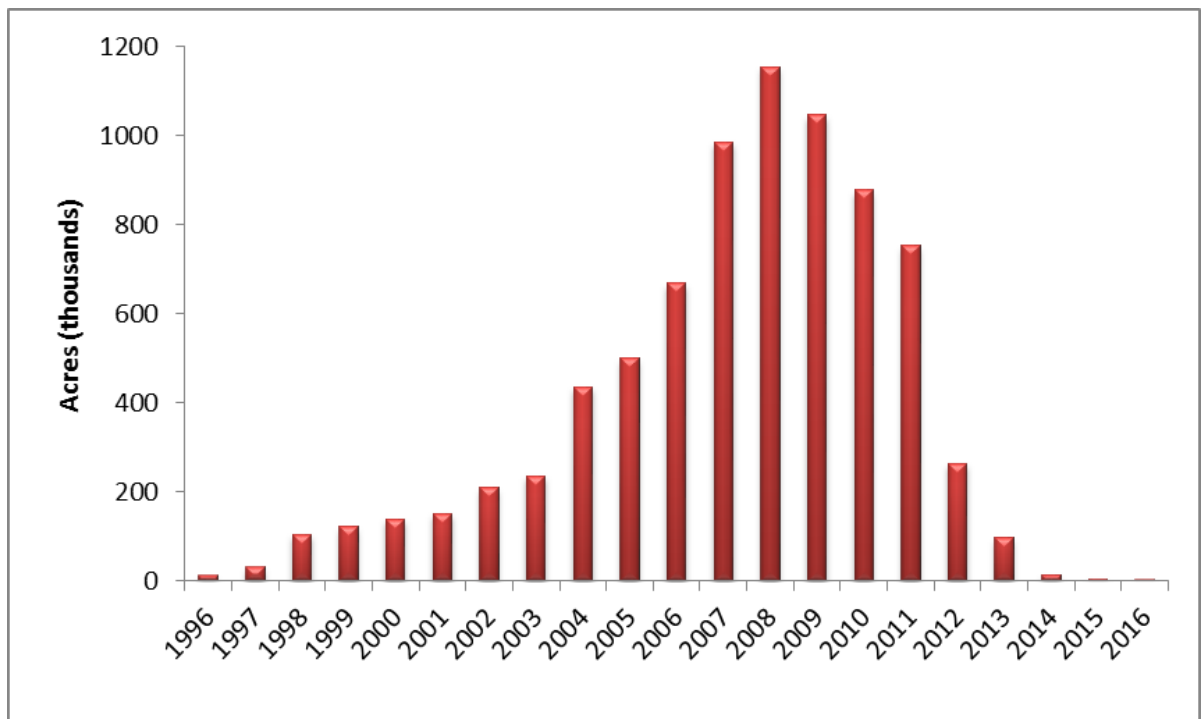


Figure 5. Annual acres affected by mountain pine beetle in Colorado, 1996-2016.

Mountain Pine Beetle Activity in All Hosts
Colorado: 1996 - 2016

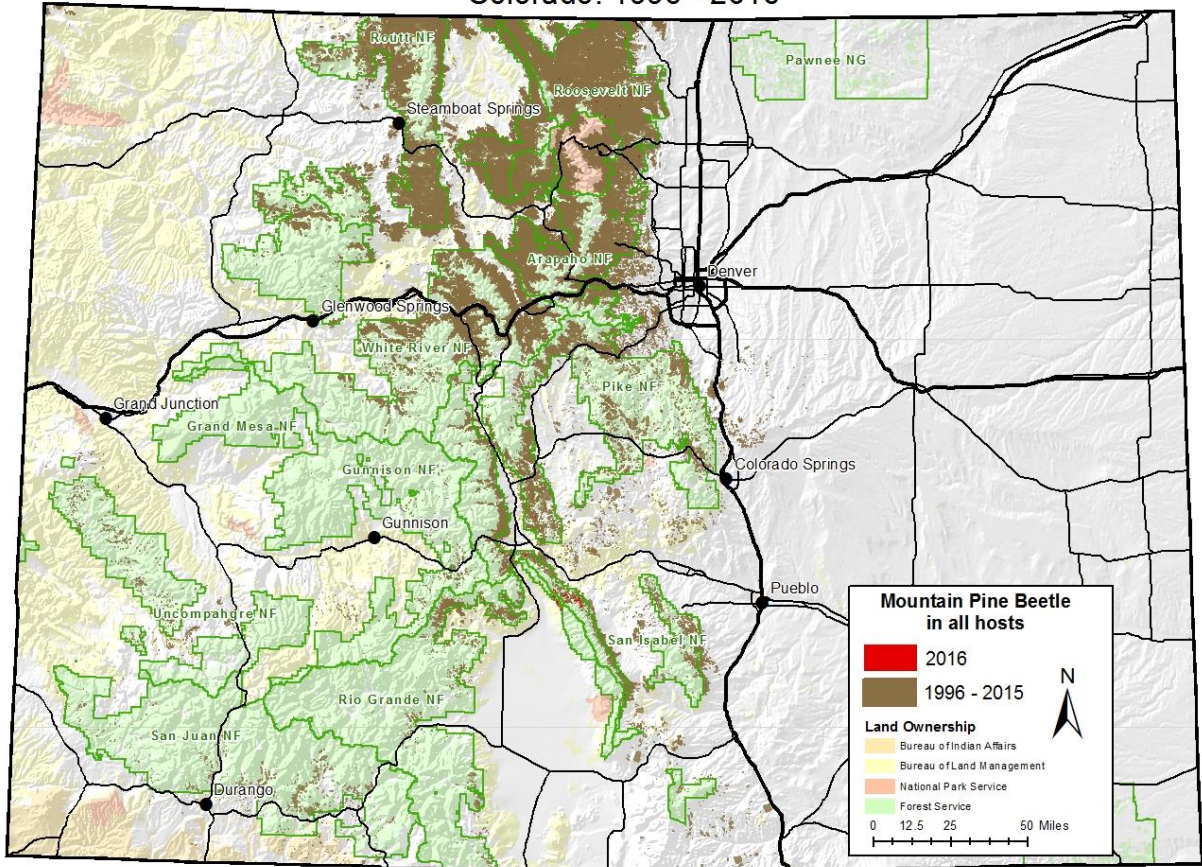


Figure 6. Mountain pine beetle activity in Colorado, 1996-2016.

Roundheaded Pine Beetle

- Roundheaded pine beetle has killed ponderosa pines in Dolores County for several years and affected nearly 7,000 acres in 2016 (Figures 7 and 8). In the state, this insect has only been reported from southwestern Colorado and epidemics tend to grow more slowly and are more localized than those of spruce beetle or mountain pine beetle. The persistence and expansion of this particular epidemic are notable.

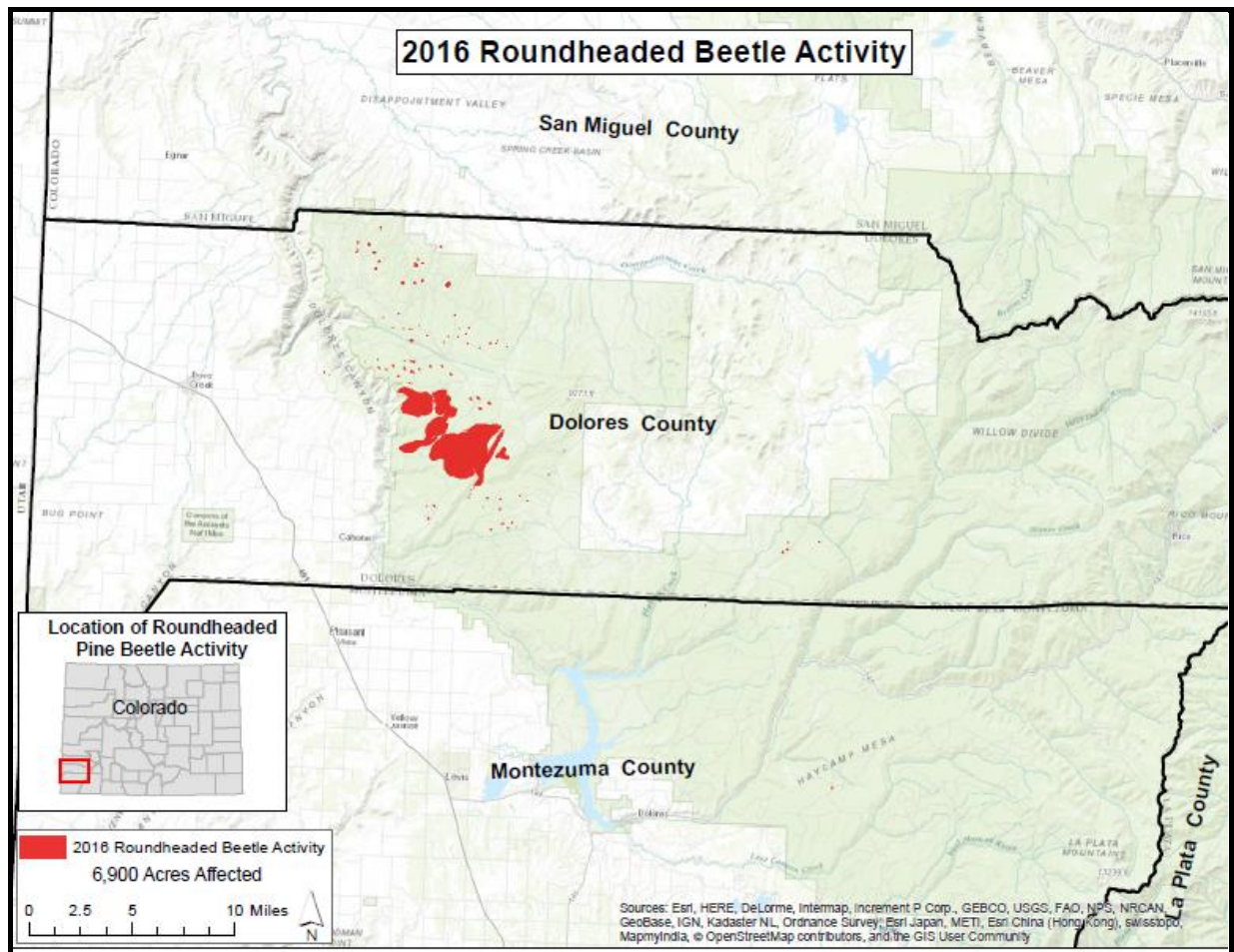


Figure 7. Roundheaded pine beetle activity in southwestern Colorado.



Figure 8. Ponderosa pines killed by roundheaded pine beetle in Dolores County. Photo: Dan West

Douglas-fir Beetle

- Douglas-fir beetle activity was detected on 19,000 acres and expanded onto 15,000 new acres in Colorado. In recent years, levels of Douglas-fir tree mortality have varied widely, from scattered mortality in some stands to almost total loss of mature Douglas-fir in others. The mortality is geographically widespread and affects Douglas-fir in almost all locales throughout the state.

Western Balsam Bark Beetle

- Western balsam bark beetle activity was detected on 122,000 acres in subalpine fir across Colorado in 2016. These infestations are generally widespread, but kill fewer trees per acre than other bark beetles currently active in the state. This tree mortality is often associated with root disease in high-elevation forests.
- Where western balsam bark beetle occurs in spruce beetle-affected stands, overall stand mortality is increased.

Fir Engraver Beetle

- Acres affected by fir engraver on white fir decreased in southwestern Colorado, from approximately 19,000 acres in 2015 to 6,300 acres in 2016. Outbreaks of fir engraver beetle are often associated with localized drought conditions and may occur in areas where white fir has matured on sites more favorable to ponderosa pine.

Douglas-fir Tussock Moth

- Douglas-fir tussock moth populations collapsed from 26,000 acres in 2015 to only 30 acres detected, all in Douglas County, in 2016. Natural enemies of this insect, including a virus (NPV), contributed to population collapse. High-value areas were treated (aerial spray) with *Bacillus thuringiensis* (BtK) outside of Colorado Springs on city property, private lands and National Forest lands.
- Localized areas defoliated in 2015 suffered significant tree mortality or top-kill depending on severity of defoliation (Figure 9). Other areas have recovered with minimal damage. Defoliation can increase susceptibility to other insects, such as Douglas-fir beetle.



Figure 9. Perry Park, 2015: (L) early summer; (R) late summer. Photos: Dan West

Western Spruce Budworm

- Western spruce budworm activity decreased in Colorado in 2016, but was locally abundant across the state. Aerial surveys detected 226,000 defoliated acres in the state in 2016, compared to 312,000 acres in 2015.
- This insect feeds on the new needles of white fir, Douglas-fir and less notably on spruce and subalpine fir (Figure 10).
- Activity was most notable on the White River, Pike-San Isabel, Gunnison, San Juan and Rio Grande National Forests and adjoining lands.



Figure 10. Western spruce budworm larva on a Douglas-fir.
Photo: Brian Howell

Western Tent Caterpillar and Large Aspen Tortrix

- Defoliation of aspen was detected on 19,000 acres in 2016, primarily caused by western tent caterpillar, with lesser amounts caused by large aspen tortrix (Figure 11). Defoliation can lead to tree mortality if it occurs repeatedly over several years, especially during droughts. The 2016 defoliation was less severe than that reported in 2015.
- Defoliated aspen typically grow new leaves in mid-to-late summer.



Figure 11. Aspen defoliation caused by large aspen tortrix or western tent caterpillar on the Rio Grande National Forest. Photo: Brian Howell

Aspen Discoloration

- Discolored aspen foliage was detected on only 5,600 acres in 2016, compared to 81,000 acres in 2015, throughout aspen stands in Colorado. Discolored aspen foliage is typically caused by foliar diseases which are often associated with wetter than average spring and early-summer weather. Marssonina leaf blight is the most common leaf disease of aspen in Colorado. Although this disease causes defoliation, it is weather-dependent and may be common one year and difficult to detect the next. Tree mortality associated with this disease is rare.