

## Aerial Survey Highlights for Colorado 2019

Aerial detection surveys of tree-killing or damaging insects and diseases are conducted annually over Colorado's forest lands. This is a cooperative effort between the US Forest Service and the Colorado State Forest Service. In 2019, 30 million acres were surveyed by five federal and state surveyors. Highlights of the survey are reported below. All reported agents are insects that kill and/or defoliate trees or abiotic damages. This report includes only forest damage that is visible from the air.

### Spruce Beetle

Spruce Beetle epidemics continue to expand in Colorado (Figure 1). Separate spruce beetle epidemics that began in the early 2000s moved through mixed spruce forest types on 1,866,000 acres. The epidemic is declining in many areas where most of the overstory spruce was depleted (Figure 2). Larger diameter trees are necessary for epidemics to grow. Aerial surveys detected new fading spruce killed by spruce beetle on 89,000 acres in Colorado in 2019 (Figure 3). Of these, 25,000 acres are in newly mapped areas.



*Figure 1. Adult spruce beetles observed on the Gunnison National Forest. Photo by Justin Backsen, USDA Forest Service.*

In Colorado, epidemics have slowed where host trees were depleted (Figure 4) and increased where adjacent stands of uninfested green spruce exist. Notable areas of spruce beetle activity detected in 2019 aerial surveys include: areas in and adjacent to Rocky Mountain National Park in Northern Colorado and areas in and around the Buffalo Peaks Wilderness, the Collegiate Peaks, the Uncompahgre Wilderness, and portions of the Southwestern Weminuche Wilderness in Southern Colorado.



*Figure 2. Spruce beetle mortality and salvage on Slumgullion Pass on the Gunnison NF. Photo by Suzanne Marchetti, USDA Forest Service.*

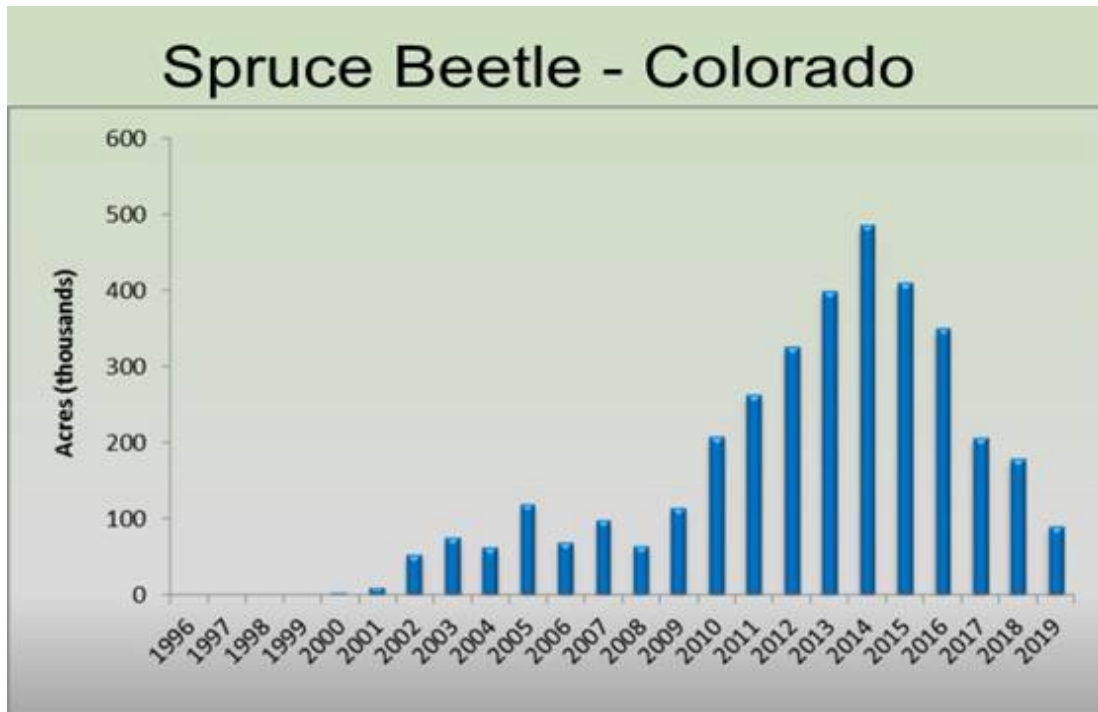


Figure 3. Annual acres affected by spruce beetle in Colorado 1996 - 2019.

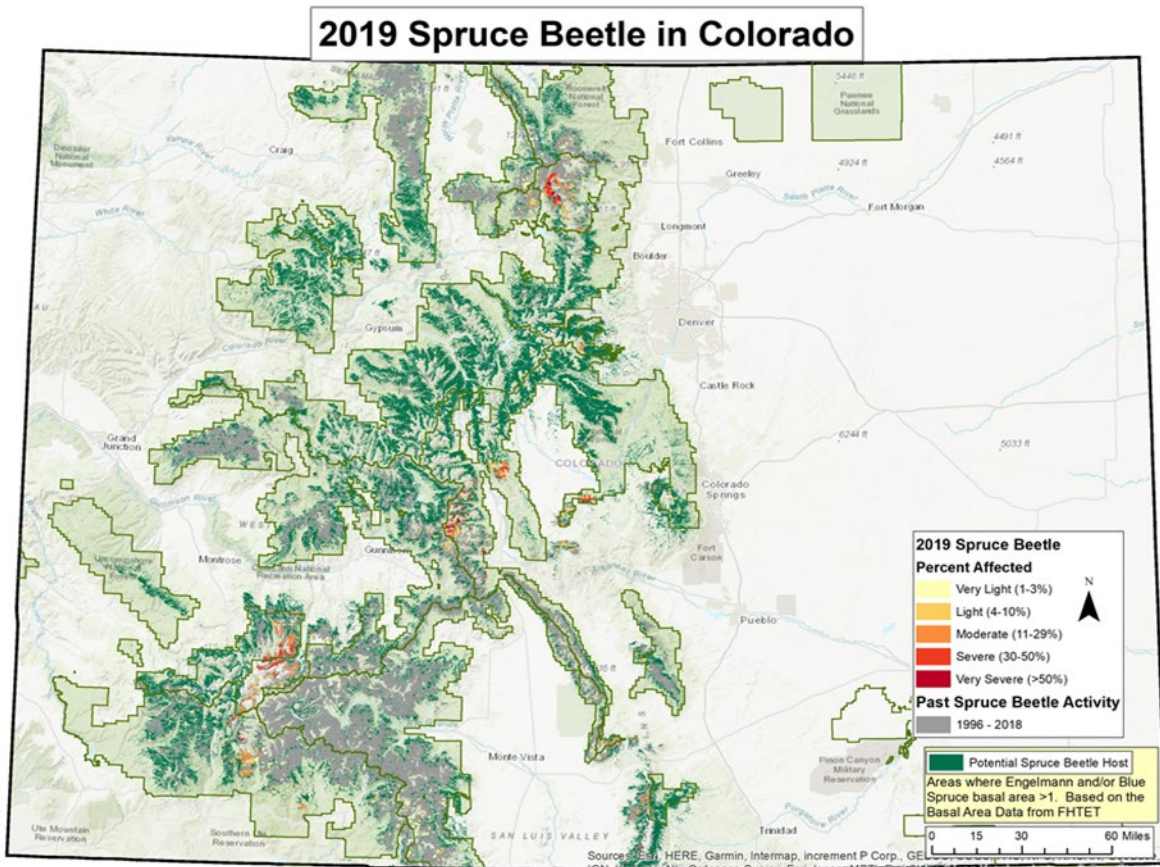


Figure 4. Spruce Beetle activity in Colorado 1996-2019.



### **Mountain Pine Beetle**

Mountain pine beetle remains at low (endemic) levels across most of the region after a large outbreak, which peaked in 2009. Aerial surveyors delineated a new outbreak on the Gunnison Ranger District on about 600 acres. Ground surveys show an increasing population near the Wilder subdivision in Taylor Canyon with abundant larger diameter lodgepole pines that could support a growing outbreak (Figure 5). The Gunnison Service Center Forest Health Protection staff will continue to monitor this area and the Gunnison Ranger District is working collaboratively adjacent private landowners to remove infested trees.

Ground surveys on the Dolores Ranger District on the San Juan National Forest show that mountain pine beetle is an active component of a complex of western bark beetles in ponderosa pine. In this area, mountain pine beetle is not the primary tree mortality agent, but is mixed with more abundant roundheaded pine beetle and western pine beetle.



*Figure 5. Lodgepole pine mortality caused by mountain pine beetle in the Taylor Canyon area of the Gunnison National Forest, Colorado. Photo by Justin Backsen, USDA Forest Service.*

### **Roundheaded Pine Beetle and Western Bark Beetle Complex in Ponderosa Pine**

The northern range of the roundheaded pine beetle extends into southern Colorado where it occurs with western pine beetle and mountain pine beetle in ponderosa pine. An outbreak of roundheaded pine beetle and to a lesser extent western pine beetle on the San Juan National Forest has continued to expand since 2011. While roundheaded pine beetle outbreaks are typically shorter in duration in southwestern forests, this outbreak has continued to increase in intensity with abundant pine hosts available. Aerial detection surveys recorded over 22,000 acres on the Dolores Ranger District in 2019 with varying intensity of beetle caused tree mortality (Figure 6). The area affected is within the San Juan



*Figure 6. Roundheaded and western pine beetle caused tree mortality in southwest Colorado. Photo by Dan West, Colorado State Forest Service.*

National Forest (Figure 7) suitable timber base and is a valuable resource for local mills. USFS FHP entomologists in partnership with the Colorado State Forest Service are tracking the extent/intensity of the outbreak, bark beetle flight times and determining bark beetle species killing trees. Unlike other *Dendroctonus* species, flight times of adult roundheaded pine beetles occur primarily in the fall with a smaller percentage of beetles flying in spring.

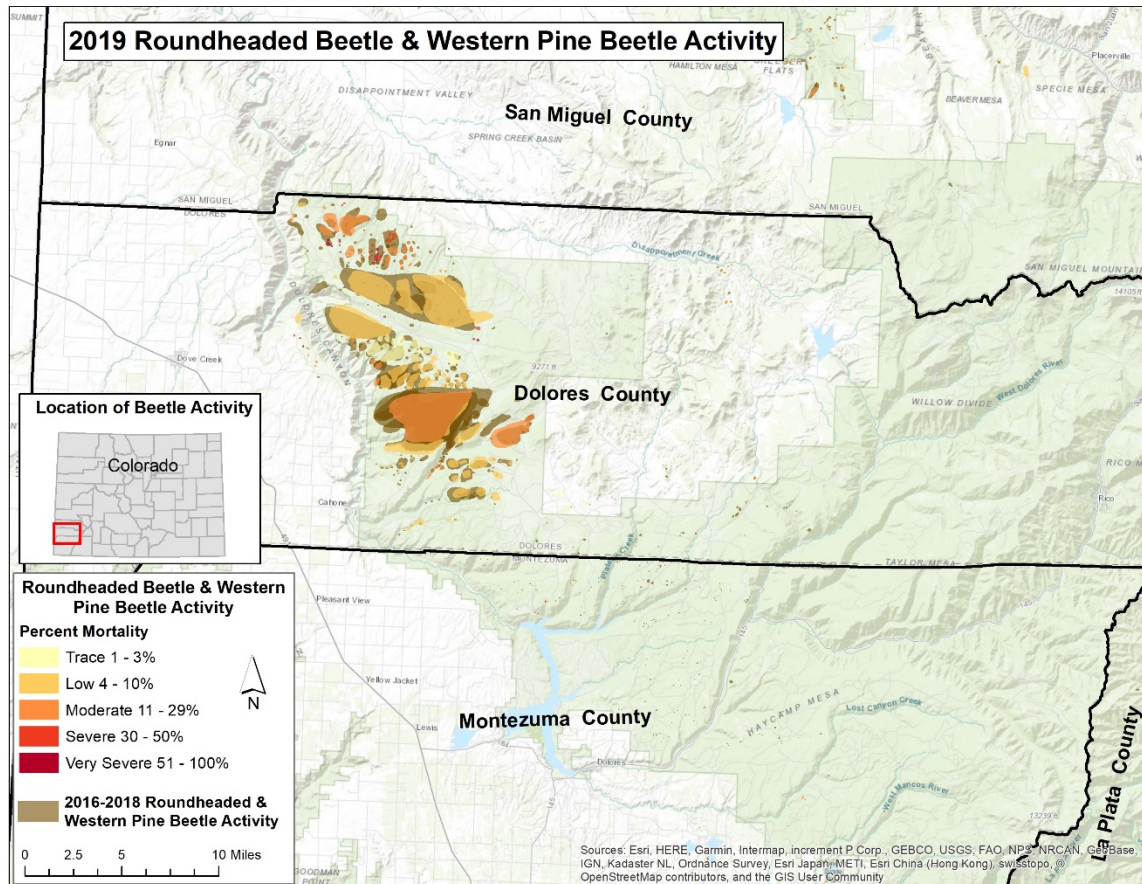


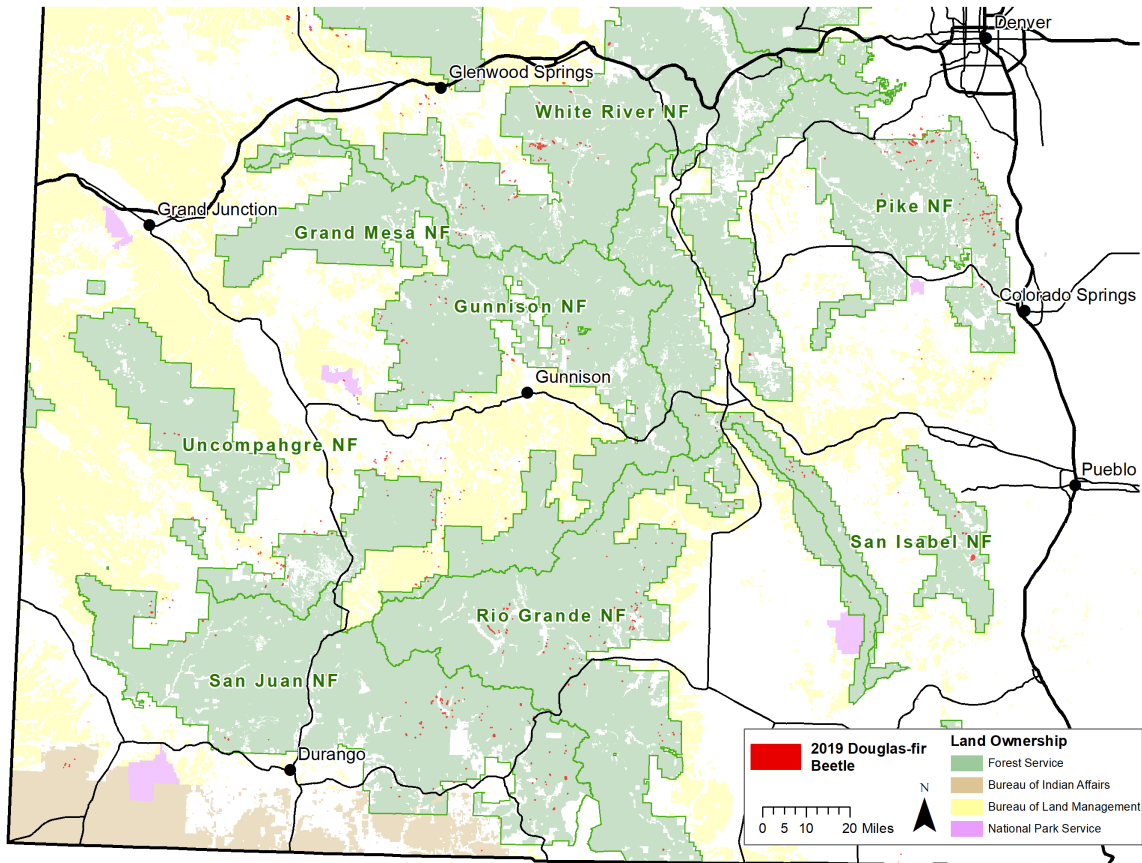
Figure 7. Roundheaded and western pine beetle activity in southwestern Colorado as observed from the 2019 aerial detection survey

### Douglas-fir Beetle

In 2019, aerial surveyors detected Douglas-fir beetle activity on 7,400 acres and expanded on an additional 6,000 acres in CO. In recent years, Douglas-fir tree mortality rates 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 Colorado (Figure 8).



Notable areas affected include portions of the Gunnison, Rio Grande, Uncompahgre, San Juan, and White River National Forests.



*Figure 8. Douglas-fir beetle activity in southwestern Colorado as observed from the 2019 aerial detection survey.*

### Western Balsam Bark Beetle

Aerial surveyors detected western balsam bark beetle activity on 23,000 acres in subalpine fir across Colorado and 5,700 acres in the Rocky Mountain Region portions of Wyoming (south and east of the Absaroka and Wind River Divide). These infestations are generally widespread; however, kill fewer trees per acre than other bark beetles currently active in the state (Figure 9).

- 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.

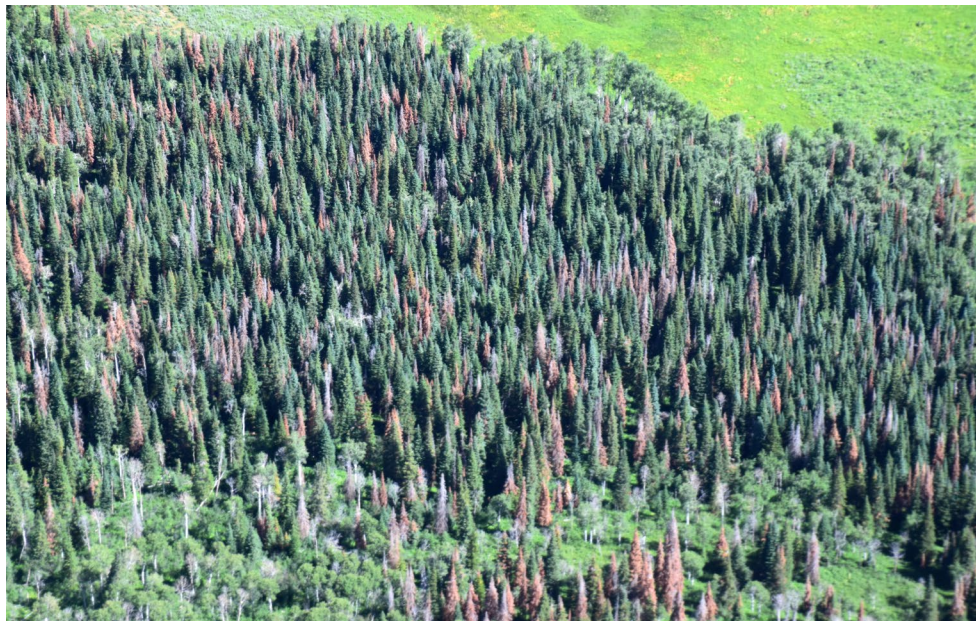


Figure 9. Western balsam bark beetle activity in subalpine fir in northern Colorado as observed from the 2019 aerial detection survey. Photo by Justin Backsen, USDA Forest Service.

### Western Spruce Budworm

Western spruce budworm activity was locally abundant in northern Wyoming and across the southwestern part of Colorado. (Figure 10). Aerial surveys detected 131,000 defoliated acres in Colorado in 2019.

This insect feeds on the new needles of white fir, Douglas-fir and less notably on spruce and subalpine fir. Drying needles webbed to twigs impart a brown cast to infested trees. Activity was most notable on the White River, Pike-San Isabel, Gunnison, San Juan, and Rio Grande National Forests and adjoining lands. Areas on the Rio Grande National Forest have had consecutive years of heavy defoliation that continues to kill trees.

2019 Western Spruce Budworm Activity in Colorado

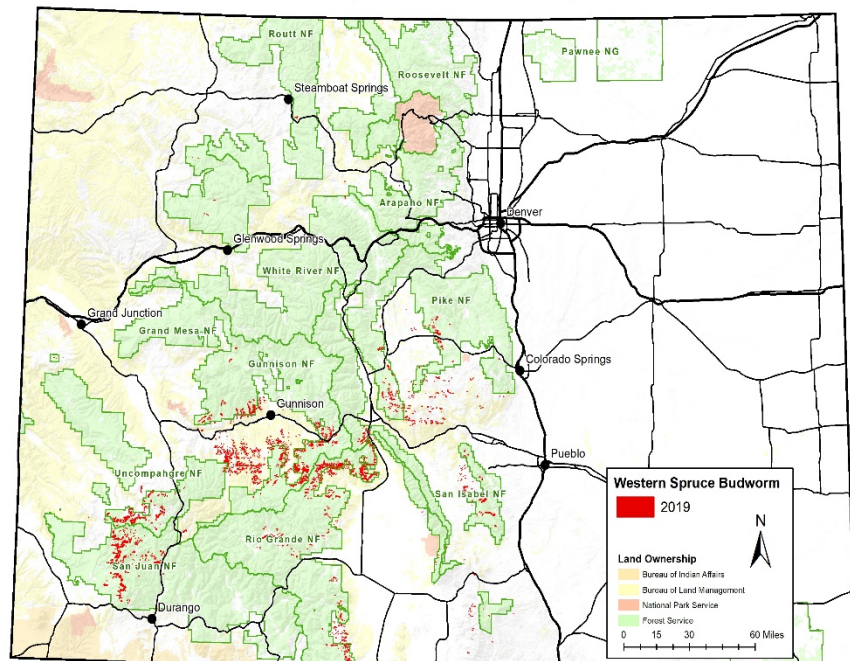


Figure 10. Western spruce budworm defoliation in 2019.



## Aspen Defoliation

In 2019, aspen defoliation/foliar damage caused by a combination of defoliators and other biotic and abiotic causal agents was observed on 64,000 acres in Colorado (Figure 11). Aspen defoliation can be caused by the large aspen tortrix, western tent caterpillar, Marssonina leaf spot and abiotic damage caused by late spring frosts or high winds. These factors produce similar aerial signatures and must be ground-checked to verify what specifically caused the damage in a particular stand. In 2019, much of the damage aerial surveyors observed was caused by Marssonina leaf spot, which is common after a wet spring. Aspen typically survives defoliation events; however, repeated defoliation over several years can cause mortality.

### 2019 Aspen Defoliation and Discoloration in Colorado

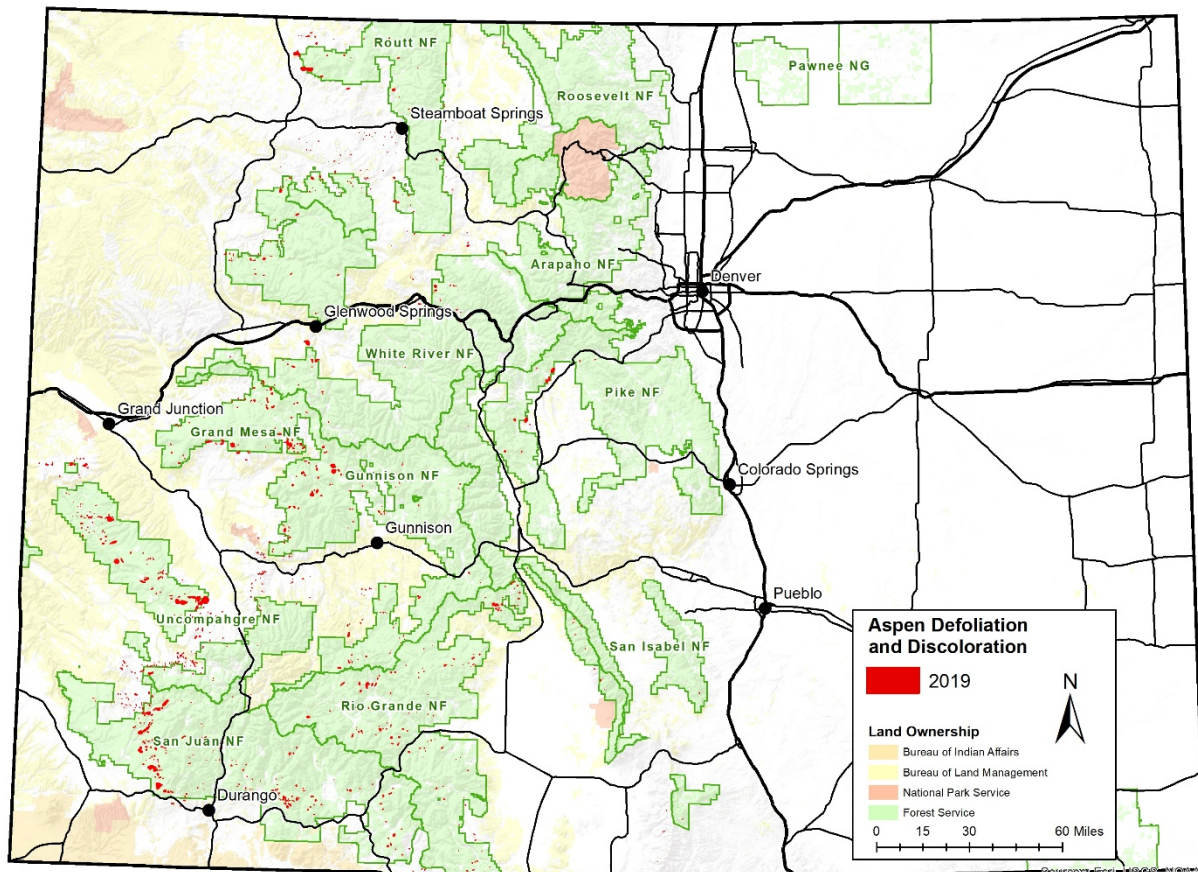


Figure 11. Aspen damages as observed in the 2019 aerial detection survey.

### **Downed Trees from Avalanches and Wind**

Depending on the tree species and the size of trees broken and uprooted, avalanches or windthrow can create habitat for damaging beetles. Spruce beetle, Douglas-fir beetle, and western balsam bark beetle are all attracted to downed trees and could potentially build up populations in their respective hosts, Engelmann spruce, Douglas-fir or subalpine fir. Beetle populations built up in downed trees can move to adjacent standing host trees.

Mountain pine beetle is not attracted to downed trees so the risk of bark beetle outbreaks is less where avalanches occur in lodgepole pine.

The risk from bark beetles increases with the increasing size of host trees toppled and increasing abundance of standing host trees in adjacent stands.

Other beetles such as engraver beetles also attack downed trees and can compete with potentially more serious bark beetles for space beneath the bark. In areas where avalanches are frequent, trees

tend to be smaller and present less risk. In new avalanche runs (Figure 12) there may be larger diameter trees taken down creating habitat. Weather conditions, stand age and composition all influence the potential for bark beetles moving into downed trees and eventually adjacent trees.



*Figure 12. Avalanche damage near Gulley Creek on the White River National Forest, Colorado. Photo credit: Justin Backsen, USDA Forest Service.*



Aerial surveys routinely document forest damages associated with avalanche activity severe enough to cause tree fall. In 2019 Colorado experienced an unusually high number of severe avalanches, particularly in March. Eighty such events were documented covering a total of 1,400 acres in the forests of Colorado (Figures 12 and 13). Less severe avalanches or avalanches that occur in areas that regularly experience them or in areas where large trees are not impacted are not mapped by aerial surveys.

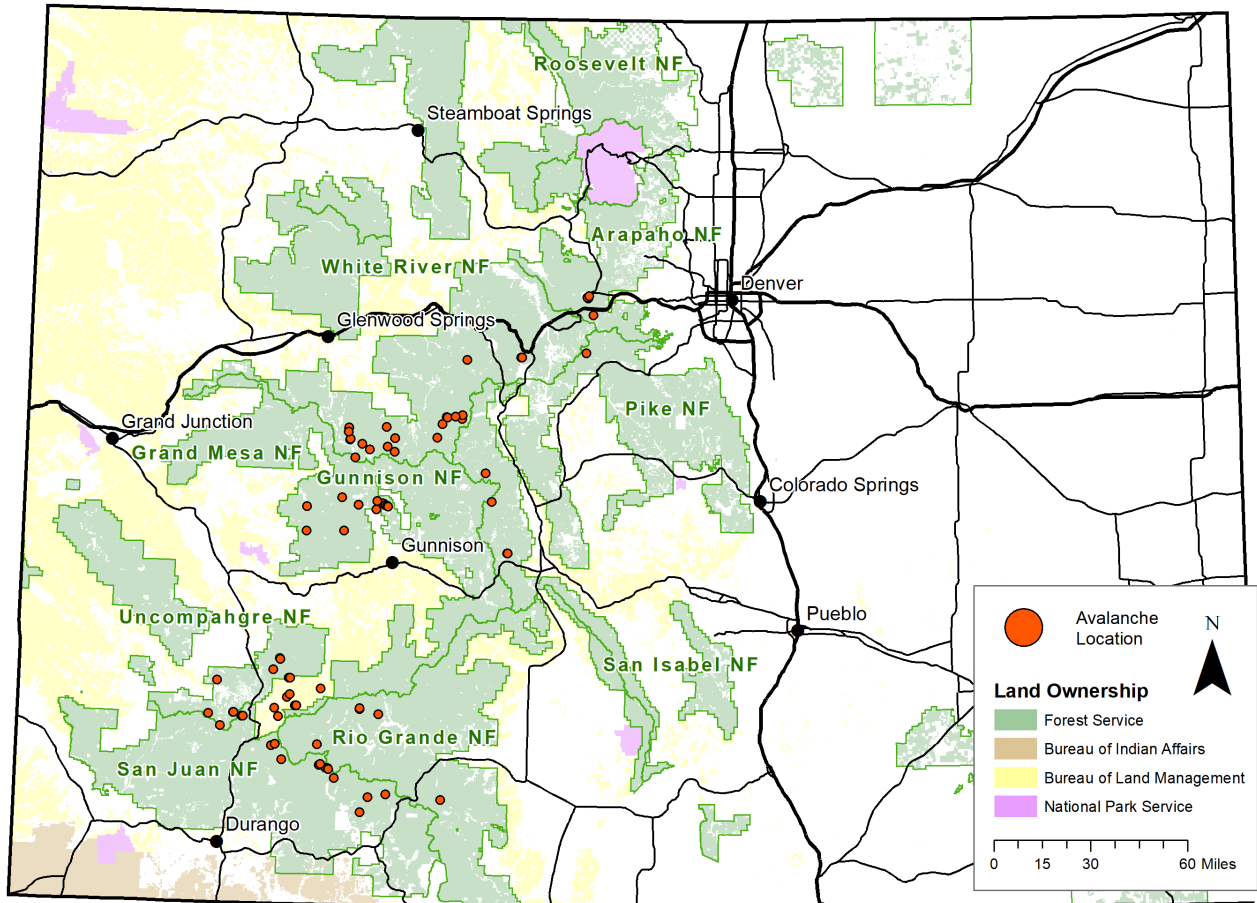


Figure 13. Location of 80 avalanches in Colorado recorded in the 2019 aerial detection survey.