

Sudden Aspen Decline in Colorado



Forest Health Management
Rocky Mountain Region
USDA Forest Service

2009 February 5



What is happening to aspen?

Aspen forests in some areas of Colorado have experienced widespread, severe, rapid dieback and mortality. This phenomenon, termed “sudden aspen decline,” has increased dramatically in recent years (Figs. 2, 3). In 2008, 553,000 acres of damage were recorded, over 17% of the estimated aspen cover type in Colorado. The southwestern and northwestern Colorado mountains are experiencing the worst damage (Fig. 4).

Is this any different from change that has always happened to forests?

Aspen forests are dynamic, and have always changed in response to climate, frequency and intensity of disturbance, and succession to other forest types. However, the current event is different from the usual changes that have been seen during the last hundred years for a number of reasons:

Landscape scale. The change is evident on a landscape scale, as opposed to the individual stand-level changes we have typically seen in the past.

Rapidity of mortality. The current phenomenon has increased dramatically over a few years, as opposed to the typical changes that we see over decades.

Mortality agents. The relative importance of pathogens and insects associated with SAD are different from those typically associated with mortality in old stands in Colorado.

What causes SAD?

Three interacting groups of factors appear to be involved:

Predisposing factors. Low elevations, south to west aspects, open stands are vulnerable to warm drought.

Inciting factors. Hot, dry conditions of 2000-2005, and possibly earlier, weakened vulnerable stands.

Contributing factors. Secondary insects and diseases are able to kill trees under stress. These include Cytospora canker, poplar borer, bronze poplar borer, and two aspen bark beetle species.

How does tree age affect SAD?

Analysis of data collected recently in southwestern Colorado does not support the widely held belief that old age of our aspen is part of the problem. On both a stand level and tree level, there is no correlation between measures of SAD and tree age or size. However, this applies only to “overstory” trees (minimum 12 cm DBH). Smaller trees are generally healthier.

Since aspen can sprout from the roots, won't forests recover quickly?

In many affected stands, sprouting is weak and roots are in poor condition. Overall there is no significant regeneration response to overstory loss from SAD (Fig. 3). Because of ungulate browsing, losses to diseases and insects, and competition, sprouting must be abundant and vigorous to ensure successful regeneration. Where sprouting is poor, other vegetation types may take over the site and the aspen clone may die.

When will it stop? If the warm drought was the inciting factor, shouldn't trees have recovered and stopped dying by now?

We cannot predict how long SAD will continue. A series of stresses often results in a downward spiral of tree health that may take years to run its course. Also, populations of insects and pathogens that contribute to mortality are high now and may further extend the event. Although 2008 saw a marked increase in acreage of aspen damage in Colorado's aerial survey, ground observers in southwest Colorado suggest that new, large areas of damage were not seen as in past years.

How has past forest management influenced SAD?

Where aspen has been cut in the past and SAD is now present, healthy green regenerated patches can often be seen beside dying, unmanaged stands. It appears that the diversification of age structure through management has increased the resilience of the landscape to SAD (Fig. 1).

Is there anything we can do to stop it or to help stands recover?

There is nothing we can do to prevent continued dieback and mortality of affected stems. Where clones still retain some vigor and energy, but are deteriorating, regeneration may be stimulated by burning, cutting or other stand manipulation before root systems are too weak to respond.



Figure 1. The healthy, fine-grained canopy in the center of the picture is aspen that sprouted after a harvest in 1984. Surrounding, older aspen is dead or dying. (Terror Creek, Gunnison NF, 2007)

What is the USDA Forest Service doing to respond to this?

Aerial survey. Aerial survey of forested land is conducted annually in the Rocky Mountain Region by Forest Health Management and cooperators. We will continue to monitor aspen conditions annually.

Analysis of landscape data. A paper published in the journal *FOREST ECOLOGY AND MANAGEMENT* documents the state of knowledge in 2008.^a

Aspen field study. Forest Health Management conducted a field survey of aspen in southwestern Colorado to document damage and identify causal factors (http://www.fs.fed.us/r2/fhm/downloads/SAD_plot_status.pdf).

Cooperation. The USDA Forest Service is cooperating with other federal agencies, Colorado State Forest Service, legislators, and local governments to share information on SAD and its management implications, and to look for opportunities for partnerships, collaboration, and funding.

Management activities. National forests are actively developing strategies to address this issue. Test regenerative treatments are underway to identify conditions under which clones may regenerate.

Why is aspen so important?

Beauty. Esthetically, the bright stems, leaves that tremble in the wind, and brilliant fall coloration of aspen contribute a major share of Colorado's scenic beauty.

Tourism. Tourism contributed \$7.3 billion and 200,000 jobs to Colorado's economy in 2004 (Colorado Tourism Office). The scenic beauty of aspen-covered mountains undoubtedly are part of the attraction.

Wood products. Several communities have industries that depend on aspen wood, producing products such as paneling and excelsior.

Biodiversity and wildlife habitat. Forest communities under aspen are exceedingly diverse. Soil and litter that develop under aspen are rich and hold moisture and nutrients well, serving as reservoirs during dry periods. Many species are specifically associated with aspen, and aspen provides unique wildlife habitat.

Contacts

Susan Gray, Group Leader, Forest Health Protection, Rocky Mountain Region; susangray@fs.fed.us, 303-275-5061

Roy Mask, Supervisor, Gunnison Service Center, Forest Health Protection, Rocky Mountain Region; rmask@fs.fed.us, 970-642-1133

Contact your local district office of the Colorado State Forest Service for more information or assessment of your aspen stands.

^a Worrall JJ, Egeland L, Eager T, Mask RA, Johnson EW, Kemp PA, Shepperd WD. 2008. Rapid mortality of *Populus tremuloides* in southwestern Colorado, USA. *Forest Ecology and Management* 255(3-4): 686-696. http://www.fs.fed.us/r2/fhm/reports/sad_2008.pdf

Figure 2. Area of aspen damage recorded on lands of all owner-ships by aerial survey in Colorado, 2005-2008.

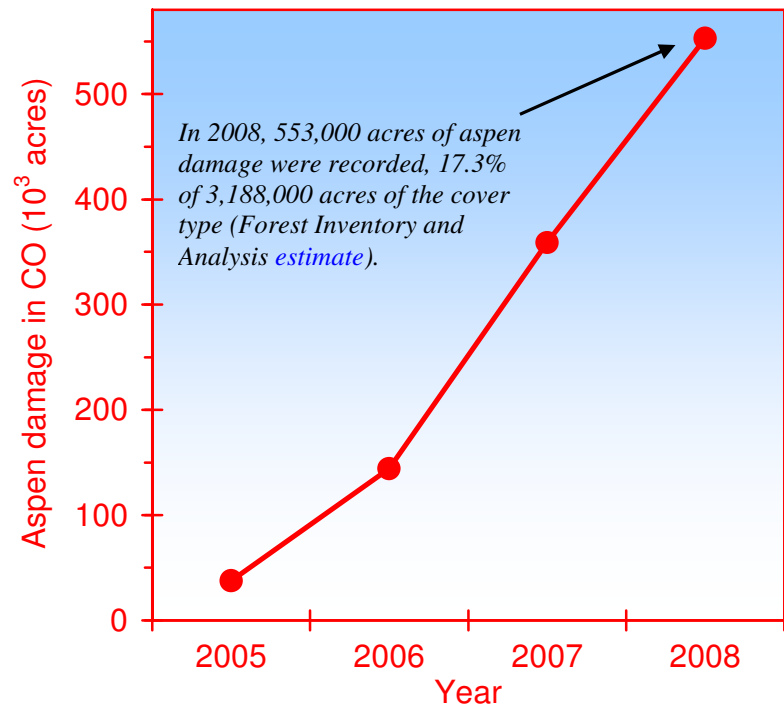


Table 1. Rapid increase in mortality in stands is consistent with information from the aerial survey on a landscape scale. Aspen mortality in 2002/2003 vs. 2006 for four stands in the Turkey Knolls area, Mancos-Dolores Ranger District, San Juan National Forest (repeated stand exams).

Unit	2002/2003 Mortality (%)	2006 Mortality (%)
6	8	31
7	9	41
8	7	34
13	9	60

Due to the nature of aerial surveys, the data provide only rough estimates of intensity and the resulting trend information. Not all aspen acreage was surveyed every year.

Figure 3. No significant regeneration response to crown loss (including mortality) associated with SAD in 160 plots.

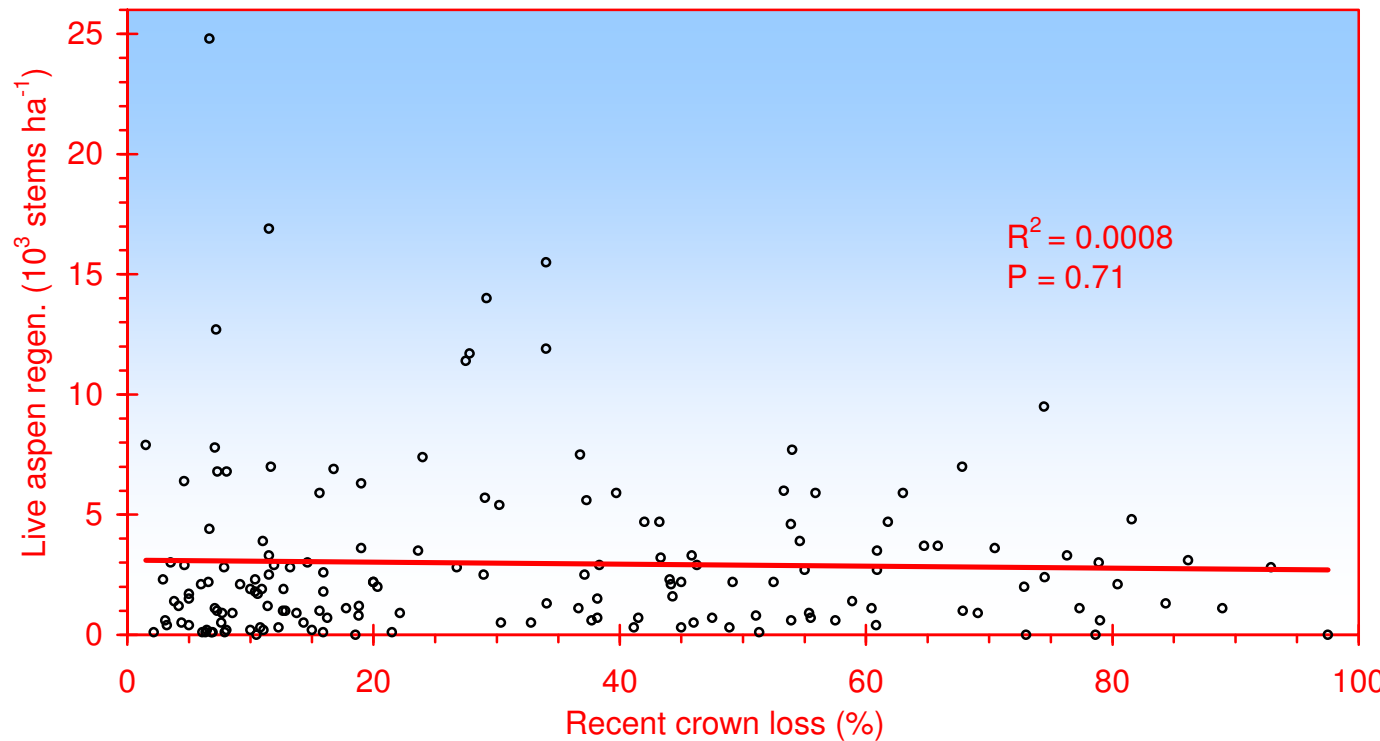


Figure 4. Aspen damage recorded in the 2008 aerial survey of Colorado. Portions of the aspen cover type were not surveyed.

