Sudden aspen decline in southwest Colorado

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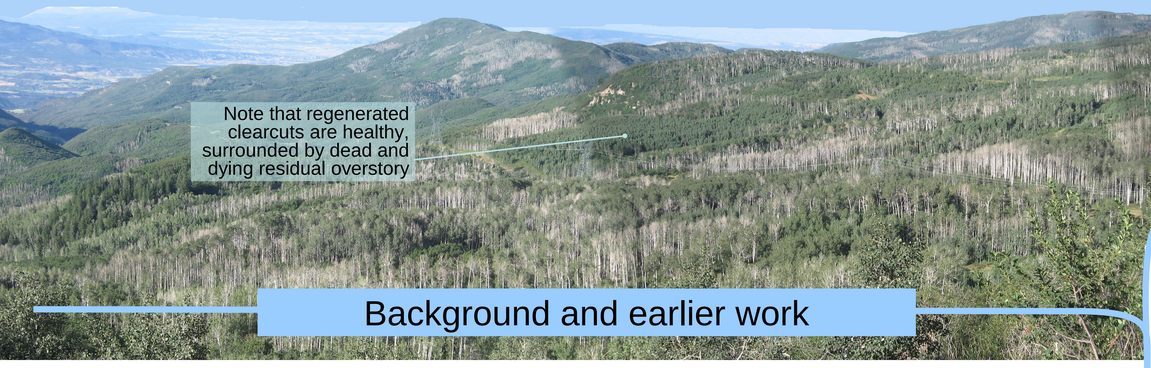
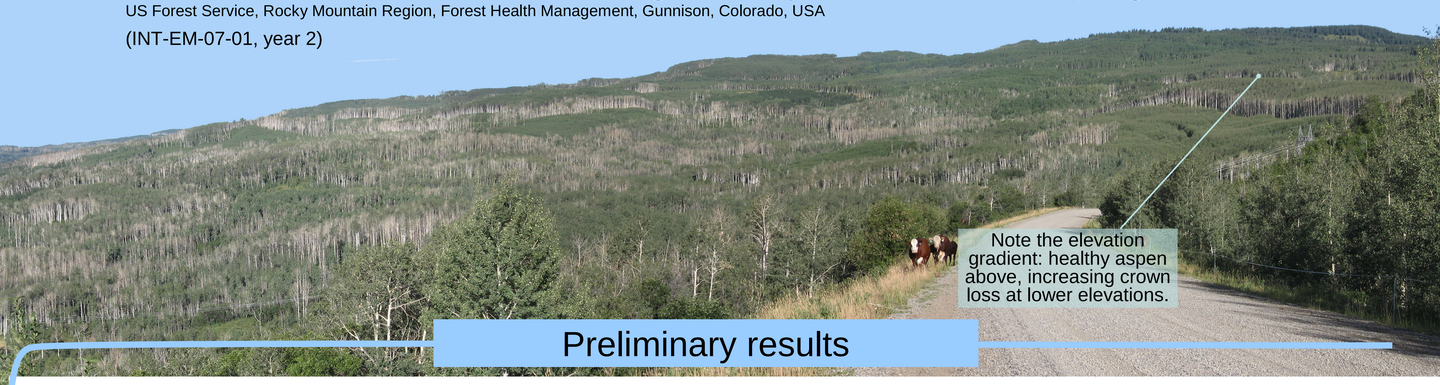
(INT-EM-07-01, year 2)



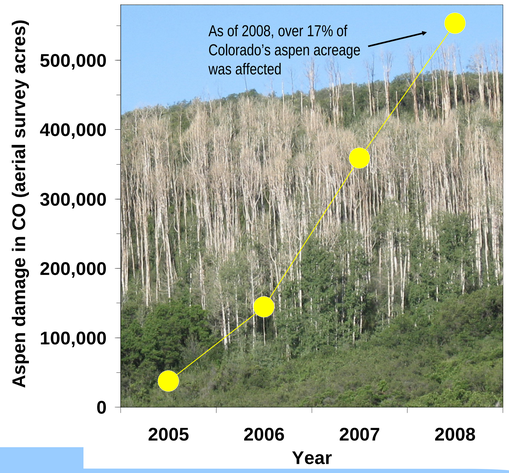


Background and earlier work

In 2004, foresters in south-west Colorado began to report unusual, rapid dieback and mortality of aspen. **Mortality has increased rapidly in Colorado** and has attracted intense media interest and concern from wildlife officials, forest managers, forest products industry, environmentalists, and others. We have named the syndrome sudden aspen decline (SAD).

We initiated a project in 2007 to determine the severity, site/stand factors and causes of SAD.

Work has been in two phases. The results of the first phase, including landscape and stand factors associated with damage and a hypothesis on the causes, are published[§] and are not presented here.

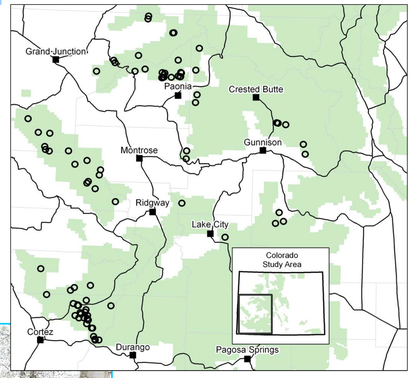


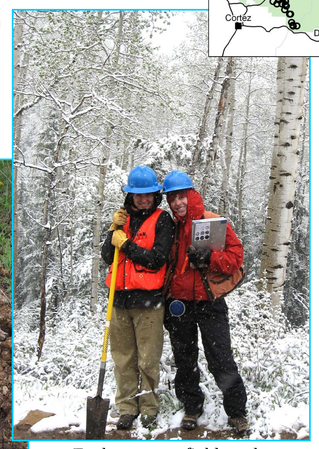
[§]Worrall JJ, Egeland L, Eager T, Mask RA, Johnson EW, Kemp PA, and Shepperd WD. 2008. Rapid mortality of *Populus tremuloides* in southwestern Colorado, USA. Forest Ecology and Management 255: 686-696.

Methods

In 2007 and 2008, we completed 162 intensive field plots (**81 pairs**) in southwestern Colorado to identify additional causes and stand impacts of SAD. We randomly selected damaged plots (>25% crown loss) in aerial survey polygons and nearby, paired healthy plots (≤25% crown loss). Measurements included:

1. Location, elevation, topographic position, slope, and aspect
2. Understory vegetation
3. Soil pit (soil class, mollic depth, texture, water-holding capacity, stoniness, etc.)
4. Root trench (quantifying live and dead aspen roots)
5. Tree data (prism plot, stand structure, crown loss, damage agents, increment cores)
6. Regeneration plot

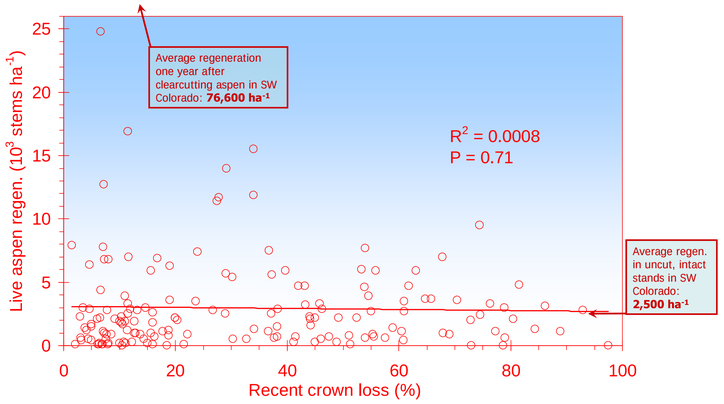




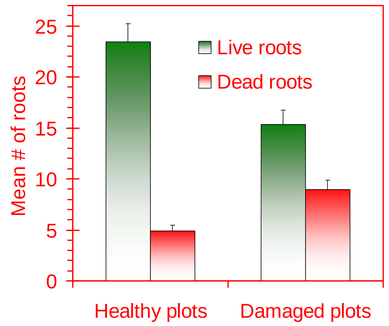
Early summer field work

Soil pit analysis

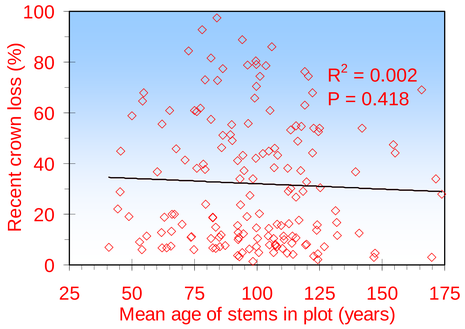
Preliminary results



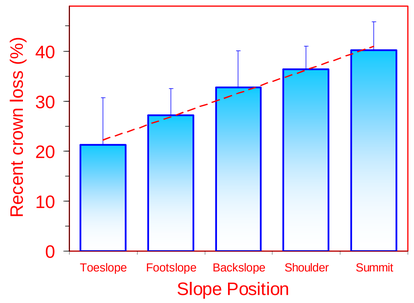
No significant regeneration response to crown loss (including mortality) associated with SAD. This confirms earlier results from two sites.[§]



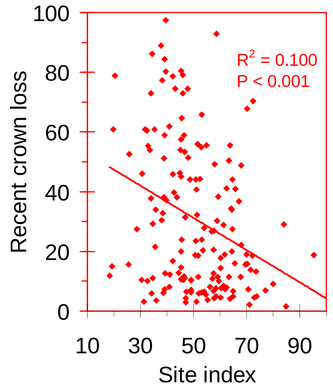
Damaged plots have significantly fewer live roots and significantly more dead roots than healthy plots.



Despite the widespread belief that SAD is related to age structure, neither age nor DBH of over-story stems are related to SAD.



There is a clear trend of increasing crown loss from toeslopes to summits, but the differences are not significant.



Site index is significantly related to crown loss, but this explains a small part of the variation in crown loss.

Biotic agents significantly associated with SAD

Galleries and adult of an aspen bark beetle, Trypophloeus populi.

Cytospora canker

Poplar borer

Armillaria root disease on aspen. Photo by Jim Blodgett.

Bronze poplar borer galleries and larva in live bark.

Preliminary Conclusions

1. Two sources of data indicate that regeneration is not responding to recent crown loss and mortality.
2. Poor regeneration in damaged stands is associated with dying root systems.
3. Within the overstory (stems ≥12 cm DBH), neither age nor DBH are related to crown loss and mortality, on either a plot basis or a tree basis.
4. Regeneration (stems <12 cm DBH) is generally healthier than the overstory.
5. Each biotic agent associated with SAD (*left*) has distinct patterns of occurrence in healthy vs. damaged plots, host DBH, contagion, etc.
6. Many site variables contribute small parts of the variation in crown loss (a measure of SAD).