

Aspen Dieback and Decline in Northern Arizona

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Introduction

An accelerated dieback of aspen communities has occurred across northern Arizona, following two defoliation events and several years of drought. The Southwestern Region's 1998 aerial detection survey showed a doubling of defoliated aspen acres (>85,000), compared to previous years, followed by another doubling in 1999 (>170,000). Although 1998 defoliation was caused by foliar insects and pathogens, the 1999 defoliation was due to frost damage following a severe June snowstorm, which occurred across most of Northern Arizona. Since 2000, aerial surveyors have switched from reporting acres defoliated, from which trees recovered, to acres of dieback, marked by thinning crowns and mortality.

One of the most severe drought events on record occurred in 2002 and dieback and mortality of aspen was observed during the growing season.

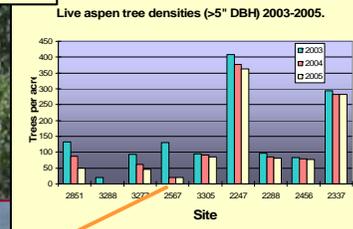
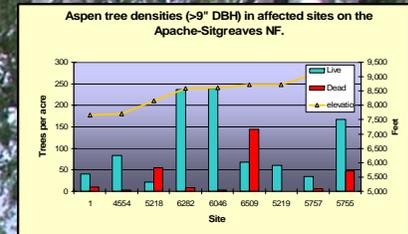
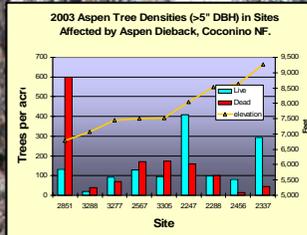
We began evaluation and monitoring of affected aspen at the stand level on the Coconino National Forest (NF) in 2003, followed by the Apache-Sitgreaves NF in 2004. This monitoring project describes mortality levels, regeneration condition, and stand and site variables that are influencing decline.

Methods

Plots were established on the Apache-Sitgreaves National Forest in 2004 and remeasured on the Coconino National Forest. Areas with aspen decline were randomly selected from off-plot aerial detection survey data, and a series of 1/20th acre permanent plots established. Plot data includes slope, aspect, and elevation. Large tree data information includes species, status, dbh, height, crown fullness, and severity of any damaging agent. Regeneration on 1/100th acre subplots were sampled for species and number.

Estimated year of death was determined by presence of leaves, buds, fine branches. Categories included current year, 1 year, and more than 2 years.

All live aspen trees greater than 5 inches dbh were tagged and tree height measured on the first two live aspen in each plot. The species, number and type of regeneration were collected on a 1/100th acre sub-plot.



Heavy mortality in an aspen clone at Dry Lake Park near Flagstaff, Arizona

Results and Discussion

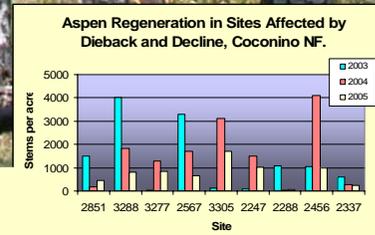
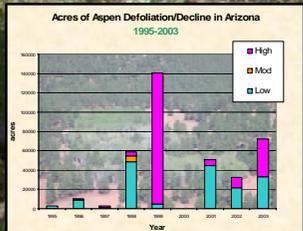
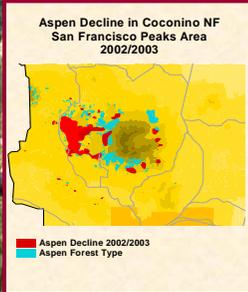
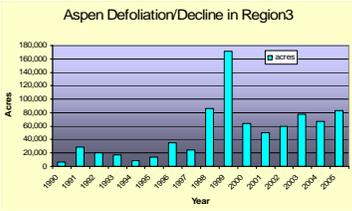
One hundred and forty-four plots were established in 18 randomly located sites on the Coconino (2003) and Apache-Sitgreaves National Forests (2004). All sites were revisited in 2005. A diversity of aspen communities is represented. Plots are laid out on a grid dispersed throughout an affected area.

A preliminary analysis of data from the Coconino plots follows. Elevation varied from 6,800 to 9,300 feet and was a key factor in both tree species composition and severity of decline. Lower elevation sites (<7,500 feet) were on northerly aspects, dominated by aspen, and had a ponderosa pine and oak component. In general, these sites have a higher ratio of dead aspen to live aspen, and more than one-half of the overstory aspen died in the past 3 years. Death is gradual and mortality is expected to continue as many live trees currently have only 10 to 30 percent of their original crown. Higher elevation sites were on various aspects, had mixed conifer component and a higher ratio of live to dead aspen.

Secondary pathogens and insects included canker fungi, wood borers, and clear wing moths.

Regeneration by suckering followed overstory dieback on many sites. Timing of regeneration appears to be correlated with elevation, with lower elevation sites the most sprouting occurred in 2003 and for higher elevation sites the spike was in 2004. Currently, there is little aspen regeneration. Ungulate browse is heavy at all sites, especially to aspen regeneration. All sites had some level of browse damage; the percent ranged from 50 to 100 percent.

Drought stressed overstory trees are expected to sprout suckers only within a year or two of tree death. The large die-off of mature aspen trees in many lower elevation sites coupled with browsing by ungulates is expected to result in type conversion of many ecologically unique and important sites across the state.



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