



# Aspen Condition in Northern Wyoming and Western South Dakota

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## Introduction

Aspen is an important and widely distributed species in the Rocky Mountains and Black Hills. Aspen forests support diversity, wildlife, watersheds, aesthetics, and local economies. Aspen decline and mortality has been reported from aerial detection surveys, field surveys, forest managers, and the public over the past years in Colorado and Wyoming. Unfortunately, information obtained from aerial surveys can not quantify the extent and severity of decline and mortality, enumerate the condition of regeneration, or catalog specific causal factors. Knowing the distribution, severity, and frequency of causal agents is required before appropriate disease management recommendations can be made.

The objectives of this study are to evaluate tree and regeneration health, quantify frequencies of damage causal agents, generate hazard maps of the extent and severity of the aspen condition, and analyze the maps in relation to aerial detection and remote sensing surveys, precipitation, other weather factors, and other surveys.

## Materials & Methods

A series of permanent plots were established systematically in aspen stands ( $\geq 50\%$  aspen;  $\geq 2$  acres) in the Black Hills and Shoshone National Forests in 2008. Three circular plots were established in each stand for both trees (1/50 acre) and for seedlings/saplings (1/500 acre). A minimum spacing between plots of 40 meters was used for both tree and regeneration plots.

At each plot center, site information was recorded including coordinates, elevation, stand age, slope position, slope, and aspect.

Root disease pathogens were assessed on a per plot basis by examining trees within 40 meters of plot centers. Armillaria was recorded as found or not found based on examining 3 recent dead aspen trees per plot for the presence of mycelial fans and/or rhizomorphs. If Armillaria was found on the dead aspen, 2 live aspen trees per plot were then examined. Armillaria root disease was recorded as found or not found if mycelial fans were observed in the cambium or phloem of a live tree. Ganoderma root disease (*G. applanatum*) was recorded as found or not found based on an examination of 10 trees per plot for the presence of Ganoderma conks.

Variables recorded for all trees included species, tree diameter (DBH), and health status (living, recent dead, old dead). For aspen trees, crown health (percentage live crown) was estimated. For seedlings and saplings, species and health status (live/dead) was tallied. All associated damage agents (diseases, insects, damage) were recorded for aspen trees (live/recent dead), seedlings, and saplings.

## Results

Three hundred and thirty permanent plots were established in the Black Hills and Shoshone National Forests in 2008. The average live crown of trees was 88%, an average tree mortality rate was estimated at 4% per year, and aspen regeneration averaged 3,450 stems per acre.

Twenty-six different damage agents were recorded on aspen trees. However, only seven agents were observed on more than 2% of the trees. Damage agents that were observed on more than 2% of the trees were as follows: Cytospora canker (*C. chrysosperma*; 39%); sooty-bark canker (*Encoelia*

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*pruinosa*; 26%); aspen trunk rot (*Phellinus tremulae*; 14%); bronze poplar borer (*Agrilus liragus*; 11%); black canker (*Ceratocystis fimbriata*; 8%), Cryptosphaeria canker (*C. lignyota*; 4%); and poplar borer (*Saperda calcarata*; 4%). Sooty-bark and Cryptosphaeria cankers are difficult to differentiate visually when cankers are young.

Twenty seven damage agents were recorded on aspen regeneration. However, only two were observed on more than 2% of the regeneration. Damage agents that were observed on more than 2% of the aspen regeneration were animal browsing (19%) and Cytospora canker (*C. chrysosperma*; 6%).

Two root diseases were detected in the plots. *Armillaria* spp. were found in 53% of the plots and

were confirmed to be causing root disease in 14% of the plots. Ganoderma root disease was found in 13% of the plots.

### Conclusions

Most of the aspen stands in the Black Hills and Shoshone National Forests are healthy and regenerating, although a few stands have significant mortality. Many causal agents were observed, but only 8 agents were observed on more than 2% of the trees and regeneration. Animal browsing was by far the most common damage on regeneration, but competing tree species and shading from overstory trees likely are the main factors affecting regeneration. Additional plots are being established and a thorough analysis of the data is planned when the field surveys are complete.

