

Evaluating aspen damage and decline in the Pacific Northwest

Robbie W. Flowers¹ & Glenn R. Kohler²
¹ Oregon Department of Forestry, Salem, OR
² Washington Dept. of Natural Resources, Olympia, WA



Abstract

This study focused on assessing the stand conditions and causal agents affecting aspen in the Pacific Northwest (PNW) by ground-based sampling of damage areas identified in annual aerial detection surveys (ADS). Forty-eight (48) sites dominated by quaking aspen (*Populus tremuloides*) were evaluated in Oregon and Washington in 2010. Stand and site attributes, aspen regeneration, and damaging agents were recorded at representative plots. Preliminary observations indicate that 67% of stands were “stable”, while 34% were deemed “successional” or “decadent.” Conifer competition was common and recorded in 63% of plots. Standing mortality of larger aspen stems (≥ 5 in dbh) ranged from 0 - 88% of total basal area, with the majority of stands having $< 33\%$. Aspen regeneration (< 5 in dbh) was detected in 94% of plots, but only 42% of plots had saplings present. Ungulate damage, cankers, stem decays, and stem insects were the most common agents affecting live trees, while ungulate feeding, foliage diseases, and defoliating insects were most frequently observed affecting aspen regeneration. Additional surveys and monitoring will occur at new and existing sites during summer-fall 2011, to help provide a more comprehensive assessment of aspen health in the PNW and inform ADS coding.

Introduction

Objectives of this ongoing study are to:

- 1) assess health of aspen stands in the PNW and determine the major drivers of aspen dieback and mortality in the PNW and
 - 2) provide information for possible changes to current ADS coding of aspen damage in the PNW
- The newly described sudden aspen decline (SAD) phenomenon that has been described in the Interior West has raised awareness of aspen health throughout North America^{2,6}. While concentrated patches of aspen decline and mortality have been documented historically in central and northeast Oregon and Washington^{3,4,5}, a more expansive, region-wide approach has not been undertaken.
 - Aspen is not as widely distributed in the PNW as in other regions, and thus has substantial ecological and aesthetic importance where it does occur. It increases forest structure and diversity, and contributes to wildlife habitat. The small size and distribution of remaining stands makes them highly susceptible to loss^{3,4}.
 - Over the last decade, increasing levels of aspen damage and mortality have been reported from ADS, state and federal forest managers, and the public in the PNW. ADS consistently maps damage in the PNW each year; however, it is unknown what the relative contribution of agents or site factors are in most of these areas.
 - This effort builds upon previous evaluations of aspen in the PNW by Region 6 Forest Health Protection staff and uses similar techniques to that of recently completed aspen monitoring projects in other Regions. It is hoped it will refine our knowledge of aspen in the PNW as well as contribute to a broader assessment of its status in North America.

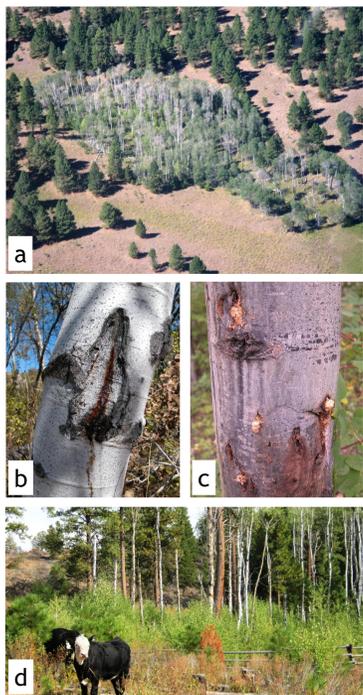


Figure 1. (a) Aspen crown dieback from ADS, (b) stem canker, (c) wood borers, and (d) ungulate damage.

Materials & Methods

- Recent ADS findings were reviewed to locate areas where detectable levels of aspen damage had been observed over consecutive years. Twenty-two locations in Oregon and 26 sites in Washington were selected and evaluated on various ownerships.
- At each site, a representative 1/20th acre circular plots and three 1/300th acre subplots were established to separately examine trees (≥ 5 in dbh) and regeneration (< 5 in dbh). Each 1/20th acre plot contained ≥ 5 live aspen trees and sites were visited once from August to October, 2010.
- At each site, general stand conditions (basal area, species composition, average DBH, crown condition, regeneration) and site attributes (slope, aspect, elevation) were recorded, along with the presence and intensity of the major damaging agents. These included insects, diseases, animals, fire, and weather-related damage.
- Due to the small sample size of this first-year data set, statistical analyses have not yet been performed. All summary results that follow should be viewed as preliminary findings.

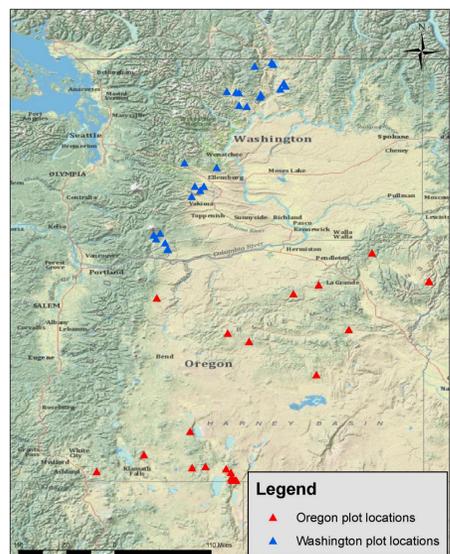


Figure 2. Location of aspen survey plots in OR and WA.

Results

- Preliminary observations at PNW aspen plots in 2010 indicated that 67% were currently “stable,” a condition represented by a diverse stand structure, the presence of regeneration, and limited tree mortality.
- In contrast, 34% of stands were deemed “successional” to conifers or “decadent” with ample mortality and little to no regeneration. Competition from secondary species, primarily conifers, was common and found in 63% of survey plots.
- Standing mortality of live aspen (≥ 5 in dbh) ranged from 0 - 88% of total basal area, with 79% of plots showing $\leq 33\%$ mortality. Live aspen sprouts (< 2 in dbh) were found in 92% of plots, while only 42% had live saplings ($\geq 2-5$ in dbh).
- Live aspen stems ≥ 5 in dbh were most affected by ungulate chewing/rubbing, cankers, stem insects, and stem decays (primarily *Phellinus tremulae*).
- Aspen regeneration was most affected by ungulate feeding, defoliating insects, and foliage diseases (primarily *Marssonina* leaf spot).

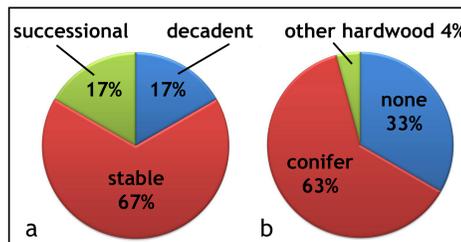


Figure 3. (a) Percent of aspen dominated plots by stand condition, and (b) percent of secondary tree species competition.

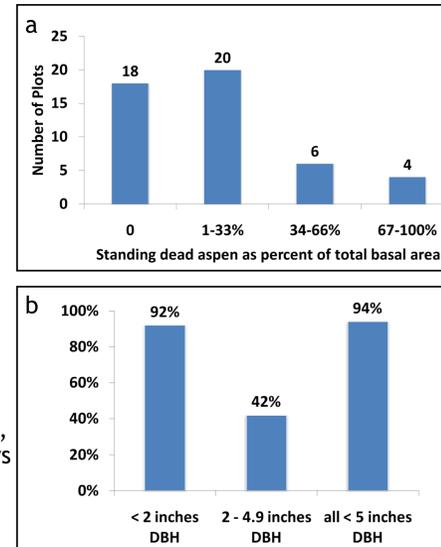


Figure 4. (a) Number of plots with standing dead aspen by percent basal area, and (b) percent of plots with aspen regeneration.

Discussion & Further Study

- The majority of stands evaluated in 2010 were deemed to be in “stable” condition. However, 34% of stands showed symptoms of slow decline. Chronic mortality of mature stems and sprouts due to a combination of damaging agents, coupled with a lack of advanced regeneration may lead to continued decline or even stand loss over time.
- Successional processes of stand age, changing site conditions, and conifer competition can predispose already small aspen stands in the PNW to decline. The high incidence of ungulate damage and stem wounding also appeared to facilitate attacks by a variety of insects and diseases. Recent surveys of aspen condition at National Forests in Washington documented a similar suite of damage agents and slow stand decline with a higher percentage of stands successional to conifers or decadent^{3,4}.
- PNW aspen condition does not appear similar to the rapid overstory mortality and lack of regeneration characteristic of SAD observed in the Interior West or to primarily insect defoliator damage as seen in some regions^{1,6}.
- In 2011, we plan to complete additional surveys and monitoring at new and existing ADS-detected aspen damage sites during the summer and fall to provide a more comprehensive assessment of aspen health within the PNW and inform possible changes to regional ADS coding.

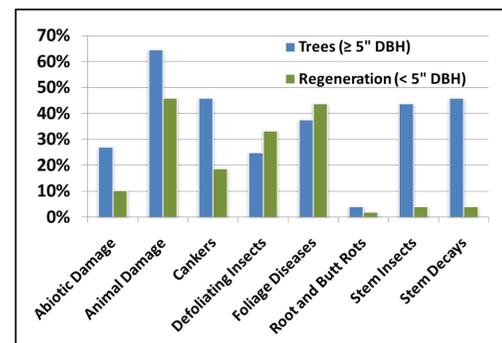


Figure 5. Percent of live aspen trees and regeneration affected by damage category.

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