



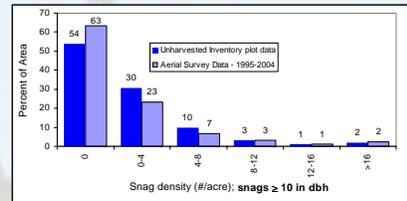
# Assessing Deadwood Landscapes: Integrating Aerial Survey Data with the DecAID Advisor

Keith Sprengel<sup>1</sup>, Julie Johnson<sup>2</sup>, Kim Mellen<sup>3</sup>, Beth Willhite<sup>4</sup>  
USDA Forest Service

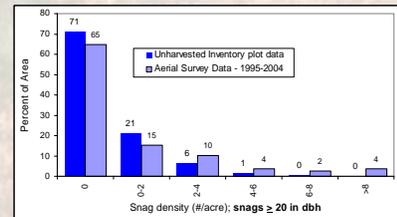
## Introduction

Forest land managers interested in managing for healthy forests in the context of ecosystem management must evaluate effects of forest conditions and existing or proposed management activities on organisms that use snags, down wood and other wood decay elements. Recent development of the "DecAID Advisor" has provided an important tool for analyses considering dead and decaying wood. DecAID is an Internet-based synthesis of published scientific literature, research data, wildlife databases, forest inventory databases and expert judgment and experience. It addresses current vegetative conditions (unharvested and managed), provides relevant summaries of snags and down wood, and presents information on wildlife use of snags and down wood. It also provides information on insects and pathogens and their role in creating and retaining dead wood.

One important aspect of dead wood analyses is ascertaining the current status of snags and down wood in the vicinity of the analysis area. This project examines how aerial survey data can aid managers in developing a picture of the 'current situation' for the incidence and condition of snags (and potentially down wood) across a landscape.

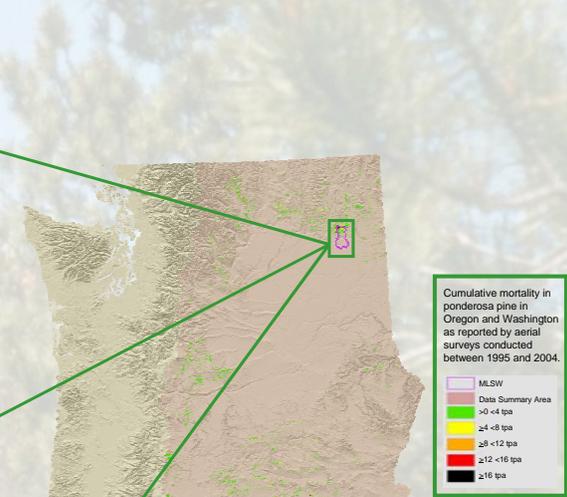
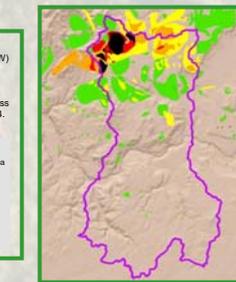
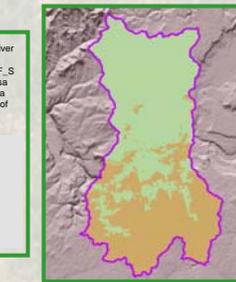
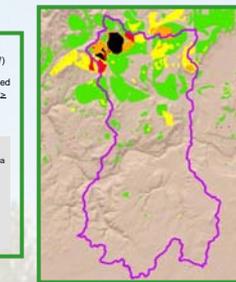
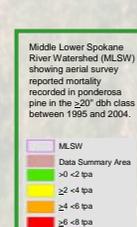
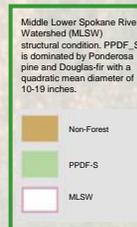
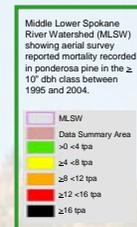


Distribution of the unharvested area of the "PPDF\_S Vegetation Condition" among snag density classes (#/acre) for snags ≥ 10" dbh, based on 302 unharvested inventory plots and distribution of 10 year cumulative ponderosa mortality within the middle lower Spokane River watershed as recorded by aerial surveys.



Distribution of the unharvested area of the "PPDF\_S Vegetation Condition" among snag density classes (#/acre) for snags ≥ 20" dbh, based on 302 unharvested inventory plots and distribution of 10 year cumulative mortality within the middle lower Spokane River watershed as recorded by aerial surveys.

<sup>1</sup>DecAID defined vegetation condition class dominated by ponderosa pine, and Douglas-fir with a quadratic mean diameter of 10-19 inches.



## Methods and Discussion

Current conditions of deadwood at the required minimum scale of 5th field hydrologic unit class (HUC) watersheds are difficult to assess. Ideally, recent ground-based snag and/or down wood inventories are available for constructing 'current condition' histograms. These, however, are expensive to conduct and often unavailable. Systematic forest inventory measurements, such as FIA, which are sample points on a widely spaced fixed grid and are staggered over time, are usually inadequate for assessing deadwood conditions at minimum scales. Forest surveys, however, are conducted annually over 100 percent of the forested lands in the Pacific Northwest (see Aerial Survey Procedures).

For our analysis, we chose to look at mortality in ponderosa pine for the DecAID Wildlife Habitat Type/structure condition class, 'Ponderosa pine-Douglas-fir small/medium' (PPDF\_S). We used the DecAID 'unharvested' plot snag density histograms for the PPDF\_S vegetation condition to represent the 'natural' condition (our target level) for snag sizes and densities across the watershed landscape. We selected for our analysis area a 5th field Hydrologic Unit Code (HUC) watershed located in northeast Washington, the 121,581 acre Middle Lower Spokane River watershed.

We eliminated all areas within the watershed that were not in the PPDF\_S vegetation condition class, using the 250-meter RPA<sup>1</sup> (Resource Planning Act Assessments) Forest Type Map to determine forest and non-forest types within the watershed (see Assumptions). Aerial survey mortality data for ponderosa pine was then 'clipped' to the analysis area boundary and summarized by snag density class (trees per acre) as a percent of the total area in the PPDF\_S vegetation condition class for the 10-year period 1995-2004. Ponderosa pine mortality for this time period was summarized for two diameter size classes, ≥10 inches dbh and ≥20 inches dbh, according to the tree per acre breakpoints documented in DecAID (see histograms). Mortality associated with western pine beetle and mountain pine beetle were used to represent ponderosa pine mortality in the ≥10 inch dbh category. Only mortality associated with western pine beetle was used to represent ponderosa pine mortality in the ≥20 inch dbh category. The aerial survey summaries were then compared with the DecAID 'unharvested' plot snag densities for the PPDF\_S vegetation condition class.

The results of our analysis indicate that the current distribution of snag sizes and densities in the Middle Lower Spokane River watershed closely approximates the distribution of snag sizes and densities in the 'unharvested' plots. Because aerial observers consistently underestimate actual mortality (see Caveats and Cautions box), it is likely that snag levels are actually somewhat higher than our analysis indicates. Therefore, from a management perspective this analysis area likely meets desired conditions for snag densities and distribution.

Field studies to look at accuracy of damages codes, severity and snag structural classes relative to information in DecAID is planned for 2005 if funding is available.

<sup>1</sup>The RPA Forest Type Map was created, using Forest Inventory Analysis (FIA) plot data, by the USDA Forest Service Remote Sensing Applications Center located in Salt Lake City, Utah.

## Aerial Survey Procedures

Since 1947 aerial insect and disease survey flights have been conducted annually over approximately 47 million acres of forested land in Oregon and Washington. These surveys are a cooperative effort of the USDA Forest Service, Oregon Department of Forestry and the Washington Department of Natural Resources.

These overview surveys record the incidence and severity of insects, and diseases that can be detected from the air, as indicated by color 'signatures' of current mortality and defoliation. Overview surveys are conducted on a four mile grid flying approximately 1,500 feet above the terrain. Each geographic area is only flown once during the time period of July through September, and therefore, may not be timed to accurately capture the true extent or severity of a particular disturbance activity.

Observers have just a few seconds to recognize the color difference between healthy and damaged trees, determine tree species, diagnose causal agents correctly, estimate intensity, delineate the extent of damage, and precisely record this information on a geo-referenced, digital map. Air turbulence, cloud shadows, distance from aircraft, haze, smoke and observer experience can all affect the quality of the survey.

Summaries of these data provide an estimate of conditions on the ground and may differ from estimates derived by other methods.

The aerial surveys provide information on the current status of many tree-damaging agents, and are important when examining insect activity trends by comparing historical and current survey data over large areas.

## Assumptions

The entire forested type in the analysis area represented DecAID's PPDF\_S vegetation condition class.

The mortality agents used to indicate dead ponderosa pine trees with a dbh ≥10 inches were: western pine beetle (in both pole sized and large trees) and mountain pine beetle.

The mortality agent used to indicate dead ponderosa pine trees with a dbh ≥20 inches, was western pine beetle in large trees.

## Caveats and Cautions

Fire and harvest history data was not obtained nor included in this example analysis.

Western pine beetle in pole-sized trees and mountain pine beetle are more likely affecting the trees in the 6 inch to 16 inch size classes.

Aerial survey is only effective at recording mortality in the co-dominant and dominant overstory.

Only snags created during the last 10 years are represented in this analysis, therefore the actual number of snags summarized for the current condition is underestimated.

Aerial survey minimum mapping standards are ≥1/4 tree per acre, or groups of ≥5 trees, therefore the aerial survey data histogram bar for "0" snags/acre is different than the DecAID unharvested inventory plot data histogram bar for "0" snags/acre, which indicates an actual condition of zero snags per acre.

Field surveys consistently suggest that aerial surveys are only capturing approximately 30% of the actual current year mortality. In multi-storied stands there is often as much actual mortality in the understorey (intermediate and suppressed) as there is in the overstorey. Therefore, estimates of total mortality based on aerial survey data are probably low.

Ips species were not included in the analysis. These beetles often affect trees ≥6 inches dbh and were not significant when considering wildlife needs of standing dead trees. It is recognized, however, that ips species also kill the tops of larger trees.

The analysis did not include mortality caused by other agents within the PPDF\_1 vegetation structure condition class.

For more information on DecAID and a discussion on "Assumptions, Caveats and Cautions," visit the following website: <http://www.notes.fs.fed.us/81/pnw/DecAID/DecAID.nsf>

For more information on aerial surveys or to download aerial survey data, visit the following website: <http://www.fs.fed.us/r6/inlid/data.shtml>