

Ground Checking Aerial Survey Polygons Identified as Douglas-fir Beetle Caused Damage in Washington in 2001

Karen L. Ripley, Robert W. Backman, Jeffrey W. Moore

Introduction:

Douglas-fir beetle (DFB) is one of the most significant tree killing insects in the Pacific Northwest. Its host is mature Douglas-fir which is a high value timber resource and provides many non-commercial values. DFB is a commonly identified damage agent in the annual comprehensive aerial forest damage detection surveys conducted by the USDA Forest Service and the Washington Department of Natural Resources.

In Washington, past efforts ground-check data produced from the annual aerial survey have been random and unfocused. This study systematically ground-checked 62 DFB polygons to evaluate their accuracy and provide feedback to the aerial observers. The survey was funded by an Evaluation Monitoring Grant provided by the USDA Forest Service's Forest Health Monitoring Program.



Aerial view of Douglas-fir trees killed by the Douglas-fir beetle, *Dendroctonus pseudotsugae*

Methods:

A DFB outbreak has been occurring in northeastern Washington since 1998. The vicinity of Republic, Washington was chosen as a study site because high numbers of DFB polygons were likely to be identified in the 2001 aerial survey and fairly good access is possible by road.

A retired technician with extensive experience and familiarity with aerial survey was hired to conduct the ground checking in mid-August. He was given the survey map that was made earlier that month. He was instructed to evaluate 60 or more DFB polygons chosen from randomly selected townships. No more than 2 polygons per section were to be evaluated. A range of large and small polygons was to be evaluated.

Data were recorded on how the polygon was chosen (located from the road and then identified on the map vs. identified on the map and then located on the ground) and how the polygon was evaluated (viewed from a distance, viewed from the perimeter, evaluated from within). The polygon's mapped location and shape were evaluated. The number, species, and size of affected trees were recorded. The actual cause of damage was identified. Comparisons were made to information provided on aerial survey maps.

Results:

General mapping success rate of 60%

Sixty-two polygons were evaluated. Thirty-five were located on the map, then approached on the ground. One of these polygons (covering about 30 acres with 10 trees/acre affected) could not be located; no dead trees were in the nearby area. Twenty-seven damaged areas were viewed from the road then matched to a polygon on the map. Of the later 27, twenty-four did not correspond to mapped polygons. These were generally smaller groups of trees (average: 23.4 trees per group, range 5 to 151 trees) than mapped polygons which directly identified damage levels from 5 to 700 trees, and from 5 to 15 trees per acre. So, overall, 25 of 62 polygons (40%) evaluated were not mapped right. Conversely, a success rate of 60% for mapping polygons was achieved.

71% of polygons mapped "in the right place"

Of the mapped polygons that did correspond to damage observed on the ground, 71% were classified as mapped in the right place. 26% were within 1/2 mile of the right place. Only one polygon (3%) could not be located.

84% success in polygon shape

Sixty-one percent of the mapped polygons were classified as "accurately drawn" shapes. Twenty-four percent were "fine". Only 10% were classified as "inaccurately drawn."

97% success in identifying causal agent

The causal agent of mapped damage was correctly identified as DFB 97% of the time. One polygon identified as DFB, was actually damage to true fir trees caused by either Scolytus or western balsam bark beetles. Although DFB was the dominant mortality agent active in the area, two of the unmapped damage areas seen from the ground were true fir affected by either Scolytus or western balsam bark beetles. One other un-mapped damage area was affected by spruce beetle.

For small polygons, 25% over-count in number of trees affected

Of 38 mapped polygons, 22 had tree numbers (not rates of damage per acre) that could be compared to the actual number of trees counted from the ground when the observer felt he could see the entire polygon (either walking within the polygon, or with binoculars from a distance). When the direct numbers of trees are compared, the total dead trees from mapped polygons (730 trees) was 146 trees higher than the number counted on the ground (584). This is a 25% over-count. The largest individual differences between mapped numbers of trees and those observed on the ground were undercounts though; polygons labeled 15, 5 and 10 trees actually had 28, 16 and 39 trees, respectively.

Tree count error not assessed for larger polygons and those with "damaged trees per acre" labels

There is much likely a larger error potential for large polygons that the observer could not accurately assess from the ground. Polygons labeled with a rate of trees per acre can also be a source of error, but were not evaluated. Five per acre, seven per acre, and 10 per acre labels were assigned to polygons included in this survey. Rate labels were generally applied to larger polygons, including more diverse forest stands. Moreover, they could not be assessed in this survey because it was difficult to quantify the number of affected acres from a ground view.

3% of polygons had map display issues

Map display problems affected analysis on 2 of 62 polygons (3%). In one case, the number of trees indicated on the map could not be compared to the number of trees observed on the ground, because it was unclear which label belonged to that polygon. The shape of one polygon could not be assessed because it was hidden beneath a mapped grid line.

Discussion and Findings:

•It is extremely difficult to evaluate the accuracy of a view from the air from the ground, particularly in complex topography. It was extremely difficult for the ground observer to assess the quality of the mapped polygon when he had just a partial view of the landscape.

•However, the results of this ground checking effort indicate that the aerial survey was approximately 60% successful in mapping damage polygons, with better success rates for larger polygons. The mapped polygon location, shape and damage agent were highly accurate.

•On small polygons with a "number of trees affected" label, the number of affected trees was slightly over-counted. The error in large polygons or those with a "trees-per-acre" label is unknown.

Future Changes

The challenges of knowing exactly where you are on the ground vs. the exact location of the polygon can be further reduced by use of existing GPS technology. When this work continues in 2002, the ground checker will be given, not just the survey map, but also the GPS location of the center of each polygon. Then he will be more certain of his location in relation to the mapped image and better able to quantify the distance between the mapped polygon and the actual dead trees.

Additional note on connecting aerial survey polygons to ground checking

In recent sudden oak death (SOD) surveys, the Oregon Department of Forestry has employed an innovative detection and mapping system to pin-point small affected areas to ground crews. A standard aerial (electronic) sketchmap system is performed on 1 mile grid. The map and GPS location of the center of each suspected SOD polygon are provided to a helicopter crew who return to the polygon, hover over it, confirm the SOD symptoms, and obtain a precise GPS reading of the polygon center. A ground crew uses the helicopter generated GPS location to return to the affected area. If funding were available, the use of helicopters to evaluate and aid ground-truthing of standard aerial survey polygons would be most effective.

Contacting the Authors:

Karen L. Ripley karen.ripley@wadnr.gov (360) 902- 1691

Jeffrey W. Moore jeff.moore@wadnr.gov (360) 902-1320

Robert W. Backman abeartoe@aol.com

All can be reached at the following address:

Washington Department of Natural Resources, Resource Protection Division
PO Box 47037, Olympia, WA 98504-7037

