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"STEWARDSHIP IN FORESTRY"

MEMORANDUM

SUBJECT: 2008 Statewide Aerial Survey Summary – Eastern Oregon

TO: Survey Cooperators and Interested Parties

FROM: Rob Flowers and Mike McWilliams

DATE: January 31, 2009

Maps are generated each year to show the approximate location, size and intensity of damage to Oregon forest lands detected during the 2008 statewide aerial survey. The following is a summary of these findings, descriptions of some of the major damaging agents, and comparisons to recent trends.

Electronic versions of regional aerial survey maps and data are also available at:

2008 Aerial Survey Maps - http://www.fs.fed.us/r6/nr/fid/as/quad08/index.shtml
2008 Aerial Survey Data - http://www.fs.fed.us/r6/nr/fid/as/index.shtml

Survey Description and Objectives

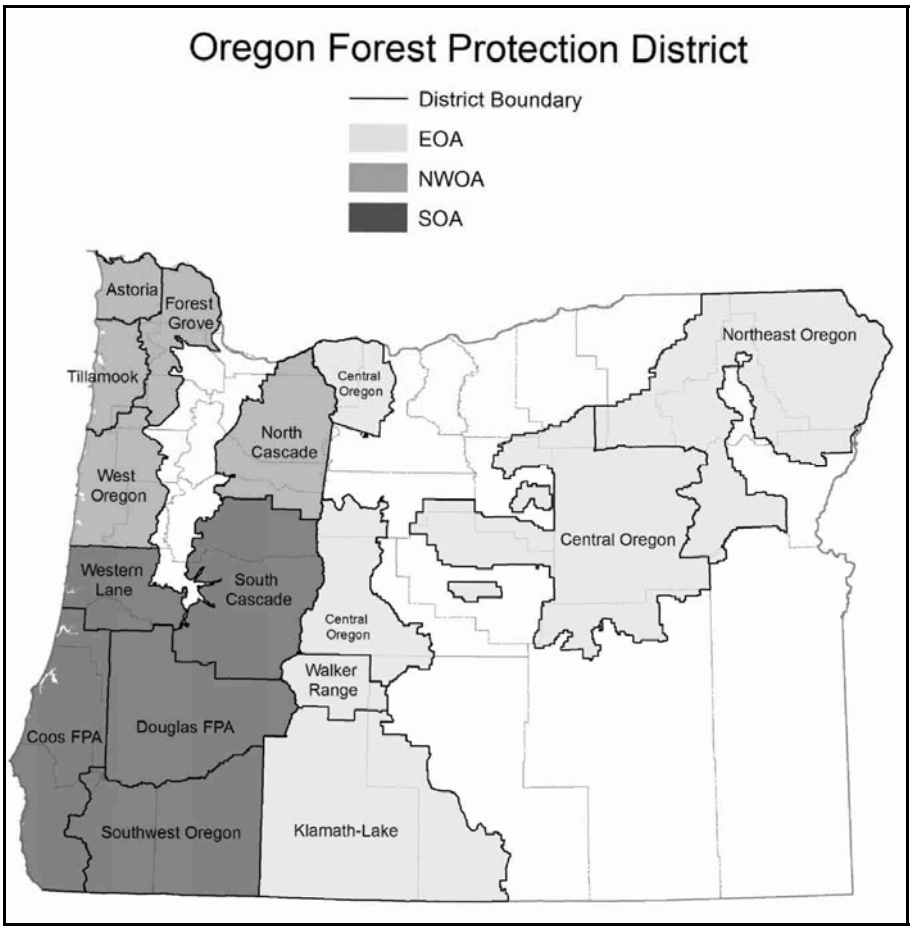
The statewide aerial survey, covering *>28 million acres*, is flown during summer and fall of each year, as this is the optimum time to detect changes in foliage or other characteristics associated with many forest damaging agents (*Figure 1*). Ownership over the survey area is approximately 60% federal and 40% state and private.

The survey aircraft flies a grid pattern at an altitude of 1,000-1,500 ft above the ground, with flight lines 4 miles apart. Two aerial observers each map a 2 mile area on one side of the aircraft using a *digital sketch-mapping system*, consisting of a touch-screen computer and a GPS receiver. The system displays topography, satellite imagery, and aircraft position, allowing affected areas to be delineated as polygons.

Polygon boundaries indicate the *approximate extent of the damage*, and a code is used to describe the probable agent(s), along with either the number of trees affected or an intensity measure (L=light, M=moderate, H=heavy). In areas where trees are too numerous to count, the number of trees per acre is estimated (1A=1 tree per acre). A key is located on each map to describe the agent and primary host(s) for each code.

The objectives of the survey are to provide the *locations and extent of current year damage* and to use this information to *document trends over time*. Providing up-to-date as well as long-term survey results to land managers may assist in planning for current or future forest management activities. Aerial surveys are designed to provide estimates only and are *not able to precisely quantify damage*; this can only be accomplished by additional ground-based surveys of mapped areas.

Figure 1: Annual aerial surveys cover all forest lands in Oregon (>28 million ac). Damage estimates are summarized by ODF area and protection districts.



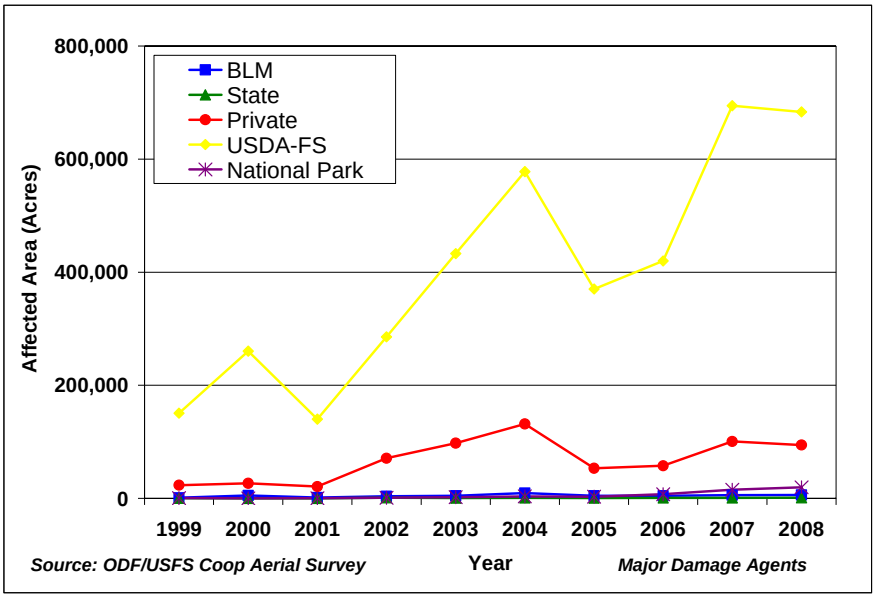
Survey Results: Eastern Oregon Area

Aerial survey results are summarized here by *ownership, protection district, and agent*. Damaging agents for the area are further grouped according to bark beetles or defoliators, with additional information given on the major agents in each category. For all damage summarized here, estimates are described by *the total number of affected acres.* In uneven-aged stands, the affected acreage generally provides the best overall estimate. Current year results are provided as part of the 10-year trend. Additional measures (wood volume, etc.) and analyses can be provided on request.

In 2008, the *total damage detected* by aerial surveys in Eastern Oregon was *>800,000 acres*, an overall decline of 2% relative to 2007 (*Figure 2*). However, follow-up ground surveys suggested that *the development of some defoliators* (and the damage signature appearance) *was significantly delayed* in much of the Central and Northeast Oregon districts due to high residual snowpack and below-average temperatures. Therefore, *defoliator damage may be more extensive than indicated* here and closer to estimates observed under better survey conditions in 2007. Surveys this year should provide further clarification.

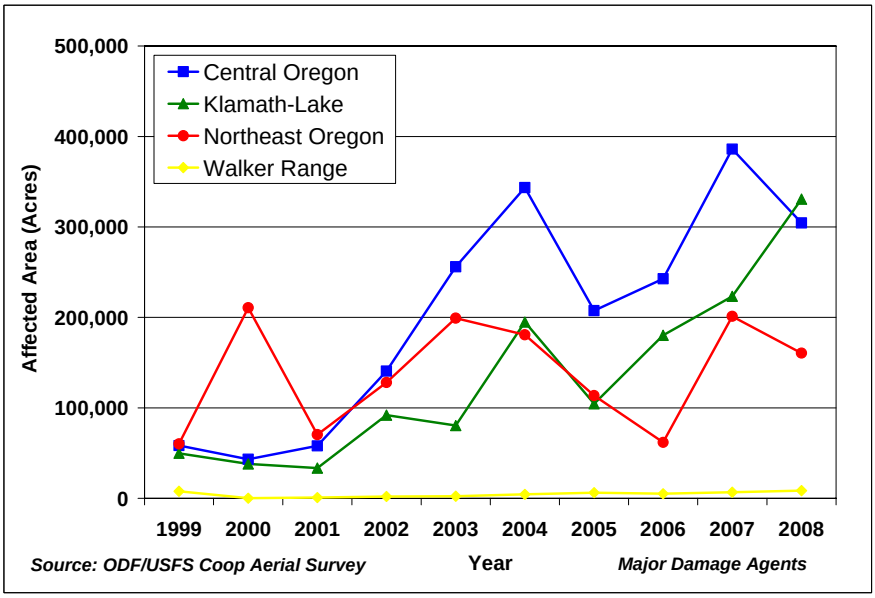
By ownership, slight increases in damage were observed on BLM, State, and National Park lands, while USDA Forest Service and private ownerships appeared to decline. Damage levels were highest in areas of USDA Forest Service ownership, consistent with the general trend that has been observed over the past decade.

Figure 2: Damage detected by annual aerial surveys of Eastern Oregon, 1999-2008.



Detected damage by *protection districts* was more variable (*Figure 3*). In 2008, declines appeared to occur in the Central and Northeast Oregon districts due to reduced detection of defoliator damage. Significant increases were observed in the Klamath-Lake district and to a lesser degree in the Walker Range FPA due to rises in bark beetle-related damage from outbreaks occurring in those areas.

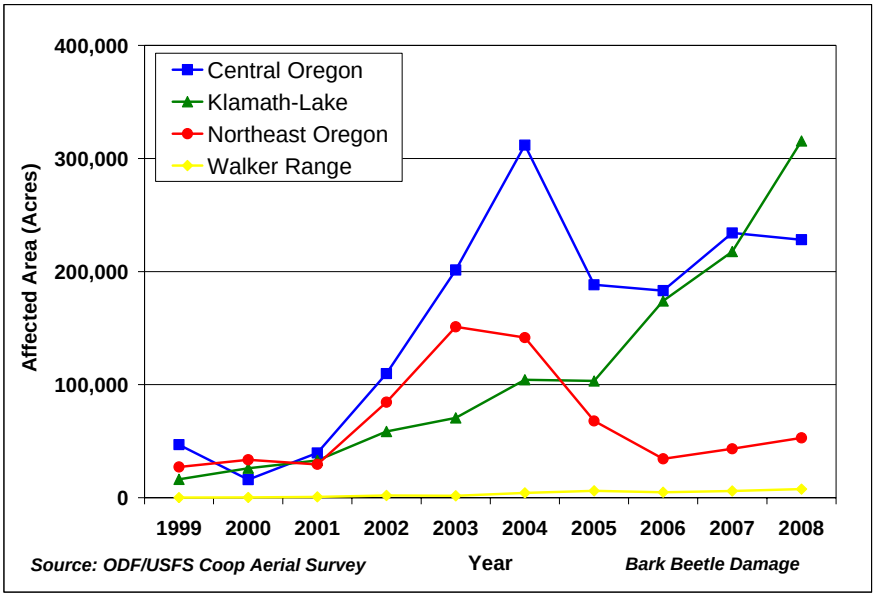
Figure 3: Damage detected by annual aerial surveys of Eastern Oregon, 1999-2008.



The most significant *bark beetles* in Eastern Oregon include the *mountain pine beetle (MPB),* whose outbreaks have historically covered millions of acres in the West, as well as *Douglas-fir beetle (DFB)*, *fir engraver*, and *western pine beetle (WPB)*, who have less extensive outbreaks, but can still cause significant tree mortality.

Damage due to bark beetles remained relatively high in Eastern Oregon, consistent with the trend observed since 2001 (*Figure 4*). Damage levels in the Central Oregon district appeared to decline slightly this year, while increases were observed on the Klamath-Lake district and Walker Range FPA, due to a rise in MPB and WPB damage. Increases in Northeast Oregon resulted from greater damage by fir engraver and DFB.

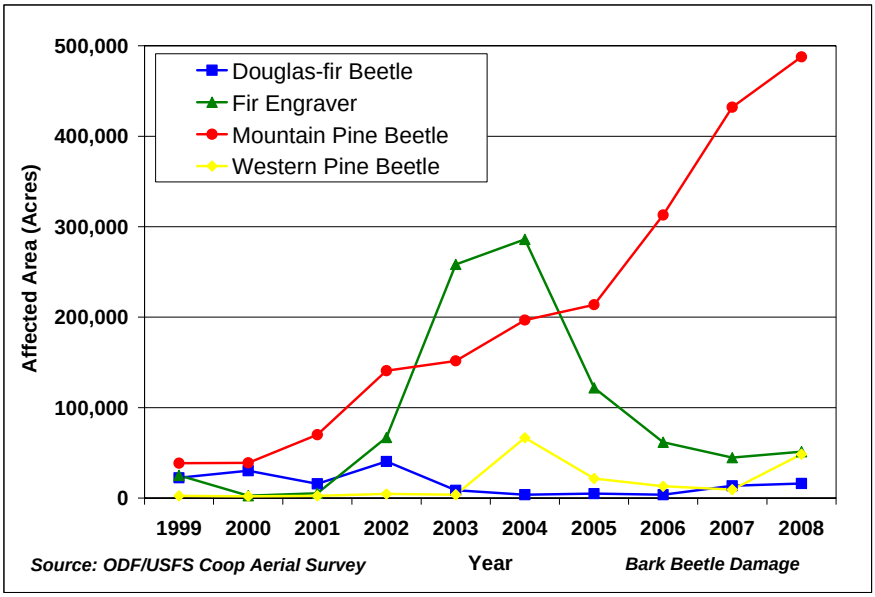
Figure 4: Bark beetle damage detected by aerial surveys of Eastern Oregon, 1999-2008. MPB accounted for >81% of all bark beetle damage in 2008.



Large MPB outbreaks continued to cause widespread mortality in mature lodgepole pine stands as well as localized damage to ponderosa and 5-needle pines throughout Eastern Oregon (*Figure 5*). Outbreaks can continue for a decade or more and result in the majority of mature lodgepole being killed. Damage by *MPB increased for the 8th consecutive year and substantial "spill-over" effects were noted*. This occurs when very large beetle populations are able to overwhelm normally more resistant hosts. This appeared to be most prevalent in more widely-spaced, large-diameter ponderosa pines as well as small-diameter ponderosa in overstocked plantations. The most substantial increases in mortality from MPB were observed in the Klamath-Lake district. Normally, *high MPB populations cannot be sustained without the lodgepole host*, and outbreaks can collapse once these mature stands are exhausted. However, as susceptible areas continue to exist, it is difficult to predict future trends.

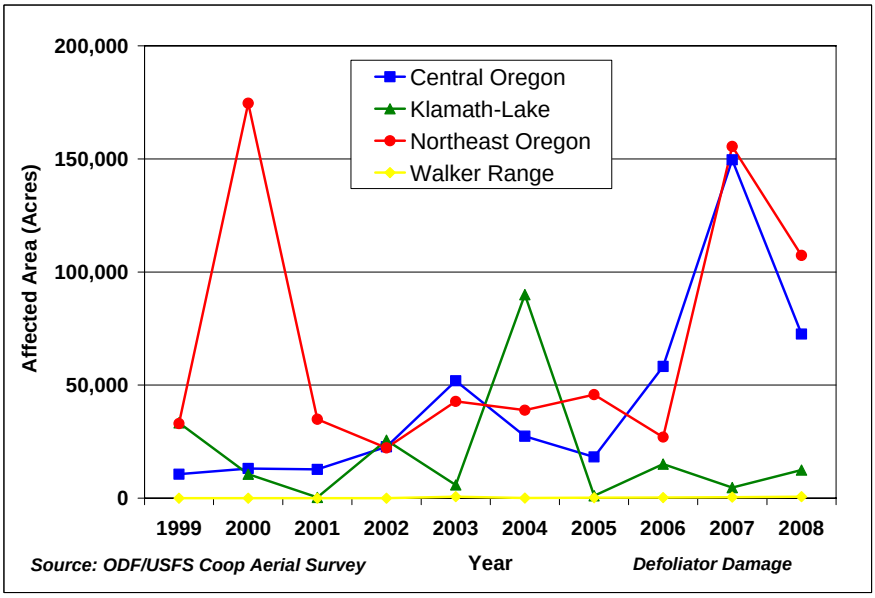
Increased damage by the other bark beetles is often related to environmental conditions such as drought or storm-damage, and therefore shows greater annual variability. Although small by comparison, damage to ponderosa pine from WPB, Douglas-fir from DFB and true firs from fir engraver increased in 2008. *Damage was dramatic in some areas, especially in white fir*, and represented the first significant increase in fir engraver and WPB damage since the last outbreaks in 2004.

Figure 5: Bark beetle damage detected by aerial surveys of Eastern Oregon, 1999-2008. MPB accounted for >81% of bark beetle damage in 2008.



The primary *defoliators* in Eastern Oregon include *chewing and sap-feeding insects* as well as *foliar diseases* whose activity can each cause premature needle/leaf drop. Recent damage is due to both *native* (Western spruce budworm (WSB) and pine needle casts) *and non-native species* (balsam woolly adelgid (BWA) and larch casebearer (LCB)). Damage from these agents can be highly variable, with short duration, severe outbreaks occurring in both regular and irregular intervals. Observed damage due to some defoliators, particularly moths, were significantly reduced in 2008 (*Figure 6*). It is currently unknown to what degree these results were influenced by survey timing.

Figure 6: Defoliator damage detected by aerial surveys of Eastern Oregon, 1999-2008. Includes damage from chewing and sap-feeding insects as well as some foliar diseases.



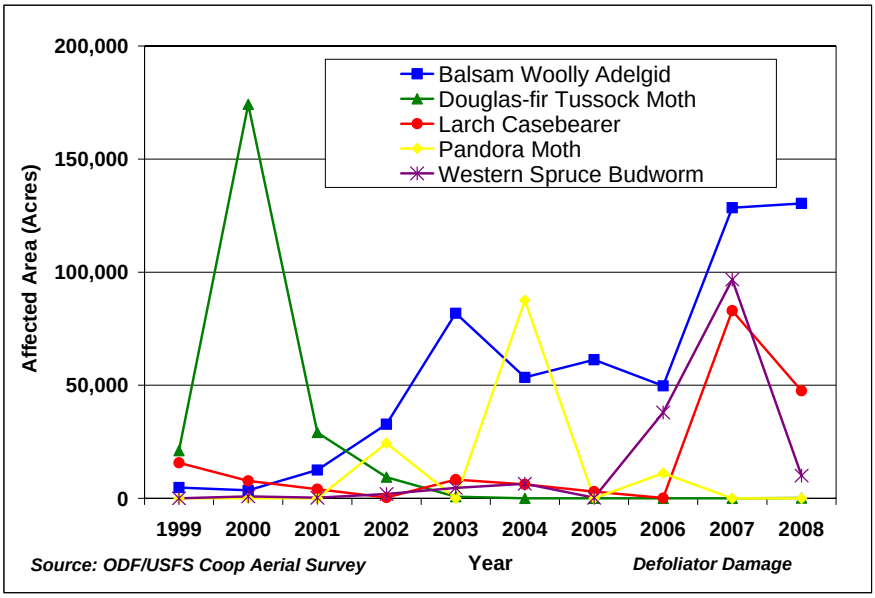
Declines appeared to be greatest in the Central and Northeast Oregon districts, where detection of WSB and LCB damage was much lower than in 2007. In contrast, increased damage was detected on the Klamath-Lake district and Walker Range FPA, due to a rise in BWA and pine needle casts (*Figure 7*).

Damage to Douglas-fir and true firs due to *Western spruce budworm has been increasing since 2001*, and while it is possible that populations were negatively impacted by environmental conditions, *follow-up ground surveys indicated that moderate defoliation was still occurring* in the majority of recently affected areas.

Similarly, damage from the *larch casebearer moth was less prominent this year*, although ground surveys were not completed in most areas to verify this. Adding to the difficulty in assessing LCB damage is its similarity to that of larch needle diseases. Although tree mortality due to these agents has been relatively low of late, reports of increasing numbers of severely infested, mature trees being killed have risen.

Damage from *BWA increased in most areas this year*. The most substantial impacts were to stands of subalpine fir, where damage intensity has risen such that rapid tree decline and mortality is occurring, often in association with bark beetles. Recent damage trends in Eastern Oregon from this long-established, non-native insect, appears similar to what occurred in Western Oregon during the 1950s and 1960s, when substantial mortality of grand fir due to BWA was documented.

Figure 7: Defoliator damage detected by aerial surveys of Eastern Oregon, 1999-2008. BWA accounted for >69% of defoliator damage in 2008.



Small areas of damage, due to some other defoliators, were also significant this year. *Black pineleaf scale* again increased its distribution and damage in Central Oregon. In areas with high, persistent infestations, both primary pine hosts and secondary hosts, like Douglas-fir, are being killed. The factors allowing scales to rise to damaging population levels are poorly understood, but appear to be related to site conditions, particularly any activities (insecticide sprays) or environmental conditions (air pollution) that may disrupt parasitioid wasps, their primary natural enemies.

The non-native, canker-causing disease, *white pine blister rust*, also continues to expand, and appears to be significantly impacting the regeneration of 5-needle pines in many areas of the Cascades. *Needle casts* of pines were also more apparent this year, particularly in the Klamath-Lake district. Infection severity is often highly localized, as it is driven primarily by spring moisture levels at the particular site. Damage tends be highly variable throughout the area, but is generally short-lived.

Survey Discussion

The above district-level summaries are coarse and *may not represent trends at a more localized level*, due to the inherent limitations of the techniques and given that only damage that is readily visible at the time an area is flown is recorded. Attempts are made to coordinate flights with peak visibility of the major agents, but this is often confounded by weather or other factors. Still, aerial surveys represent the most *efficient and cost-effective* method available for obtaining a reasonable annual depiction of the extent of forest areas affected by many types of damaging agents. *Please contact us* with any questions regarding this summary or if you would like additional information or analyses for a more specific area.

Acknowledgments

Annual aerial surveys are conducted by *ODF Forest Health and Air Operations* staff in cooperation with the *USDA Forest Service*. Thanks to ODF pilots Jim Baranek and Trevor Courtney, as well as federal cooperators Robert Schroeter, Keith Sprengel, Ben Smith, Julie Johnson, and Sundi Sigrist.

Additional Notes

We would *greatly appreciate feedback* in regard to the usefulness and timeliness of this information. Also, as we are only able to conduct limited ground surveys each year, any observations or specific information you could provide would be much appreciated and readily used to help improve survey mapping and data accuracy.

For additional information, contact :

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Additional Survey Results and Other Forest Health Information are available at: http://egov.oregon.gov/ODF/PRIVATE_FORESTS/fh.shtml