Agenda Item No.:	B
Work Plan Title & #:	Administrative Work Plan 0
Objective # & Title:	IBI 2 - Governance
Presentation Title:	Annual Forest Health Report
Date of Presentation:	June 3, 2009
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SUMMARY
This agenda item provides an overview of the major insect, disease, and other damaging agents affecting Oregon forests in 2008 (ORS 527.335 and Programmatic Annual Work Plan item), and an update on the sudden oak death eradication program (ORS 561.510). On a statewide level, increasing levels of insect damage were observed for a number of bark beetles and sap-feeding insects in 2008, while declines appeared to occur for many defoliators. Ongoing monitoring for non-native insects detected a small number of European gypsy moths, but no high-priority, non-native wood-boring insects were found. In 2007 and 2008, we found approximately 60 new sudden oak death (SOD) infested sites each year. Delays in completing treatments and consecutive years of unusually wet weather contributed to spread of the disease, forcing the expansion of the quarantine zone from 26 mi^2 to 162 mi^2 in early 2008. The ongoing SOD eradication program has effectively slowed the spread of the disease, resulting in a sub-county quarantine as opposed to the multiple county quarantines currently found in coastal California. Swiss needle cast continues to damage Douglas-fir forests in the Coast Range, with damage detection this year estimated at an all-time high. White pine blister rust damage continues to cause substantial damage to whitebark pine in many high elevation areas. More localized damage resulted this year from weather events that caused heat injury, snow/ice damage, and an increase in foliar diseases. Bio-monitoring plots did not indicate any ozone damage in Oregon this year, while black bear damage to forest areas of western Oregon appeared to decline.

CONTEXT
A Cooperative Agreement signed in 1965 between the State Forester, the Board of Forestry (BOF), and the USDA Forest Service provided for personnel to carry out systematic surveillance and reporting of insect and disease conditions on forest lands. In addition, Oregon's Forest Insect and Disease Law, ORS 527.335, mandates that the State Forester conduct surveys to determine the presence, extent, trend, and impact of native and invasive pests as well as overall forest health. Annual aerial and ground surveys fulfill this statute and support the following critical functions/measures:

- Departmental Key Performance Measures (KPM #629-14);
- Forestry Program for Oregon: Indicators of Sustainable Forest Management (Strategy F.a. and F.b.), adopted by the Board in January 2007;
- Private landowner reporting requirements for forest certification systems;
- Distribution of annual forest damage maps and data summaries to Departmental personnel and other cooperators (public agencies, private industry, the general public);
- Synthesis into the annual USDA publication, " Forest Health Highlights in Oregon," targeting professional/non-professional foresters, land managers and the general public; (Attachment 1)

- Incorporation into the USDA Forest Service National Insect & Disease Risk Map (NIDRM) project and forest health conditions report to the U.S. Congress.

BACKGROUND & ANALYSIS

The annual aerial survey of forest lands in Oregon began in 1947. The over sixty years of aerial survey information collected for Oregon has been recognized at the regional and national level as one of the best long-term data sets on forest health information available. The Department has also been recognized nationally for developing and testing digital sketch-mapping and aircraft safety technologies that have improved the efficiency of information delivery. In cooperation with the USDA Forest Service, Departmental personnel currently map damage due to insects, diseases, and other agents on over 28 million acres each year. Departmental ownership of the survey aircraft allows us to meet both public and private landowner needs for specialized aerial surveys, which currently include sudden oak death (SOD), Swiss needle cast, and black bear damage. Although the native damaging agents described below currently cause the most significant tree mortality or growth loss each year, they are a natural part of forest ecosystems and contribute to greater decomposition rates, nutrient cycling, vegetation diversity, and wildlife habitat. Of greater concern are the non-native species; while they are currently affecting limited areas, they have the potential to cause much greater long-term damage to Oregon forests.

The following is a summary of Forest Health Conditions in Oregon, 2008 (Attachment 1):

- In the 2008 statewide aerial survey of Oregon forests, over 910,000 acres of tree damage and mortality were observed. Bark beetles accounted for nearly two-thirds of the overall damage detected. More challenging survey conditions, in combination with wide regional variation in insect and disease activity, resulted in a net increase of only 10,000 acres relative to the 2007.

- Mountain pine beetle (MPB) is the most destructive bark beetle in Oregon. Low levels of damage are always present, with attacks focused on stressed trees. More widespread damage results from periodic outbreaks that have occurred many times historically, and are linked to vulnerable stand conditions. Outbreaks begin in and are sustained by areas of large-diameter, dense lodgepole pine, and often continue until those areas are exhausted. The area affected by MPB rose for the eighth consecutive year, increasing to over 550,000 acres in 2008. The majority of damage was initially restricted to lodgepole stands, but other hosts (ponderosa and 5-needle pines) have been increasingly affected in recent years due to high beetle populations overcoming normally more resistant hosts. Damage was less intense than in recent years in central and northeast Oregon, while areas of Klamath and Lake Counties continued to show increased damage.

- Outbreaks of fir engraver and western pine beetle (WPB) have historically caused high levels of mortality in Oregon, and are often triggered by consecutive years of below-average moisture. Moderate levels of damage occurred for each beetle in 2008, with fir engraver affecting over 65,000 acres while WPB damage was observed on over 50,000. Wide geographic variation in damage occurred, but was most apparent for fir engraver in more drought-prone areas of northeast Oregon, while damage by WPB was most apparent in central Oregon, often in areas recently affected by MPB or fires.

- Observed damage from two major defoliating insects, the Western spruce budworm and the non-native larch casebearer, decreased substantially in 2008, and this appeared to be due both to delays in signature development in some areas as well as reduced activity. Detection of Western spruce budworm damage in central Oregon declined by 89% this year to 10,000 acres. Follow-up ground surveys indicated a much higher degree of damage in early fall than was initially detected, and this may be related to delayed larval development and feeding as the result of below-average

summer temperatures. Larch casebearer damage in northeast Oregon declined by 40% in 2008 to 49,000 acres. Ground surveys indicated its continued presence in previously affected areas as well as co-occurrence with two larch foliar diseases. Defoliation intensity for these moths was generally considered low to moderate, with a very limited degree of tree mortality observed.

- The most damaging sap-feeding insect in Oregon is the balsam woolly adelgid. This non-native insect caused widespread decline and mortality of true firs in western Oregon during the1950's and 1960's, and is currently infesting many areas of central and eastern Oregon. In 2008, damage increased to over 140,000 acres, with tree decline and mortality most severe in stands of Pacific silver and subalpine fir. Scattered damage continues to occur along the Cascades, while more intense and widespread damage was observed in northeast Oregon.

- The Oregon Department of Agriculture captured a total of 12 gypsy moths at one previous and four new sites in 2008. All moths were determined to be the European strain. Moths were captured for a second year at a location in Eugene, indicating that a breeding population may be present. An eradication spray project is planned for this area in spring 2009. No additional moths have been found at the three most recent eradication sites of Bend, St. Helens, and Shady Cove.

- Sudden oak death, caused by the non-native pathogen *Phytophthora ramorum*, expanded in 2008 despite aggressive eradication efforts. During the first 4 years of the eradication effort, the number of new infested sites and infected trees decreased each year. In 2005, the area infested began increasing, and in 2007 and 2008, we found approximately 60 new infested sites each year. Delays in completing treatments and consecutive years of unusually wet weather contributed to spread of the disease, forcing the expansion of the quarantine zone from 26 mi^2 to 162 mi^2 in early 2008. Most of the 2008 sites were small (less than 1 acre) and scattered near the center of the quarantine zone, and we found no significant expansion to the north. Of particular note is one new infested site 2 miles to the east of other known sites Despite the new occurrences, the distribution in Oregon forests remains limited to a small area near Brookings, suggesting that eradication efforts have significantly slowed the spread of the pathogen and limited the potential economic and ecological impact of this pathogen on Oregon's forests and industries.

- The 2008 Swiss Needle Cast (SNC) aerial survey was not fully completed because of delays due to weather conditions and aircraft availability. However, three sample blocks were flown in Tillamook, Newport, and Coos Bay, and these were used to estimate overall results, which indicated an increase in SNC damage in 2008 to over 375,000 acres of Douglas-fir, the largest area detected since an all-time high of 387,000 acres in 2002. This estimate continues a trend of slow disease increase observed since 2004. The majority of areas with obvious symptoms of the disease occurred within 18 miles of the coast, consistent with previous observations. The Swiss needle cast aerial survey provides a conservative estimate of damage, as permanent plot data and ground checks show that Swiss needle cast occurs throughout western Oregon, but often is not severe enough to enable aerial detection.

- A number of more localized, often weather-related damage events occurred this year. In early 2008, shore pine and Sitka spruce showed damage from heavy salt deposition that occurred as the result of the large and powerful winter storm that struck the Oregon coast in December 2007. In spring 2008, outbreaks of foliar disease in shore pine and incense cedar occurred along the central and southern coast due to favorable environmental conditions. In early summer, heat injury to a number of conifer and hardwood species was also observed in the Willamette Valley and southern Oregon due to a period of unusually high temperatures. Severe winter storms also affected many areas of northwest Oregon in December 2008. The heavy ice accumulation coupled

with the wet snow and wind caused breakage of large branches, tops and entire trees. Hardwoods suffered the most damage, with many tree and branch failures in landscape and forest situations

- Department staff and the USDA Forest Service cooperate in a National ozone biosite monitoring program. Each year in late July and August, indicator plants are monitored for ozone injury in 35 sampling hexagons distributed throughout the state. To date, ozone injury to plants has not been detected in any of the Oregon plots.

- Black bears cause damage and mortality, particularly in young conifers, in the spring of the year by peeling the bark to feed on inner bark tissues. An annual aerial survey of damage in northwest Oregon has been completed since 1989 with support from State forests, federal agencies, and private industry. In 2008, damage was observed on over 28,000 acres, which was similar to the 10-year average, but represented a 22% decrease relative to 2007. Damage from root disease, insects and drought are also common in areas affected by bear, and follow-up ground surveys by cooperators would be needed to accurately determine the relative contributions of these agents.

RECOMMENDATIONS
This report is provided to the Board for informational purposes.

ATTACHMENTS
(1) Forest Health Highlights in Oregon – 2008.