

Forestry Program for Oregon Strategy F: Protect, maintain, and enhance the health of Oregon's forest ecosystems, watersheds, and airsheds within a context of natural disturbance and active management.

F a. Tree mortality and damage from insects, diseases and other agents

Why is this indicator important?

Insect and disease outbreaks, weather events, and fire constitute important and interrelated disturbance factors affecting Oregon's forests. These factors can have both detrimental and beneficial effects as they exert great influence on the structure, species composition, and ecological function of forests. As these disturbance events occur, it is important to keep policy makers and the public informed as to whether damage is exceeding historic levels and what if anything can be done to mitigate the impacts.

Desired trend

Stable or decreasing long-term levels of Oregon forest tree mortality.

What does this indicator tell us about sustainable forest management?

State

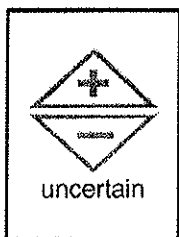


In 2007, the Oregon Department of Forestry-USDA Forest Service (USFS) cooperative aerial survey of Oregon forest lands detected tree mortality occurring on over 840,000 acres representing an estimated 30 million cubic feet. The predominant mortality agents were bark beetles, with greater damage occurring in eastern than in western Oregon. Approximately 78 percent of areas mapped with tree mortality occurred on federal forestlands. The major tree species affected were pines and true firs due to the effects of mountain pine beetle and fir engraver, respectively. Tree mortality estimates in 2007 were 10 percent lower by area and 50 percent lower by volume than the 25-year average, with the greatest reductions on state and private lands.

From 2001-2005, USFS Forest Inventory and Analysis (FIA) ground surveys estimated 27 percent of live trees in Oregon forests had signs or symptoms of insects and diseases, damage by animals, weather, or fire, or physical defect. Approximately 15 percent of Douglas-fir and 32 percent of ponderosa pine were affected. Damage levels were higher in eastern than in western Oregon, and were greater on federal than on private lands. More than 15 million acres had greater than 25 percent of the basal area affected, representing approximately 35 billion cubic feet. Root disease and dwarf mistletoe affected the most acres and volume, while the most prevalent types of damage observed were due to abiotic agents (i.e. weather, fire) and physical defects. Compared to the previous periodic inventory (1994-2003), a smaller percentage of trees, acres, and volume were affected by damaging agents.

Wildfires are a natural disturbance in Oregon's forest ecosystems, but human actions can affect wildfire extent and intensity. Many burned forest acres do not experience significant overstory tree mortality. However, a large amount of forest canopy mortality has occurred, particularly in 2002 in western Oregon.

Trend

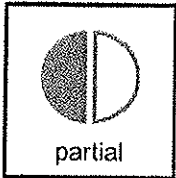


The greatest threats to the health of Oregon's forests are introduced organisms or native species whose populations and impacts are increased by drought, high stand densities or other factors. Bark beetle epidemics in western North America continue to occur. Non-native pests as well as changes in climate or human activity have the potential to greatly affect the structure and composition of Oregon's forests in the future.

The most common agents of forest disturbance tend to be more prevalent in older, unmanaged stands. If the current trajectory of management in federal forests continues, we would expect to see increases of these agents there, while declines are likely to continue to occur on state and private lands, where stands are younger and more intensively managed. The incidence and impact of damaging agents has been and will continue to be uncertain, but remains closely tied to forest management activities that affect overall structure and species composition.

As a result of a combination of factors such as forest management, fire management, fuels management, insect outbreaks, and climate change, Oregon may be experiencing an increase in the number of acres where overstory tree mortality is resulting from wildfires.

Information



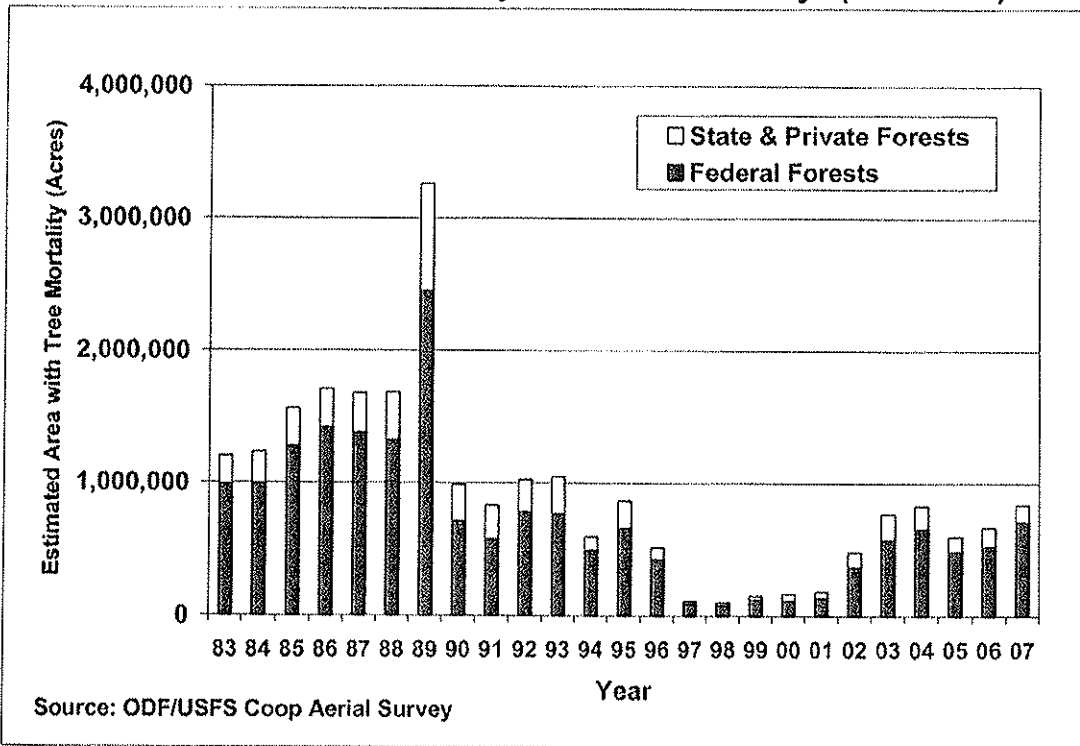
Annual aerial surveys have been completed in a generally consistent manner for more than 5 decades. Consistent estimates of tree mortality and damage are available going back to 1980. Information on the number of trees, area and volume affected by damaging agents should be available from FIA on a 5-year reporting cycle. Changes in FIA survey design have and will present difficulties in making comparisons with earlier measurements. Both the aerial survey and FIA programs are well supported and can be expected to provide data at regular intervals.

Forest health surveys only assess burned areas of less than 100 acre, while larger fire boundaries are surveyed by the PNW Wildfire Coordinating Group. Oregon lacks a comprehensive statewide database of forest mortality from wildfire. Remotely-sensed canopy cover change detection data were used as a surrogate for actual wildfire tree mortality information. More years of fire mortality data are needed to confirm trends.

Metrics and Data Sources

Metric	Data Source
Estimated tree mortality (acres affected and volume) based on annual aerial surveys	Oregon Department of Forestry USDA Forest Service Forest Health Protection & Forest Health Monitoring
Estimated tree damage (number of trees, acres affected & volume) based on periodic and annual ground surveys	USDA Forest Service FIA
Acres burned by fire based on remote sensing	Oregon Department of Forestry USDA Forest Service
Acres burned by fires resulting in 50 percent or greater reduction in crown cover (surrogate for tree mortality from fire) based on remote sensing	Oregon Department of Forestry

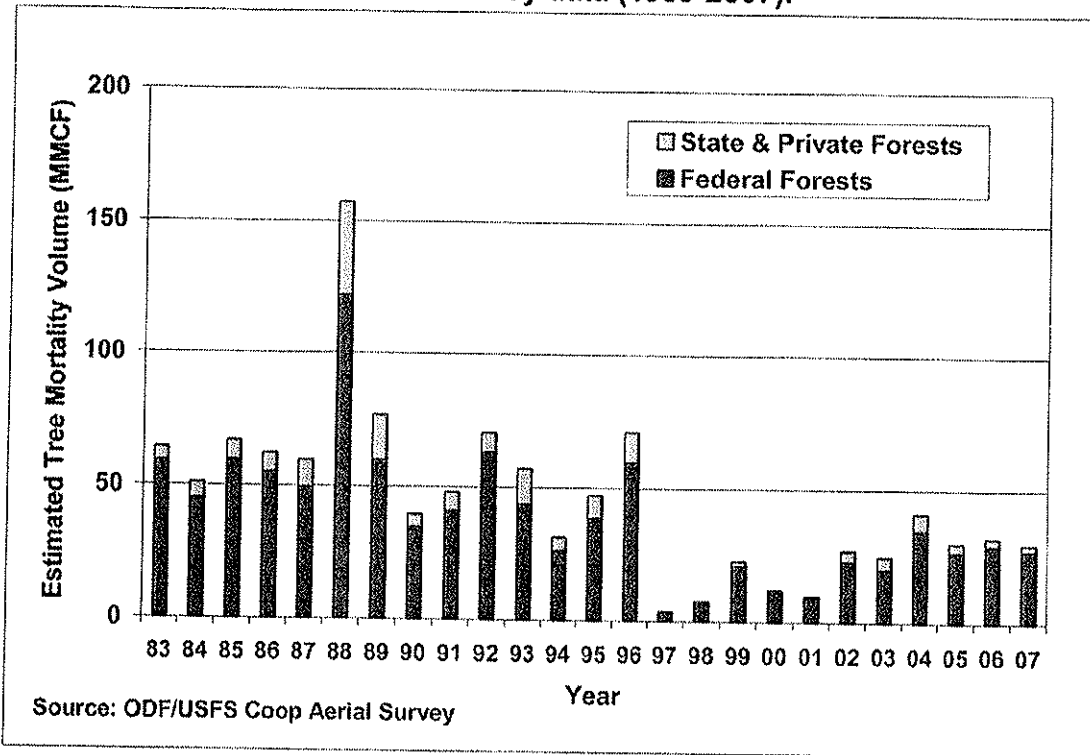
Figure 1 – Estimated area (acres) over which tree mortality occurred on Oregon forest lands as detected by annual aerial surveys (1983-2007).^{1, 2}



¹ Forest health surveys only assess burned areas of less than 100 acre, while larger fire boundaries are surveyed by the PNW Wildfire Coordinating Group.

² Does not include areas affected by insect defoliators or needle diseases as they experience wide annual variations and generally have less impact on forest cover.

Figure 2 – Estimated volume (MMCF) of tree mortality on Oregon forest lands based on annual aerial survey data (1983-2007).^{1, 2, 3}

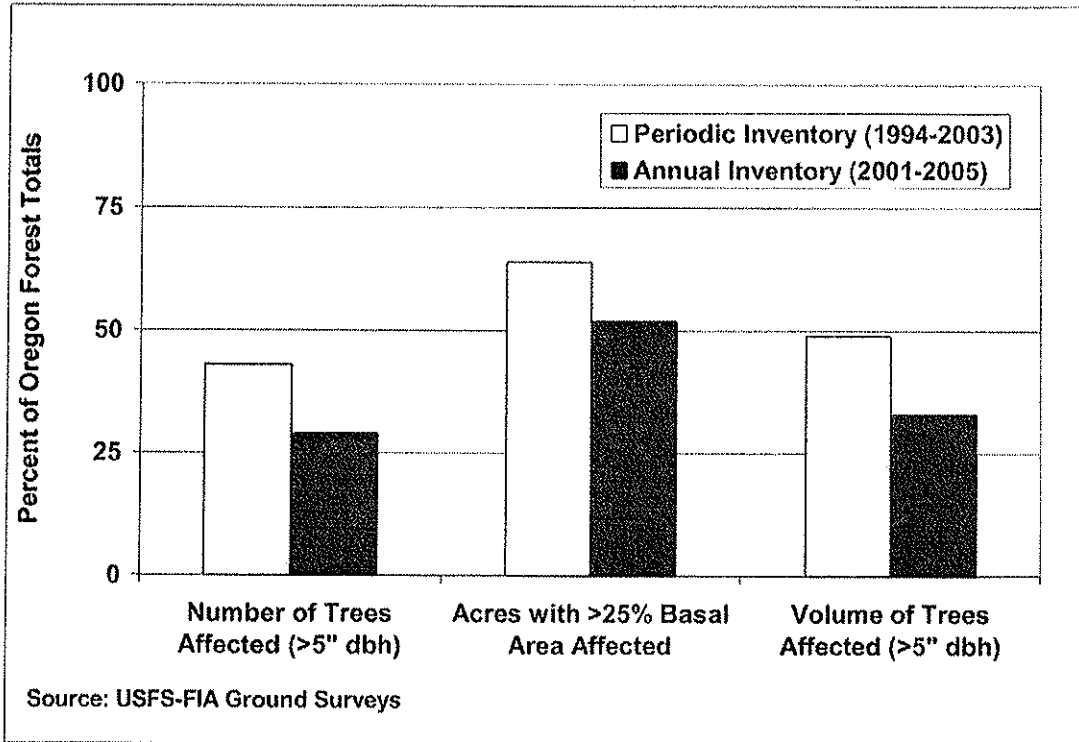


¹ The number of recently dead and dying trees mapped during aerial surveys are converted to a volumetric measure for each agent/host combination by reporting area. The reporting area is an arbitrary geographic designation developed by the USFS that provides a seamless coverage over forested areas in Oregon.

² Forest health surveys only assess burned areas of less than 100 acre, while larger fire boundaries are surveyed by the PNW Wildfire Coordinating Group.

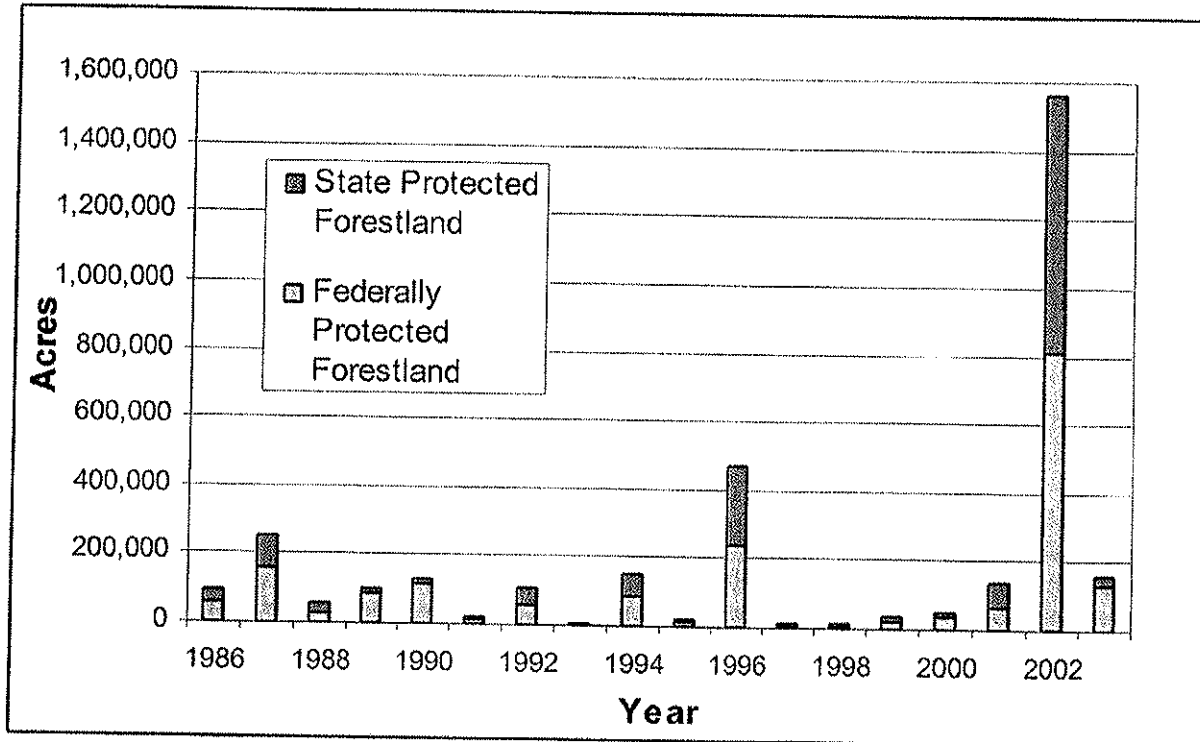
³ Does not include areas affected by insect defoliators or needle diseases as they experience wide annual variations and generally have less impact on forest cover.

Figure 3—Comparison of the percent of total Oregon forest trees (number of trees), forested area (acres) and tree volume (cubic foot volume) of trees affected by damaging agents on Oregon forest lands as determined by periodic (1994-2003) and annual (2001-2005) ground surveys.¹



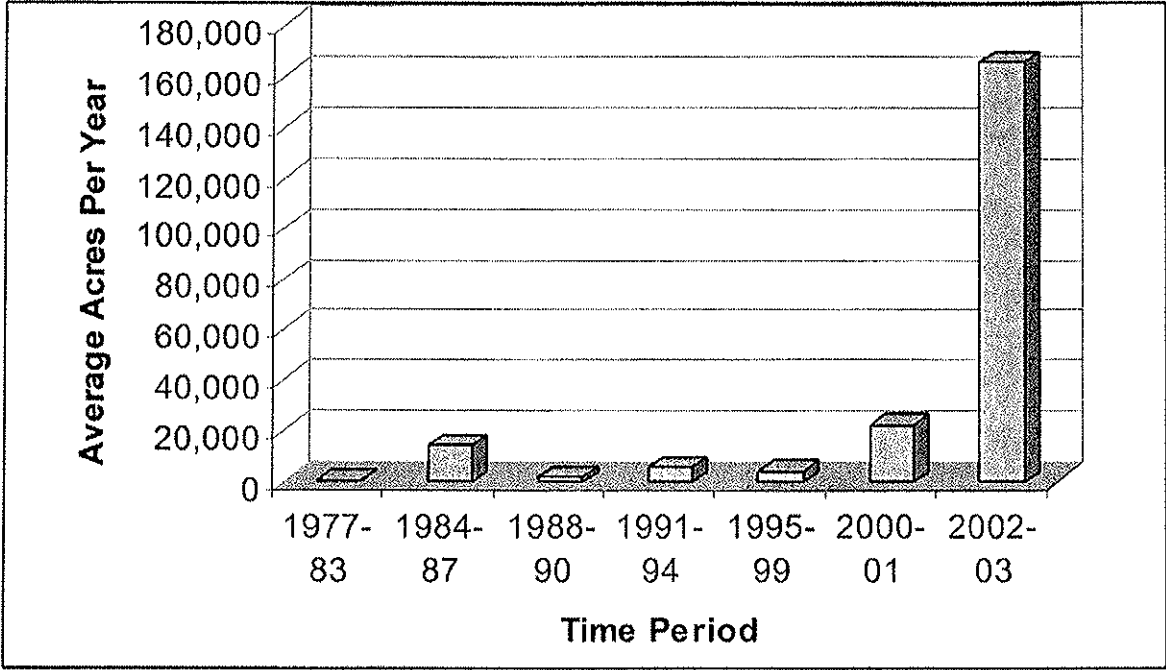
¹ The periodic and annual inventory values represent 10-year and 5-year summaries, respectively, as only a portion of the established plots are surveyed each year. As such, they are complementary to aerial survey results but cannot be directly compared.

Figure 4—Total Oregon Forestland Acres Burned



Data sources: Oregon Department of Forestry and USDA Forest Service, based on remote sensing.

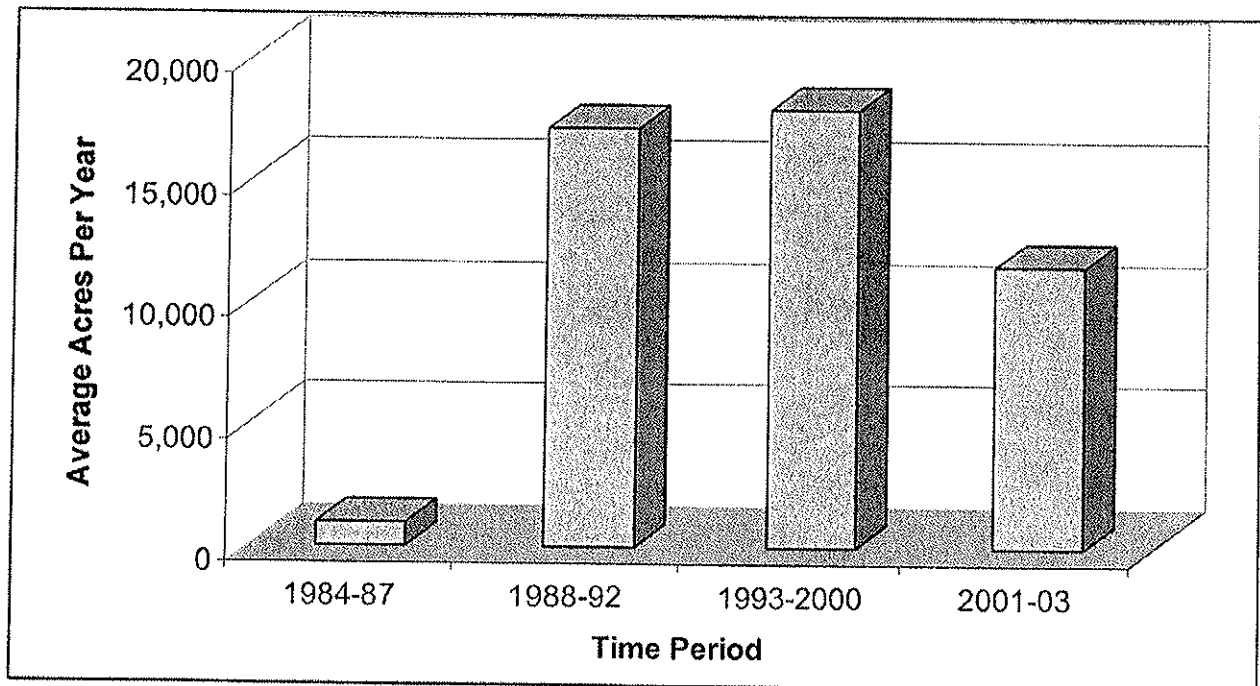
Figure 5—Average Acres Burned per Year in Western Oregon Resulting in a 50 Percent or Greater Reduction in Crown Cover¹



Data source: Oregon Department of Forestry

¹ Oregon Department of Forestry Change Detection Study data were used as a surrogate for direct assessments of wildfire tree mortality. Changes in reflective values from satellite imagery were used to detect the spectral signatures of burned areas with canopy reductions and differentiate these areas from intact forest canopies and from timber harvest areas and other sources of canopy cover reductions. Change detection data are only available for variable multi-year periods.

Figure 6—Average Acres Burned in Eastern Oregon Resulting in a 50 Percent or Greater Reduction in Crown Cover¹



Data source: Oregon Department of Forestry

¹ Oregon Department of Forestry Change Detection Study Data were used as a surrogate for direct assessments of wildfire tree mortality. Changes in reflective values from satellite imagery were used to detect the spectral signatures of burned areas with canopy reductions and differentiate these areas from intact forest canopies and from timber harvest areas and other sources of canopy cover reductions. Change detection data are only available for variable multi-year periods.