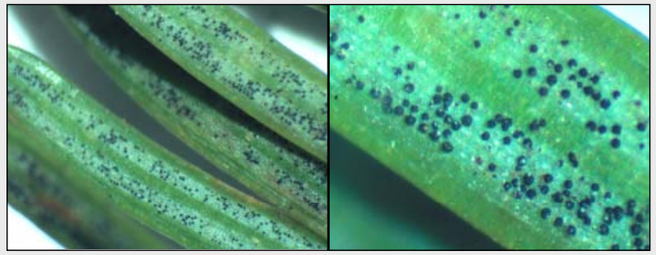
Aerial Surveys for Swiss Needle Cast in Western Oregon

Alan Kanaskie[1], Michael McWilliams[1], Keith Sprengel[2], Dave Overhulser[1], and Jack Prukop[1]
1 Oregon Department of Forestry, 2 U.S. Forest Service

Introduction

In the last decade Swiss needle cast, caused by the native fungus *Phaeocryptopus gaeumannii*, has severely damaged Douglas-fir in the coast range of western Oregon. The primary impact of the pathogen on Douglas-fir (which is the only susceptible tree species) is premature loss of foliage. This results in significant reduction in tree growth. Recent reduction in volume growth from Swiss needle cast in western Oregon likely exceeds 100 million board feet per year.

The Pathogen



Fruiting bodies of *P. gaeumannii* block stomates on the underside of Douglas-fir needles, interfering with photosynthesis and water regulation.

Foliage Loss

The main effect of Swiss needle cast is premature loss of foliage, which results in growth loss and poor vitality. Before foliage is cast it often becomes very yellow (chlorotic) with irregular necrotic areas.

Symptoms of Swiss Needle Cast

Trees damaged by Swiss needle cast have sparse transparent crowns and discolored foliage. Both height and diameter growth are reduced by the disease.

Swiss Needle Cast 1996-2001

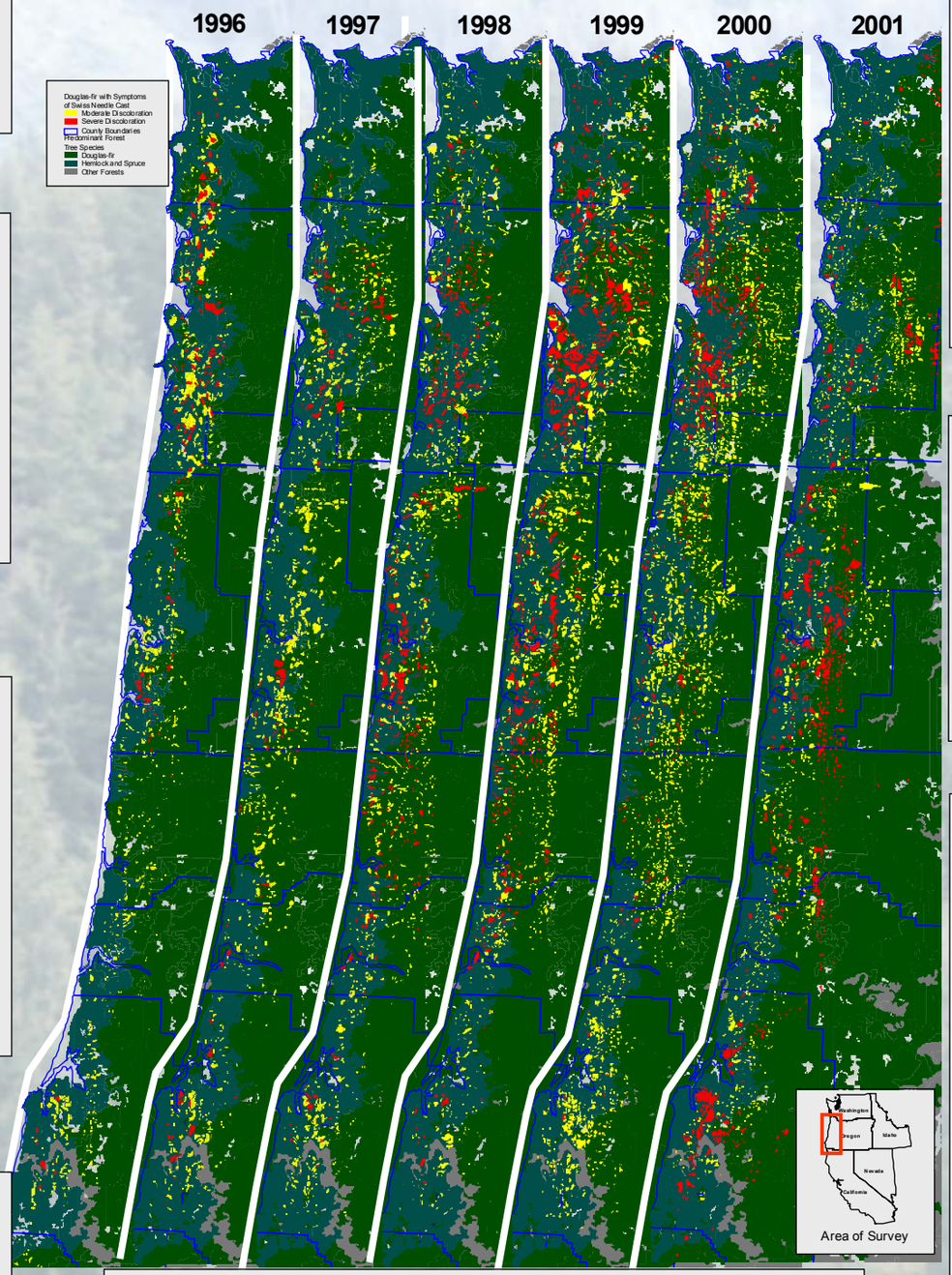


Figure 7. Maps showing patches of Douglas-fir forest with symptoms of Swiss needle cast in western Oregon, 1996-2001.

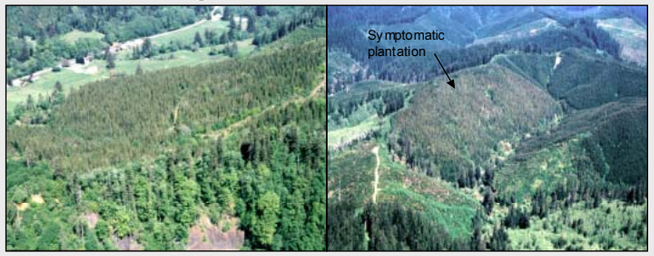
Aerial Survey Procedure

Each year since 1996, we surveyed the Douglas-fir forests of western Oregon with a twin-engine plane to monitor the amount and distribution of damage from Swiss Needle Cast. Flights were made in April and May at 1,500 to 2,000 feet above the terrain, following north-south lines separated by two miles. The surveys covered 2.9 million acres of forest each year. Observers looked for patches of Douglas-fir forest with obvious yellow to yellow-brown foliage and sketched them onto 1:100,000 scale topographic maps (prior to 1999) or computer touch-screens (2000 and 2001).

Appearance of Diseased Stands

When Swiss needle cast damage is severe, Douglas-fir forests appear yellow to yellow-brown in the spring just before bud-break. This discoloration is the signature mapped by aerial observers. Sometimes crowns are sparse but not yellow, making aerial detection difficult.

Aerial Signature of Swiss Needle Cast



Aerial observers look for patches of Douglas-fir forest with yellow to yellow-brown discoloration.

Results

The number of acres in the Coast Range with obvious symptoms of SNC each year is shown in the figure below. The easternmost area with SNC symptoms in the 2001 survey was 35 miles inland from the coast, which is a slight increase compared to previous surveys. Most of the areas with symptoms that could be detected from the air occurred within 18 miles of the coast. No Swiss needle cast damage was mapped in the Cascade Range in 2001, although Swiss needle cast does occur at damaging levels in some areas. Despite variation from year to year due mainly to weather, the survey provides a broad picture of the area significantly impacted by Swiss needle cast, and establishes a zone in which forest management should take into account the effects of the disease.

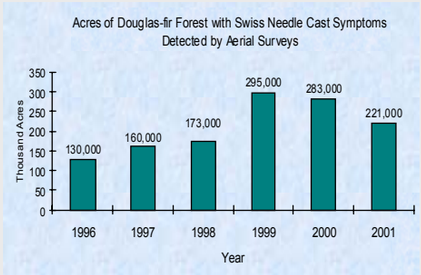


Figure 6 Trend in area of Douglas-fir forest in western Oregon with symptoms of Swiss needle cast detected during aerial surveys in April and May, 1996-2001.

Authors: Alan Kanaskie, Mike McWilliams, Jack Prukop, and Dave Overhulser work for the Oregon Department of Forestry in Salem, Oregon. **Keith Sprengel** works for the US Forest Service in Sandy, Oregon.