ELYTRODERMA NEEDLE DISEASE

State Forester Forum

Introduction

Elytroderma disease, also known as Elytroderma needle cast, is the most common needle disease of ponderosa pine in Idaho. It can be quite damaging in some areas, but in most cases does not cause severe problems. Region-wide outbreaks can occur, and several have been documented over the last 100 years, but the most severe damage, in the form of growth loss and mortality, took place on relatively limited areas. Due to the potential for damage to ponderosa pine of all ages, and its ability to increase suddenly under certain conditions, foresters need to be familiar with this disease.

Biology

Elytroderma disease is caused by the native fungus *Elytroderma deformans*. It is similar to other needle cast fungi in that it infects the current-year's foliage and causes needles to die and fall off approximately a year after initial infection. However, it differs markedly due to the fact it grows from needles into, and becomes perennial in, the shoots and twigs of ponderosa pine. The persistent nature of infection in woody tissues is what causes symptoms and damage different than other foliar diseases.

The fungus spreads from tree to tree by aerial dispersal of spores produced from fruiting bodies on previously infected needles (Figure 1). Disease symptoms are usually more severe in the lower portions of the crown due to generally higher humidity and needle wetness (Figure 2).

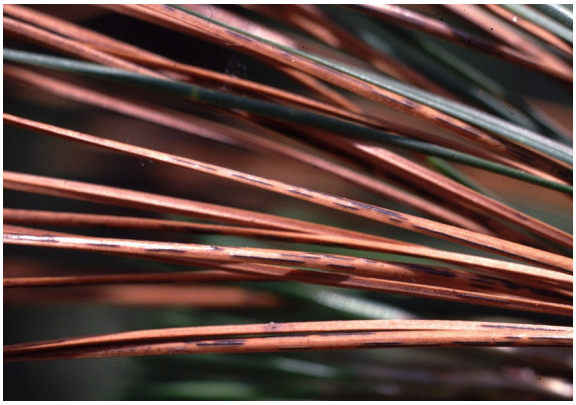

Figure 1. *Black, elongated fruiting bodies on infected needles.*

Figure 2. *Brooming in the lower crown of a mature ponderosa pine.*

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The beneficial effect of microclimatic conditions on infection can also explain the pattern of occurrence of Elytroderma disease in groups of trees, stands, or along openings. Partially shaded crowns, understory trees, and the portion of crowns facing meadows, draws, or northerly-aspects are more commonly infected.

Regional climate events can act as the catalyst for outbreaks by providing favorable conditions for spore release, dispersal, germination, and infection. Again, differing from other needle cast and blight fungi is the fact that, with *Elytroderma*, a one-time favorable set of climatic conditions are all that are needed to initiate a persistent outbreak. Other needle-infecting diseases need successive years of favorable climate to build their population and cause sustained damage because they do not become perennial in the woody tissues of their host like *E. deformans*. Most outbreaks of other needlecast fungi last only one to several years until a season without favorable conditions occurs.

Recognition

Elytroderma disease in ponderosa pine can be easily recognized by several characteristics. Infected branches usually have noticeably-reddish needles in the spring and early summer. These infected branches are called flags because they stand out against a background of green foliage (Figure 3).

Figure 3. *Branch "flagging" on ponderosa pine saplings.*

The reddish color fades over the course of the summer.

A second character can usually be observed by making a shallow cut across an infected shoot to expose brown to black spots, called resin cysts (Figure 4).

Figure 4. *"Resin cysts" in the inner bark of an infected shoot.*

A third character is the formation of witches' brooms. Witches' broom is a generic term for localized branch growth characterized by a proliferation of twigs with short internodes. In the case of Elytroderma disease, a witches' broom can begin to form several years after a branch is infected. Brooms caused by Elytroderma disease often have branches that curve upward at their ends and have many old, dead needles on them (Figures 5 and 6).

Figure 5. *Brooms caused by Elytroderma disease.*

Figure 6. *Brooms caused by Elytroderma disease.*

Brooms also tend to be very dense, compact and round. Witches' brooms caused by Elytroderma disease are frequently mistaken for brooms caused by ponderosa pine dwarf mistletoe. Elytroderma brooms can be identified by the lack mistletoe shoots or basal cups and the accumulated dead needles and the upward curving branches. In addition, while the range of ponderosa pine dwarf mistletoe is limited to various areas along the western edge of Idaho; Elytroderma disease can be found across the range of ponderosa pine.

Damage

Elytroderma disease causes the needles of infected branches to fall off, or cast, approximately 1 year after infection. Lightly infected pines are not usually damaged unless they are already under stress from other factors. When trees become moderately infected (25-75% of live branches infected) they become weakened and more susceptible to attack by bark beetles. Trees with more than 75% of branches infected are more likely to die as a direct result of foliage loss than from attack by bark beetles.

Vigorous, fast-growing ponderosa pines are rarely damaged by Elytroderma disease. Because most infection occurs in the lower branches, vigorous trees can usually recover lost foliage through rapid growth in the upper portion of their crowns.

Management

Elytroderma is not serious disease in most areas. However, where it is known to be a problem, or where a marked increase in disease has taken place, foresters should incorporate the following recommendations into their management plans (Childs 1968).

Young stands

- Maintain optimum spacing to sustain tree vigor. Elytroderma disease is most damaging to slowly growing trees and occurs most frequently in dense stands.
- During thinnings do not select crop trees with flags within three feet (preferably six feet) of the terminal. Vegetative growth of the fungus allows it to spread to the leader; such trees do not grow well and are likely to develop stem deformities.
- Select non-infected or lightly infected trees for crop trees. Trees with flags will most likely develop more infection due to vegetative spread of the fungus within an already-infected tree.
- Bole-pruning will aid in disease management by removing the branches most likely to become infected by spores.

Mature stands

- A sudden increase in the number of flags within a stand is not cause for immediate action.
- Evaluate stands for Elytroderma disease in spring and early summer when flags are reddest and therefore most noticeable.

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- The following assumptions can be made where a sudden increase in disease has occurred:
    - Flagged twigs will usually die within a few years.
    - Incidence of flagging will usually double.
    - Trees with 50% of their twigs flagged or killed are likely to be attacked by bark beetles or succumb to root disease. Trees with more than 75% of twigs flagged or dead are likely to die as a direct result of defoliation.
    - Trees already having poor crowns before the increase in disease incidence will quickly sustain more damage than trees with good crowns.
    - When harvesting in lightly-infected stands, remove any trees that have more than 33% of their twigs flagged or killed. Remove trees with lighter levels of infections whenever possible.
    - When harvesting in moderately or severely-infected stands leave only trees with the most vigorous crowns and the fewest infections. Partial harvesting in such stands can result in rapid crown deterioration and residual mortality.
    - To minimize infections in the new stand, cut or kill infected seed trees as soon as the stand is regenerated. Better yet, cut all ponderosa pine during the harvest and plant disease free seedlings.
- Prescribed burning in mature stands is thought to be one way to reduce the effects, current or potential, of Elytroderma disease due to the killing of lower-crown branches where the disease is most likely to become established.

Near homes and in recreation areas

- Pruning can remove already-infected lower branches and eliminate those most likely to become infected in the future.

References

Childs, T.W. 1968. Elytroderma disease of ponderosa pine in the Pacific Northwest. Research Paper PNW-69. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon. 45 p.

Useful Links

Forest Insect and Disease Leaflet

US Forest Service Region 1 Field Guide

US Forest Service Region 1 Management Guide

Acknowledgements

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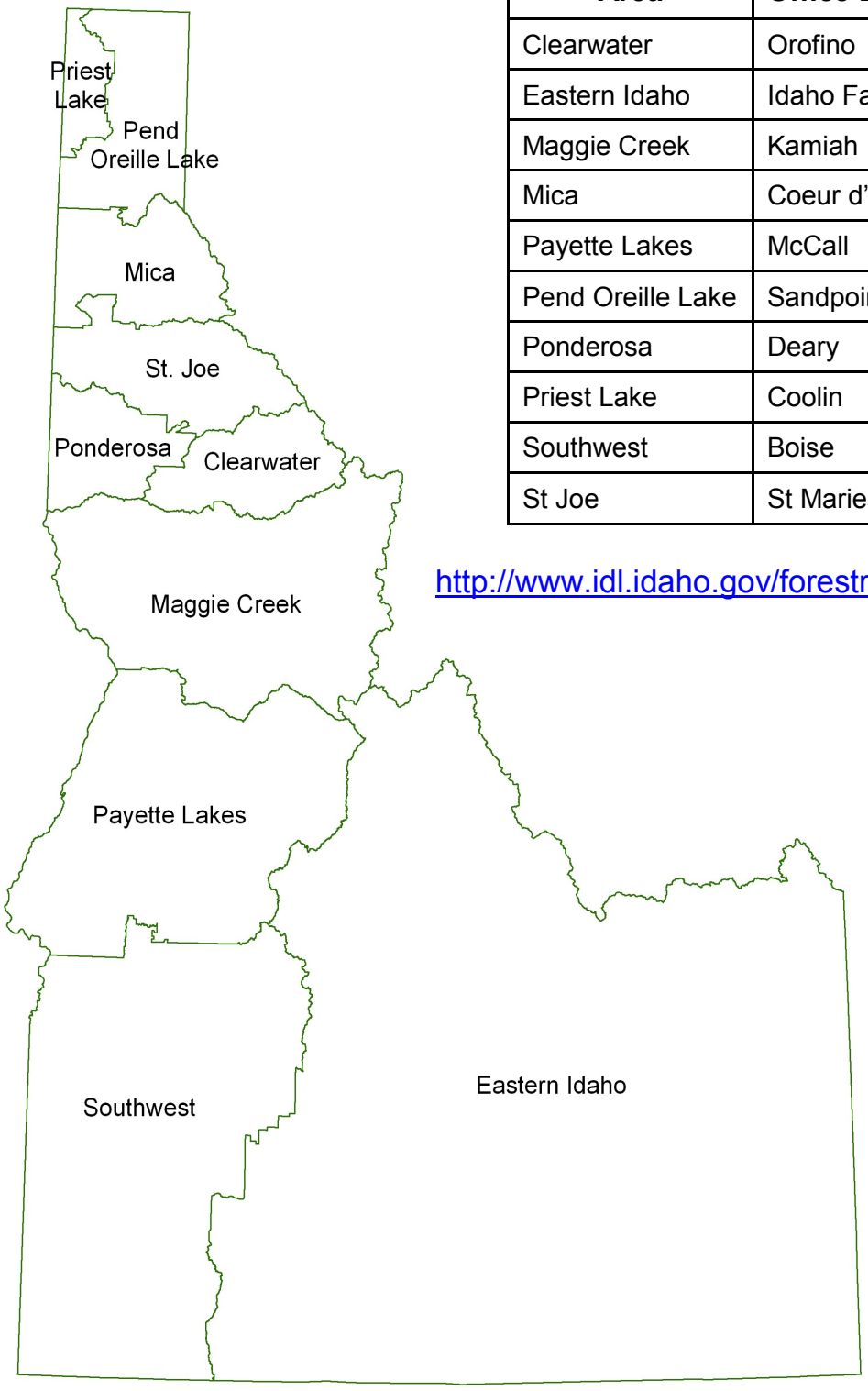

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