

June 25, 2012

Re: Diplodia in ponderosa pine at Mustang Meadows; RCSC-10-12

To: Cleve J. Her Many Horses

CC: Elton HawkWing

James T. Blodgett
Plant Pathologist

*USDA Forest Service
Rocky Mountain Region
Forest Health Management
Rapid City Service Center*

USDA Forest Service
Forest Health Management
8221 S Highway 16
Rapid City, SD 57702

Phone: (605) 716-2783
Fax: (605) 343-7134
E-mail: jblodgett@fs.fed.us

In September 2011 pictures of ponderosa pine from Mustang Meadows, in southwest Todd County (43.0112° N; 100.09917° W), with damage symptoms were examined. Based on the pictures, symptoms were likely caused by the fungal disease Diplodia shoot blight. Plant samples were received last fall, but a final diagnosis of the causal agent could not be determined.

Fresh samples were collected from these pines in the spring of 2012 including recently opened cones, branches with older and recent symptoms, and healthy branches. Microscopic examinations revealed small, black fruiting bodies and spores of the pathogen that causes Diplodia shoot blight on scales of second-year seed cones and at the base of needles of older symptomatic branches. Although no fruiting bodies were observed in branches with recent symptoms, symptoms were typical of this disease. Laboratory culturing confirmed Diplodia in the recent symptomatic branches and also in healthy appearing branches that had no fruiting bodies and no indication of this disease. Thus, diagnoses of the samples confirm symptoms were caused by Diplodia shoot blight. This disease is prominent in the area. Fungal fruiting bodies and even symptoms may not be visible in trees that are infected with the Diplodia pathogen.

Disease description:

Diplodia shoot blight and canker is caused by a fungal pathogen *Diplodia pini* (= *Sphaeropsis sapinea*). It is one of the more common and sometimes serious disease problems of ponderosa, Austrian, and Scots pine in this area. We have seen an increase in damage caused by this disease throughout South Dakota and Nebraska over the past few years. There was a large outbreak of this disease reported in the Black Hills in the early 1980's and this native disease has been in the area for 1,000's of years.



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Typical symptoms of this disease include death of new shoots, discolored needles (tan to gray), needles remaining attached to the twigs, and stunting or crooking of shoots. Severe infections can lead to tree mortality at any age. Young shoots and needles can die rapidly and are most susceptible to infection when the candles are expanding in the spring. Spores can penetrate these immature tissues and the pathogen can infect both current-year and older tissues through wounds.

This pathogen can persist in stems and branches of pines with no symptoms, a condition called latent infection. Wounding or water stress can act as a trigger, allowing the fungus to rapidly cause disease in these already infected trees.

Unless damage is extreme trees often recover. Our monitoring of several hundred trees over 6 years in SD and NE indicated most trees recovered unless 75% or more of their crowns were affected by Diplodia. All trees from that study had extensive hail damage and mortality sometimes was assisted by opportunistic bark beetles such as *Ips* spp. Most pine with less than 75% of their crowns impacted recovered, although some trees did sustain branch and top dieback.

Increased disease development has been associated with water deficits, competing vegetation, areas with high soil nitrogen, site not suitable for a tree species, and with physical damages caused by hail, snow, and insects. Pruning and shearing wounds may become infected, and are susceptible to infection for several days. Seasonal variations and climate differences also have been related to differences in the amount of disease caused by this pathogen. Hail events are frequently associated with outbreaks of the disease in this area and symptoms develop one to two weeks after hail events.

Management options:

- Reducing water stress and wounds, and keeping trees healthy are the best options in forests and shelter belts.
- Reducing water stress is an important factor in controlling pine shoot blight. Techniques to reduce disease losses include managing competing vegetation, stand thinning, using planting techniques that reduce drought, and selecting tree species that are adapted to the site.
- Pruning or shearing should be avoided during rain events. During rain, conditions are highly favorable for infection of the wounds. Conifers can be pruned any time of year, but pruning during the dormant season is best. Pruning tools should be disinfected.

- Seedlings and small trees can become infected when they are located close to infected cone-bearing pines. Avoid planting adjacent to infected pines or remove infected trees.
- Fertilization of pines at levels recommended for ornamental and shade trees can result in increased disease, and should be avoided.
- Selecting non-host trees is a long term option. Studies have shown that pines differ in susceptibility, but most 2 and 3 needle pines are susceptible to this disease. A recent study has shown that although ponderosa pine is susceptible to Diplodia, it is a better option than Austrian, lodgepole, and red pine; and did not differ from Scotch and jack pine in susceptibility to this pathogen.
- Fungicide application is only practical for very high valued individual trees. It is expensive and must be applied to individual trees. Spraying for diseases in forests or shelter belts is not practical.
- Infection of new shoots can be reduced significantly by applying an appropriately registered fungicide to pines during the 2-week period when shoots are highly susceptible to infection. This time is usually from late April to mid May; from bud break to the end of shoot expansion. Fungicide treatments do not eliminate the pathogen in infected trees and will not prevent infection of cones.
- Burning infected branches and cones might reduce the amount of fungal spores (inoculum) in an area, but it is not clear if this would have a significant effect on future disease in an area. Spores of the fungus will survive in dead branches and cones for a few years and later infect healthy branches. However, the pathogen is common in healthy branches and produces thousands of spores in infected cones on healthy trees. Spores mostly spread by rain-splash from infected cones and dead branches in tree crowns. Studies have shown that most spores spread down and only a few yards out from infected crowns during rain, but spores can be transported by wind and some insects.
- Wood quality is not affected by Diplodia. This disease lives in bark tissues. Trees with Diplodia shoot blight should be de-branched before transporting and the branches should not be transported off the harvest site. Decay fungi can colonize trees killed by any agent and should be utilized quickly after mortality.

If you have additional questions regarding Diplodia shoot blight and canker or any other questions regarding forest health please contact the Rapid City Service Center again.