

Management for White Pine Blister Rust With Pruning Techniques

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Introduction

White pine blister rust (WPBR), caused by the invasive fungus *Cronartium ribicola* (figure 1), is a disease that affects limber pines (*Pinus flexilis*) throughout Colorado and Wyoming, including recreational areas (figure 2). WPBR causes cankers in pines, girdles branches and stems. It can rapidly kill small trees (figure 3), reduce reproduction, and deform or kill larger trees.

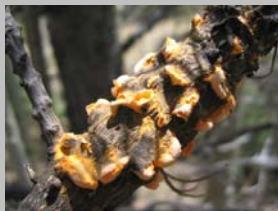


Figure 1. Aeciospores located on infected branch.

Silvicultural options for controlling white pine blister rust in limber pine were previously untested. Potential treatments including preventative and pathological pruning are available for other white pines in other regions (e.g., Hagle 1989, Hunt 1988, Hunt 1998).

The intent of this study was to apply established pruning techniques from other regions of North America to Colorado and Wyoming ecosystems to slow the mortality caused by WPBR and to develop recommendations for future white pine blister rust preventative measures in the Central Rocky Mountains.



Figure 2. Infected pine with rust-caused flagging at Teton National Park.



Figure 3. Infected limber pine girdled because of rust.

Objectives

The overall objectives of this study were to determine if pruning and canker removal prevents or reduces pine mortality caused by WPBR and to determine if pruning is feasible in the Central Rocky Mountains.

Results addressing reduction of pine mortality will be available after treated trees are evaluated in 10 years for health and WPBR reduction. This poster addresses the feasibility of pruning, specifically concentrating on:

- 1) physical effort needed to operationally prune recreational areas,
- 2) extent of damage caused by WPBR in recreational areas,
- 3) location of WPBR cankers in trees in the Central Rocky Mountains, and
- 4) application of procedures in operational situations.

Acknowledgements and Literature Cited

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Methods

Study locations were located in popular recreation areas - the Vedauwoo Campground in the Medicine Bow National Forest and the upper mile of the Mosca Creek Trail in the Great Sand Dunes National Park and Preserve (figure 4). Study sites were split into 3 blocks. Within each block, there were 4 infected and 2 healthy treatments. The treatments were repeated 3 times within 3 size classes for a total of 36 infected and 18 healthy trees per block.

Figure 4. Map of Colorado and southern Wyoming where sites were located.



Trees were randomly assigned the following treatments:

- 1) no treatment
- 2) pruning of the lower 7 feet of branches (being certain not to remove more than 40% of the foliage)
- 3) pruning of the lower 7 feet (or 40% of the crown) and removing all WPBR cankers
- 4) removal of all cankers only



Figure 5. Using pole pruner.

Infected trees received treatments 1 through 4 while healthy trees received either treatment 1 or 2.

Trees with lethal infections were not included in the study. Sample trees were tagged and mapped.

Pre-treatment data recorded diameter at breast height (dbh), maximum needle retention, height, health status, crown class, live crown ratio, and the number and distribution of cankers.



Figure 6. Finished tree that was both pruned and had all cankers removed.

Post-treatment data:

- number of cankers removed
- number of cankers remaining
- number of people treating tree
- treatment time

Equipment used (figure 5):

- pole pruners
- pole saws
- pruning saws
- pole chainsaws

With available equipment, cankers were removed up to 17 feet (figure 6). The crew attempted to remove cankers above 17 feet by climbing trees.

Results and Discussion

Effort Needed to Operationally Prune

Crews of 2 to 3 people worked at both sites. Table 1 shows the average number of trees treated each day and the total amount of effort needed to apply the four pruning treatments. Overall, when crews collected data, they pruned one tree every 1 hour and 20 minutes. When crews only pruned and collected minimal data, they pruned one tree every 30 minutes.

Table 1. Effort Needed to Operationally Prune Trees

| location | avg. # trees treated/day | avg. # crews/day | avg. # people/crew | avg. person-hours/day |
|----------|--------------------------|------------------|--------------------|-----------------------|
| Mosca | 23.8 | 2.3 | 3.7 | 32 |
| Vedauwoo | 66* | 2.3 | 3.5 | 37.1 |

Extent of Damage

Since it was crucial to determine how disease severity affects the ability to prune a tree, a 100% survey of Vedauwoo Campground was conducted. Limber pine accounted for 62% of the species. Of the limber pines, 81% were infected with WPBR.

Location of Branch Cankers

Other pruning studies were based on treating trees where WPBR infection only occurs in the bottom portion of the tree. In the Central Rocky Mountains, however, it has been shown that WPBR cankers are found throughout the tree crown (Kearns, 2005). In this study, the site data confirmed this.

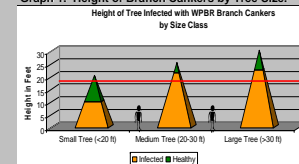
The study trees in this study had an average of 6 cankers per tree. The majority of the cankers were located on branches (629 of 656) averaging 12.9 feet from the ground and 4.8 feet from the main stem.

Application of Pruning Procedures

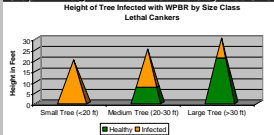
Graphs 1 and 2 address the ability to prune cankers from trees and the urgency of returning to a stand to repeat pruning.

The red line in graph 1 indicates the height that the crews were able to prune cankers (17 feet). This graph shows that cankers in small trees are easily pruned with standard pruning equipment. However, in medium and large trees, removing all cankers is difficult.

Graph 1. Height of Branch Cankers by Tree Size.



Graph 2. Height of Branch Cankers by Tree Size.



Graph 2 addresses the urgency to prune repeatedly. Lethal branch cankers – those located within one foot of the main stem are shown in orange. This graph shows that smaller trees have lethal branch cankers located throughout the crown while medium and large trees have higher lethal cankers.

Conclusions

Trees infected with WPBR occupied some recreational areas in the Central Rocky Mountains. Damage caused by WPBR in these areas was extensive, especially because the rust infections are located throughout the tree crown.

Pruning was feasible in the Central Rocky Mountains. Most cankers were located low enough to be pruned with available equipment. However, in smaller trees, preventative and pathological pruning must recur periodically to prevent lethal branch cankers from reaching the main stem.

Evaluations of the pruned trees in 10 years will yield results on the efficacy of the preventative and pathological pruning treatments.