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Whitetail Dwarf Mistletoe Control Project

An Uneven-Age Management Case Study

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Introduction

This report presents long-term (≈20 yr) results from a dwarf mistletoe control project conducted in 1990 and 1991 on the Mescalero-Apache Reservation in southern New Mexico. At the time of this project, Agency foresters at Mescalero were attempting to initiate a system of regulated uneven-age management. It was recognized that dwarf mistletoe infection would be problematic, since these parasites spread readily from older to younger host trees. Indeed, because of the damaging effects of mistletoe, **even-age** management had been the standard recommendation for infested stands. Thus, a compromise was proposed for infested stands: apply uneven-age management in lightly infested stands, and temporary even-age management in moderately to heavily infested stands. This project, known as Whitetail 1 and 2, represents the first attempt at regulated uneven-age management in a dwarf mistletoe-infested stand at Mescalero[1].

Treatment and Monitoring

The 320 acre Whitetail 1 and 2 project area was selectively logged during the winter of 1989/90. At that time, these ponderosa pine stands already included several age/size classes, from scattered mature trees to young seedlings. A majority of trees were pole size and 40 to 70 years old. The commercial entry removed nearly all trees ≥ 9" dbh with visible mistletoe infection. Based on inventory data and walkthrough examinations in the summer of 1990, it was estimated that about 20 percent of the remaining trees (excluding seedlings) were infected. The mistletoe was very patchy in distribution; it appeared that at least two-thirds of the acreage was entirely free of mistletoe. Post-harvest density was highly variable, but averaged about 300 trees per acre (excluding seedlings and young saplings).

The Forest Health-funded mistletoe control project, implemented over the winter of 1990/91, attempted to remove all of the remaining visibly-infected trees. Because these usually occurred in distinct patches, we recommended that patch cuts (group selection) be used to remove the larger infection centers, in order to reduce the amount of latent infection (new infections without visible mistletoe shoots) remaining in the stand. This was largely accomplished by the Tribal thinning crew. Single-tree selection was applied in the majority of the stand, retaining about 100 trees per acre and basal areas of 40 to 50 ft^2.

We conducted a systematic survey of the project area in April 1991, a few months after this treatment, and found an infection rate of less than two percent. By the summer of 1993, mistletoe infections were observed much more frequently within the project area. In an attempt to limit additional spread of mistletoe, the Agency conducted a follow-up sanitation treatment in the winter of 1993/1994, three years after the initial treatment.

In April 1994, a few months **after** this "re-cleaning," I established a 4.5 acre permanent plot in a representative portion of the project area. All live ponderosa pine ≥ 2" dbh, a total of 342 trees, were tagged, measured for dbh, and carefully examined for infection. Recently felled trees within the plot were tallied and examined for signs of mistletoe (all of these trees had been left on site). The plot included an irregular opening at least one acre in size that had been patch cut in the

[1] A nearby project site known as Whitetail A and B demonstrates even-age management of a (formerly) severely infested stand (Conklin 2002).

initial treatment, and a couple of smaller infection centers. The majority of the plot was mistletoe-free (and was likely so before the treatments).

Twenty (5.8 %) of the live sample trees were visibly infected. Three of these were sawtimber-size trees that had been marked for removal, but had not yet been cut. Most of the remainder had relatively inconspicuous infections, some of which may not have been visible during the follow-up treatment. A walkthrough in other portions of the project area found similar amounts of infection. Overall, it appeared that workers had a more thorough job locating and felling infected trees during the original treatment than during the follow-up treatment.

The follow-up treatment had felled 21 trees within the plot area. Sixteen of these had signs of mistletoe infection, while the others were apparently cut because of poor form or/or low vigor. Based on the infected trees cut and those still standing, the infection rate on the plot **prior to** the follow-up treatment had risen to about 10 percent. After completing the initial work on the plot, I marked all of the remaining visibly infected trees for possible removal.

By 1999, nine additional sample trees had become visibly infected, while nine of the infected trees I had marked had been cut (these were cut in 1994, shortly after the plot was set up). Thus the infection rate remained virtually unchanged. The infection rate subsequently increased to 9.1% in 2004, and 12.3% in 2009. The average DMR among all live sample trees in 2009 was 0.23.

Diameter growth on a random subsample (57 trees) was 2.8” over the 15 year period. Growth was greatest (averaging 1.4”) in the first 5 year period (1994-1999), and subsequently decreased, probably due to drought (in second 5 year period) and increasing competition. About two percent of the sample trees (excluding those cut) died over the 15 year period, with bark beetles and windthrow the primary causes.

Discussion

Intuitively, the relatively aggressive efforts to control mistletoe in this stand have reduced damage from the disease considerably. On the other hand, our monitoring here clearly documents the persistence of dwarf mistletoe, and the difficulty (and potential expense) of controlling it over the long-term.

Early monitoring results in the Whitetail 1 and 2 project area supported a modification in the treatment of lightly infected stands at Mescalero. Now, where mistletoe is encountered in a stand, all host trees within 30 to 50 feet of visible infection are usually cut. This basically involves a patch-cut of all host trees, including a “buffer” around the edges of the infection center. Only very young host regeneration (< 2’ tall) is retained in these portions of the stand; its expected infection rate is very low (Conklin 2002). This approach has been more effective at reducing mistletoe than simply removing all visibly infected trees, or even patch cutting infection centers (but without a buffer). In general, the current approach is more economical and efficient, since it doesn’t involve follow-up work before the next scheduled entry. However, its efficacy for controlling mistletoe over the long-term (several decades) at Mescalero is unknown.

Perhaps the greatest benefits (e.g. improved growth on selected trees, reduction in fire hazard, etc.) from treating this stand were derived from the overall thinning rather than the mistletoe control. While a “q-factor” was initially used as a guide to balance age/size classes, in practice,

markers focused on retaining the best available crop trees on each acre. Given the existing stand structure, this retained the characteristics of an uneven-age stand, although not necessarily one that is “fully-regulated”. This has been the general approach for uneven-age management at Mescalero to the present.

Historically, the incidence and severity of pine dwarf mistletoe on the Mescalero Apache reservation has been higher than in most other parts of the Southwest (Hawksworth and Lusher 1956). Not only has a greater proportion of the host type been affected, but also the mistletoe seems to be a more aggressive pathogen[2]. This alone suggests that the aggressive control efforts used here in recent years may not be appropriate everywhere in the Southwest. Moreover, timber production continues to be an important management objective at Mescalero; on public lands, timber has become much less of a “driving force” in recent years. Finally, natural regeneration occurs more readily at Mescalero than in some other parts of the Southwest.

On public lands, infected trees might often be retained within managed areas for their unique characteristics and potential ecological values[3]. Past control efforts (especially in the 1980s) appear to have reduced the number of large infected trees in many parts of the Southwest, compared to historic conditions. A better integration of the effects of fire—the primary natural control of dwarf mistletoe—is also suggested for managing this disease on a landscape scale.

[2] This could involve differences in the genetics of the host-pathogen relationship, climactic differences, or both.

[3] Retaining these also helps maintain forest cover and avoids sacrifice of accumulated growth, especially on sites that may be difficult to regenerate. Lightly infected trees can often survive and maintain reasonable growth for decades.

References

Conklin, D.A. 2002. Emergence of latent dwarf mistletoe infection in young ponderosa pine regeneration: 10-year monitoring of the Whitetail A & B project at Mescalero. USDA Forest Service, Southwestern Region, R3-02-02. 8 pp.

Hawksworth, F.G.; Lusher. A.A. 1956. Dwarf mistletoe survey and control on the Mescalero-Apache Reservation, New Mexico. Journal of Forestry 54(6): 384-390.

Author’s note

While reviewing an earlier draft of this report, foresters at Mescalero mentioned that they were concerned about being perceived as overly-aggressive in their approach to mistletoe control. They reminded me that a sizable proportion of the Reservation—including much of the steeper terrain—was typically not harvested, and that ecological benefits from dwarf mistletoe (which they recognize) are available on those sites. Over the years, I have supported aggressive mistletoe control efforts at Mescalero (for reasons mentioned in this report), and have viewed them as a management experiment.