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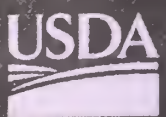
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Forest Health Management

Evaluation of Hidden Lakes
Dwarf Mistletoe Pruning Study
Routt National Forest, Colorado

Technical Report R2-61

Forest Health Management Branch



United States
Department of
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Renewable Resources
Forest Health Management

Forest Service
Rocky Mountain Region
Denver, Colorado



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**Evaluation of Hidden Lakes
Dwarf Mistletoe Pruning Study
Routt National Forest
Colorado**

**by
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**Technical Report R2-61
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Introduction

Lodgepole pine dwarf mistletoe (*Arceuthobium americanum* Nutt. ex Engelm.) is the most widely distributed and damaging disease of lodgepole pine (*Pinus contorta* Dougl.) in the central Rocky Mountains (Hawksworth and Johnson 1989; Johnson, Hawksworth and Drummond 1981). It has been estimated to infest more than half of the lodgepole pine in Colorado and Wyoming. The disease is most commonly controlled through silvicultural methods aimed at reducing the spread of the disease through the cutting of infected trees (Hawksworth and Johnson 1989; Hawksworth et al. 1977; Hawksworth and Wiens 1996). In addition, in highly valuable stands and recreation sites, the pruning of infected branches has been advocated to limit spread of the disease and extend the longevity of infected trees (Hawksworth and Johnson 1961; Hawksworth and Wiens 1996; Lightle and Hawksworth 1973). Past studies have been mainly concerned with pruning dwarf mistletoe infected ponderosa pine (*Pinus ponderosa* Laws.). In 1966, a study was established in northcentral Colorado to test the feasibility of pruning infected lodgepole pine in order to maintain stocking and carry the stand to rotation. The only alternative in many cases would be to harvest the stand and start over.

Materials and Methods

A 20-acre stand of 30-year old lodgepole pine near Hidden Lakes in the Parks Ranger District, Routt National Forest (located at T7N, R82W, SW 1/4 sect. Sect. 33) was selected as the study area. The stand was thinned to a 15- by 15- foot spacing in 1962, but unfortunately with little regard for control of dwarf mistletoe. The residual stand in 1966 averaged 194 trees per acre of which 151 (78 percent) were infected. In 1966, a decision was made by Forest staff and the Branch of Pest Control, Division of Timber Management in the Regional Office, to determine the feasibility of thinning and pruning lodgepole pine for dwarf mistletoe control (Stewart 1966). All lodgepole pine in the thinned area were examined and assigned to one of three treatment categories:

Non-pruned: trees visibly free of dwarf mistletoe infections to be left untreated.

Pruned: infected trees that would have half their live crown remaining if pruned up to the highest visibly infected branch, plus two complete whorls. Trees meeting these requirements could also have bole infections on the lower half of the stem, since this type of infection is not an important source of seed and has little impact on growth of trees.

Cut: all other infected trees, including those with infections on the upper half of the stem, to be cut down.



The entire stand was treated once according to the criteria described above. Approximately one-third of the stand was pruned.

During 1971 and 1972, all residual trees 10 feet or more in height were counted and examined for dwarf mistletoe infection (Brown 1978). In addition, diameter at breast height (DBH), total height, pruned height, height of stem infections, and height and number of branch infections were recorded for each pruned tree. Number of infections per tree were also recorded for nonpruned trees as well. Dwarf Mistletoe Rating (DMR) (Hawksworth 1977) was not recorded in 1972.

Twenty-five years have passed since this stand has been remeasured, thus we were afforded an opportunity to gain some information on the efficacy of these treatments and dwarf mistletoe infection, as well as tree growth.

The original data set included information on 377 pruned trees and 849 nonpruned trees. The sampled trees were painted with either blue or yellow tree marking paint (pruned trees were numbered, nonpruned trees indicated with a spot of paint). At the time of our visit, many of the numbers were not legible, thus it was decided to sample 100 trees in each category and take more detailed data on 20 pruned trees with visible original numbers for growth measurements. Tree measurements included DBH and DMR for all trees and total height and age (measured at stump height) for the 20 remeasured pruned trees (Table 3, Appendix). Since the original data was presented on a per acre basis, I took five 1/20th acre plots and tallied the numbers of infected overstory lodgepole pines and regeneration (ingrowth) that were 4.5 feet or more in height (Table 4, Appendix).

Results

The following table compares average tree data for all non-pruned and pruned trees:

Table 1. Comparison of summary statistics for 100 non-pruned and pruned trees, Hidden Lakes, Routt National Forest (1997).

	Non-pruned trees	Pruned trees
Ave. DBH (inches)	8.69	8.19
Ave. DMR	0.52	0.95
Percent infected	47.0	80.0

The following table compares tree data for 20 remeasured pruned trees:

Table 2. Comparison of tree data for pruned trees in 1972 and 1997, Hidden Lakes, Routt National Forest.

Measurement	1972	1997	change
Ave. DBH (inches)	5.75	8.75	+ 3.0
Height (feet)	23.6	37.1	+ 13.5
DMR 1/	<1.0	0.9	--
Percent infected	55.0	75.0	+ 20.0
Growth-last 10 yrs (inches)			+ 10/20
Age (taken at stump height)		50	

1/ Estimated for 1972 based on numbers of recorded infections.

In 1972, there were 62 overstory trees (pruned and nonpruned) per acre and 35 percent were infected. In 1997, there were 192 trees per acre and 77 percent were infected. In addition, there were 360 understory trees and 38 percent were infected.

Originally the stand was sanitized of visible infections through the removal of infected trees and pruning of infected branches. However, in the first examination of the stand 35 percent of the trees had infections. The appearance of infections on pruned and nonpruned trees six years after treatment may be a result of carelessness in detecting infections (although it was stated in the original report that trees were examined with the aid of a ladder to thoroughly look over the tree), failure of crews to adhere to pruning standards or difficulty in detecting latent infections. It was also noted that 82 percent of the branch infections were in the lower two feet of the live crown. This would result in a very low DMR (less than 1.0) for these trees. In fact the average number of infections for infected trees was 2.9.

It is interesting to note the differences between the non-pruned and pruned trees. The pruned trees were smaller in diameter and were more infected than the non-pruned trees (Table 2). Probably there were more latent infections on pruned trees at the time of treatment.

The current level of infection for the stand as a whole (77 percent infected, DMR 0.9) is low and the disease has little visible impact on growth at this time. Research on the disease indicates that

growth effects do not occur until the DMR is 3.0 or greater. Research also indicates that the DMR increases to the next full rating at about 15 years, thus in another 30 years the DMR may be close to 3.0 for many trees. At that time the stand will be of harvest size.

Even though pruning of infected trees is not practiced in timber management units in the Rocky Mountain Region, the results of this study suggest that it is feasible to reduce the effects of the disease by thinning and pruning. This approach could be used in recreation sites where trees need to be retained for cover and screening. This practice would also improve the general health and longevity of trees.

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Appendix

Table 3. Summary statistics for remeasured, pruned trees, Hidden Lakes, Routt National Forest (1972 and 1997).

Tree no.	DMR		DBH (in)		Height (ft)		Age (yrs)	Growth (10 yr.) (inches)
	'72	'97	'72	'97	'72	'97		
21	1	1	7.7	11.0	34	44	49	7/20
24	0	0	3.5	7.0	19	36	50	9/20
59	1	2	5.1	7.7	20	35	50	9/20
77	0	1	7.2	10.2	24	38	51	10/20
85	0	1	6.8	9.6	27	38	52	10/20
93	1	2	7.2	9.7	31	40	50	6/20
94	9	1	6.4	9.4	29	41	56	9/20
95	2	1	6.4	10.6	22	37	42	12/20
96	1	1	7.5	11.0	32	41	54	11/20
98	0	0	3.6	7.3	15	30	52	15/20
99	2	1	4.5	7.5	20	39	53	10/20
100	7	2	4.8	8.5	19	37	51	12/20
105	0	0	6.0	7.0	20	32	44	10/20
106	0	0	5.7	8.5	22	32	61	8/20
113	0	0	6.0	8.7	28	40	63	10/20
114	1	1	7.5	10.3	25	41	49	11/20
115	0	1	3.6	6.1	18	31	46	5/20
116	19+	1	5.0	8.4	20	34	34	12/20
117	3	1	6.4	9.0	29	41	45	9/20
118	0	1	4.2	7.6	18	34	38	7/20
Average	0.9		5.7	8.7	23.6	37.0	49.9	10/20

Table 4. Summary statistics for 1/20 acre plots, Hidden Lakes, Routt National Forest (1997).

Plot no.	Overstory trees (no).		Understory trees (no).	
	Total	Infected	Total	Infected
1	9	6	30	12
2	9	5	14	4
3	7	5	24	10
4	12	11	14	6
5	11	10	8	2
Totals	48	37	90	34
Acre basis	192	148	360	136
Percent infected	77.1		37.8	



