COST EFFECTIVENESS OF UTILITY RIGHTS-OF-WAY VEGETATION MANAGEMENT TREATMENTS: I. INITIAL CLEARING

by Lawrence P. Abrahamson, Christopher A. Nowak, Edward F. Neuhauser, Curtis G. Foreback, H. Dale Freed, Scott B. Shaheen and Craig H. Stevens

Management of vegetation on electric transmission rights-of-way (ROW) is performed to provide reliable transmission of electricity in an economic and environmentally acceptable manner. Tall growing vegetation (mainly trees) can cause disruptions in the transmission of electricity by growing or falling into the transmission wires (conductors). The emphasis of ROW vegetation management is to prevent trees from entering or threatening the transmission wires by removing them, and/or by encouraging stable plant communities consisting of lower growing species that inhibit establishment of trees. Various management schemes, including those involving herbicides, have been successfully used to achieve these goals in the initial clearing phase of electric utility ROW management. Vegetation clearing modes (selective or nonselective cuts) and herbicide application methods (stump treat, precut basal or no herbicide treatment) were evaluated for cost effectiveness in accomplishing management objectives during the first phase of ROW vegetation management — initial clearing.

Methods and Materials

Study area description. Studies took place on Niagara Mohawk Power Corporation's Volney-Marcy 345 kV transmission ROW in the Towns of Lee, Western and Floyd in Oneida County, New York. The ROW passes through the Interlobal Highland Region, between the Tug Hill Plateau and the Mohawk Valley; it is dominated by the Northern Hardwood forest type with a predominance of red maple (*Acer rubrum*) and Eastern hemlock (*Tsuga canadensis*), although there was a mixture of both active agricultural and forest land on and surrounding the study area. Soils encountered were mainly silt and sand loams of varying drainage.

Experimental design and treatment. A randomized complete block design was used to test initial vegetation clearing (six treatments, two replications, two blocks) treatments on ROW vegetation. Treatments were blocked across a contiguous 15 mile section of ROW between abandoned agricultural land and woodland areas. All treatment plots ranged in size from 0.6 to 2.1 acres. A pre-treatment inventory of vegetation was conducted in 1982. The ROW was cleared and treated in spring 1983. A post treatment vegetation survey was completed in the fall of 1983 to evaluate the effectness of the initial vegetation clearing treatments.

The six Initial Clearing study treatments were composed of three selective and three clear cut treatments:

Selective Cut with No Herbicide. No herbicide treatment. Selective mechanical cut of trees.

Selective Cut with Precut Basal. Precut basal treatment of selected trees with a herbicide formulation consisting of 2 gal triclopyr at 4.0 lb active ingredient (a.i.)/gal (3,5,6-trichloro-2-pyridyl-

L.P. Abrahamson is Senior Research Associate, and C.A. Nowak is Principal Research Support Specialist and Doctoral candidate, Faculty of Forestry, State University of New York, College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, New York 13210; E.F. Neuhauser, C.G. Foreback, H.D. Freed and S.B. Shaheen are Research Specialist, Senior Environmental Analyst, Director System Forestry and Assistant Analyst, Niagara Mohawk Power Corporation, 300 Erie Boulevard West, Syracuse, New York 13202; and C.H. Stevens is Environmental Manager, Tree Preservation Co., Inc., 566 North State Road, Briarcliff Manor, New York 10510.

oxyacetic acid) (Garlon™ 4) and 98 gal oil; targeted at the lower 1 to 2 ft of individual stems, saturating the base of the stem and all exposed roots to the point of rundown and puddling around the root collar zone. Followed by a selective mechanical cut of all treated woody vegetation, mainly trees.

Selective Cut with Stump Treatment. Selective mechanical cut of trees. Followed with a herbicide stump treatment using a "ready to use" herbicide formulation of picloram at 0.2 lb a.i./gal plus 2,4-D at 1.0 lb a.i./gal (4,amino-3,5,6-trichloropicolinic acid and 2,4-dichlorophenoxyacetic acid) (Tordon™ RTU), applied to the freshly cut cambial area of the stump.

Clearcut with No Herbicide Treatment. No herbicide treatment. Nonselective mechanical clearcut of all large vegetation as in selective cut with no herbicide treatment.

Clearcut with Precut Basal. Precut basal treatment of all large woody vegetation with a herbicide formulation consisting of 2 gal triclopyr at 4.0 lb a.i./gal and 98 gal oil; targeted at the lower 1 to 2 ft of individual stems. Followed by a nonselective mechanical clearcut of all large vegetation as in selective cut with precut basal.

Clearcut with Stump Treatment. Nonselective mechanical clearcut of large vegetation, mainly trees. Followed with a herbicide stump treatment using a "ready to use" herbicide formulation of picloram at 0.2 lb a.i./gal plus 2,4-D at 1.0 lb a.i./gal, applied to the freshly cut cambial area of

Table 1. Mean total desirable and undesirable stem and sprout density and treatment cost in response to initial clearing treatments; one growing season pre- and post treatment.

Comparison group	Sample size (n)[1]	1982 stem density Desired	1982 stem density Undesired	1983 stem density Desired	1983 stem density Undesired	1983 undesirable percent stumps sprouted	1983 sprouts only Desired	1983 sprouts only Undesired	Initial treatment costs
		stems/ac					stems/ac		dollars/ac
Clear cut/ Precut basal	4	1200	1160 a	2480 c	24400 a	12 d	330 a	1810 a	1440 a
Clear cut/ no treatment	4	530	2410 a	3430 ab	11880 a	69 a	1450 a	7630 a	1040 a
Clear cut/ stump treat	4	650	2260 a	1350 bc	10820 a	33 b	730 a	4020 a	1450 a
Selective cut/ Precut basal	4(3)	700	1600 a	2490 abc	21590 a	28 bc	970 a	2920 a	1380 a
Selective cut/ no treatment	4	660	1040 a	4640 a	19210 a	73 a	980 a	11830 a	810 a
Selective cut/ stump treat	4(3)	420	1130 a	660 bc	5920 a	16 cd	160 a	1810 a	940 bc

Effects were tested using analysis of variance or covariance with a randomized block design model (alpha 0.10). Means within a column, within a comparison group, followed by the same letter are not statistically different (alpha 0.10; Duncan's Multiple Range Test). Desirable stems in 1982 were not separated because there was a significant block x treatment interaction.

1/ Sample size in parentheses is for percent stumps sprouted; it is lower because one plot was not measured and one plot did not have stumps.

woody stumps as in selective cut with stump treatment.

Data collection and analysis. Treatment costs were based on current year (1983) contractor billing rates for labor, equipment and herbicide mix for small research plots. Although the actual costs per treatment may be higher than if done on larger operational plots, the cost ratios between treatments would not change.

Plant community development was monitored pre- (1982) and post- (1983) treatment by surveying total species density (sprout or seedling) and number of stems greater than 6 ft height on systematically located strip transects covering 7% of the treatment plot area. Plants were classified as undesirable or desirable. Desirables are any vegetation, including trees and shrubs, that attains maximum heights < 20 ft. Undesirables are any vegetation, mainly trees, that attain maximum heights > 20 ft. Analysis of variance and covariance were used to test treatment effects on undesirable and desirable plant density, percent of undesirable stumps that sprouted, herbaceous cover and treatment costs. Means were separated using Duncan's Multiple Range Test.

Interpretation of cost effectiveness for the initial clearing treatments was based on both vegetation control and treatment cost. A treatment that would decrease undesirables, increase desirables and maintain relatively low costs was determined as most cost effective.

Results

Before clearing there was no significant difference in undesirable stem density (Table 1). Desirable stems did differ among the treatments in 1982, but this difference was compensated for using analysis of covariance techniques.

One growing season after initial clearing (1983), there were no differences in undesirable stem densities among the six treatments (Table 1). Although there were significant treatment differences for desirable stems, the numbers of stems per acre were not great enough to offset the large numbers of undesirables per acre. The greatest number of desirables were found in both the selective and clear cuts with no herbicide treatment. The least number of desirables was found in the selective cut with stump treatment.

The percentage of undesirable stumps that sprouted was reduced with herbicide treatments, but the total number of sprouts was not affected (Table 1). Costs were not significantly different among the treatments (Table 1).

Conclusion

Regardless of the treatment used, there were high undesirable stem densities after two growing seasons. Treatment costs and control of undesirable stems were the same for all treatments. There was a difference among treatments in desirable stem densities. If this relatively small difference in desirables is important, then the most cost effective initial clearing method is clear or selective cutting with no herbicide treatment. However, we believe that the differences in desirable stem densities are not large enough to offset the high density of undesirables. Therefore, initial clearing treatments may be considered equal in cost effectiveness, and other considerations (e.g., site conditions, equipment availability, management objectives, etc.) can be used to form the basis for choice of treatment.

Faculty of Forestry
State University of New York
College of Environmental Science and Forestry
Syracuse, New York 13210