

RODENT GIRDLING OF VIRGINIA PINE RELATED TO AMOUNT OF GROUND COVER HERBS

J. H. Tinga and F. W. Garrett Virginia Polytechnic Institute Blacksburg, Va.

In highway landscaping for bank cover and erosion control, two species of plants were established in 1960. Virginia pine seedlings (*Pinus virginiana*) were planted bare root on 8-foot centers, and *Serecia lespedeza* was seeded at the rate of 4 pounds of seed per acre.

Methods and Materials

In the spring of 1965, several 24- to 48-inch pine trees had brown needles. On inspection, these trees showed girdling by rodents at or near the soil line. Many surface trails and holes of field or pine mice were in evidence in areas of thick ground cover.

To determine the relationship of ground cover density to pine damage, a 2-mile span



Figure 2.--Typical heavy ground cover heavily infested area showing *Pinus virginiana* with 12-inch girdle.

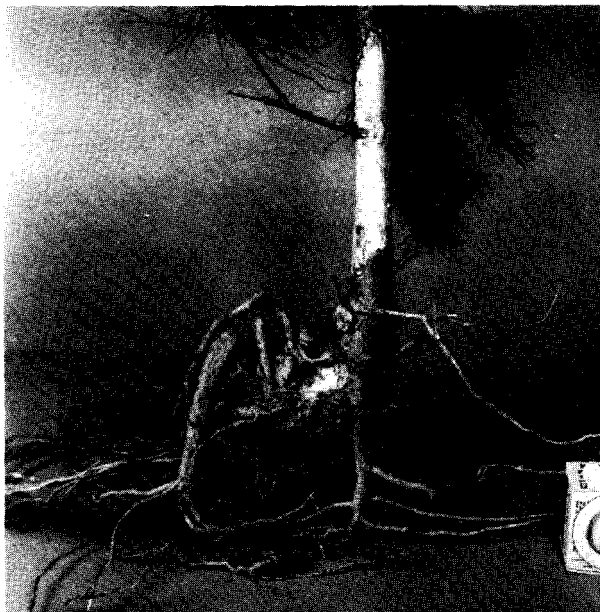


Figure 1.--*Pinus virginiana* showing 5-inch girdle starting at ground level on a 1-inch diameter 5-year-old tree.

of highway bank near Pulaski, Va., was chosen for study and observation. The bank was approximately a 100-foot slope (about 45 degree angle) of variable gravel, shale, and clay subsoil. The heavy herb cover was made up almost entirely of *Serecia lespedeza* 36 to 40 inches tall. A duff of stems and leaves had accumulated on the soil over the past 5 years. Apparently, the *Serecia lespedeza* became well established in areas of lower acidity and did not persist in the most acid soils.

Four categories of cover density were established: C₁ (0 to 25%), C₂ (25 to 50%), C₃ (50 to 75%), and C₄ (75 to 100%).

Ten trees were selected at random in each plot of uniform ground cover density. There were eight replications of each density. A total of 320 trees were examined.

In examining the trees for girdling, bark injury less than 1 inch high and less than 50%



Figure 3.--General view of area heavily damaged by rodents. Serecia lespedeza planted in combination with Pinus virginiana along Interstate 81.

of the circumference of the tree was designated a light girdle. When bark was removed from more than 50% of the circumference of the tree, it was called heavy girdling.

Results and Discussion

All trees with heavy girdling died during the spring and summer. Table 1 shows the relationship of ground cover to damage.

There was more tree injury in the heaviest ground cover, and there was a significant difference between the heavy cover, C4, and

the moderate cover, C3. There was also a significant difference in the moderate cover, C3, and the light cover, C2, but no significant difference in the light cover, C2, and the very light cover, C1.

More girdling that killed the trees occurred in the heavy ground cover. Of the 80 trees in these plots, 63 which had heavy girdling died. There was not a significant difference at the 1% level between C1, C2, and C3 in regard to heavy girdling of the bark by mice.

The entire area under investigation was excavated subsoil in 1960, when seeding and

TABLE 1.--The relation of ground cover to mouse injury to pine trees

Areas	No. of trees out of 10 by ground cover density with--							
	Any damage				Severe damage			
	C ₁	C ₂	C ₃	C ₄	C ₁	C ₂	C ₃	C ₄
1.....	0	0	1	4	0	0	0	3
2.....	0	0	0	9	0	0	0	9
3.....	0	3	1	7	0	1	1	7
4.....	0	0	1	6	0	0	1	5
5.....	0	0	2	10	0	0	2	9
6.....	0	0	9	10	0	0	9	10
7.....	0	0	2	10	0	0	2	10
8.....	0	0	3	10	0	0	2	10
Total	0	3	19	66	0	0	17	63

NOTE: Plots (areas) contain 10 trees each. 8 sampling areas of each cover type. 4 levels of cover type. 320 trees sampled. Areas selected at random over a 2-mile stretch of highway bank.

planting were done. The mice migrated from the nearby hayfields and fence rows. Most of the bank with a heavy cover became densely populated. The population density may not have pushed the mice into areas of less natural protection. Horsfall (1965a) has shown that the mice re-invade an apple orchard at a sporadic rate. A heavy infestation can develop in one small area of 6 trees. Adjoining areas are relatively free of rodents until population pressure forces the colony to expand.

Horsfall (1965b) has established that rodents demand a rather wide range of types of food. If the food is limited to two species, then one or both of these species will be eaten. If the preferred seed is completely consumed by

late winter, the rodents may eat a less desirable food, the bark of 1/2 - to 1-inch Virginia pine. In early March the sap becomes active and the cambial area becomes more succulent. If rodents are present, much girdle damage can be done in a very short time. Since the relatively small amount of fresh food is on a vital part of the tree system, the loss of a small quantity of cambium can cause death.

A mixed stand of pine and serecia is no more beneficial than a pure stand of pine, if the mixed stand is susceptible to a destructive mouse population. While inclusion of a drought-hardy legume (such as *Serecia lespedeza*) in the planting, will provide the trees with a source of organic nitrogen, releasing nitrogen fertilizer applied at planting will provide the same benefits.

Planted Virginia pine seedlings cost approximately 25 cents each. If there are 680 trees on an acre, then it costs \$170 to plant an acre, or \$170,000 to plant 1,000 acres (the scope of Interstate Highway planting).

It is important to consider such damage, as described above, to be a potential threat when heavy ground cover is provided in the landscape. Perhaps planting pine trees without a nurse crop will minimize losses caused by girdling. The money saved can be used for more planting, which will further beautify the Nation.

References

- Horsfall, F. H., Jr.
 1965 a. Pine Mouse Hazard and the Role of Herbaceous Cover as a Contributory Biological Control. Va. Polytech. Inst.
 1965 b. Pine Vole Hazard to Apple Trees and the Role of Herbaceous Cover as a Contributory Biological Control. Va. Polytech. Inst.