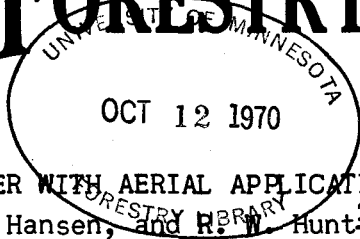


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IMPROVING THE BROWSE SUPPLY FOR DEER WITH AERIAL APPLICATIONS OF 2,4-D^{1/}
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The application of growth hormone herbicides for control of weeds, brush, and other plants is common practice. The possibility that these chemicals might prove useful tools in improving habitat for such wildlife species as the northern white-tailed deer (Odocoileus virginianus borealis Miller) has only recently been suggested. Although public and private forest land management agencies have been actively engaged in the application of herbicides to millions of acres, the results of such application on the browse available to deer has been given little attention.

Vegetational surveys on many upland forest types in Minnesota indicate a preponderance of American hazel (Corylus americana Walt.) and beaked hazel (Corylus cornuta Marsh.), which are low in deer preference, and a low ratio of preferred shrubs. This situation has likely resulted from the reproductive efficiency of these species on burned and logged-off areas and from heavy deer use. Research has demonstrated that hazel regenerates aggressively by sprouts and suckers as well as by seeds and, therefore, has an advantage over associated species. This over-abundance of hazel reduces the carrying capacity of the range.

Early basic research with ground applications of 2,4-D has demonstrated that this herbicide can reduce the population of hazel, thus increasing the proportion of the more desirable browse plants for deer. Therefore, the present study was started with two objectives in mind:

- (1) to develop an effective and relatively inexpensive technique for manipulating forest vegetation to increase the browse supply for deer, and
- (2) to measure the indirect effect of such vegetational changes on other wildlife.

The aerial applications of herbicide were made on eight two-acre plots on the Tamarac National Wildlife Refuge on July 25, 1958. The 2,4-D ethyl ester formulation was applied from a Super Cub equipped with a Whitaker Sprayer at the rate of two pounds of acid per acre in $3\frac{1}{2}$ gallons of water. Two plots were sprayed in each of four cover types: aspen, jack pine, oak and upland brush. The vegetation was tallied on the plots designated for spraying, as well as on nearby unsprayed plots in the same cover types. A total of 482 shrubs was also marked for study. Information was obtained on both woody and herbaceous plants before and after spraying. Although the conclusions reached are based on the results only one year after treatment, many of the findings are significant.

Tallies on the unsprayed plots in 1958 and 1959 indicate the mortality of woody plants was 4 percent or less for all cover types. The mortality on the sprayed plots was least under the most dense tree canopy and greatest where an overstory cover was lacking.

The data in the following table show important changes in the plant cover that are due largely to the herbicide. Differences by browse preference groups and cover types are

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striking. In this connection, it should be pointed out that the aspen and jack pine types have a continuous overstory; the oak type has a scattered overstory, and the upland brush type has only an occasional tree in the overstory. The increase in the stem population is the result of killing the original stems, followed by sprouting or suckering from the roots. The decreases are due to the killing effect which the species was unable to offset by regrowth.

From a deer browse improvement standpoint, the first year results are encouraging, since the greatest increase in the aspen and jack pine types was in the first preference group. The increase in the second preference group was also a little greater than in the less desirable species in the third group. Both the oak and upland brush types had marked decreases in number of stems with the exception of the first preference group of plants in the upland brush type. In this type, bur oak (*Quercus macrocarpa* Michx.) regrowth was responsible for the increased stem count. The mortality of low preference browse species was also heavier than of preferred species for all cover types. The mortality of the marked woody plants was also higher in the types that lacked an overstory. Observations so far indicate 2,4-D had no killing effect on the herbaceous plants. However, there was a striking increase in the density of the grasses and sedges after more light was permitted to reach the ground. The study has been under way too short a time to obtain information on the effects of the vegetational changes on other wildlife.

The extent to which aerial applications of 2,4-D will increase the browse supply for deer will depend on the species composition of the shrubs and on the density of the tree canopy. Preliminary data gathered on this study and elsewhere in Minnesota suggest that areas of 100 acres or less may be sprayed for less than \$4.00 per acre.

Table: Percent change in number of stems by browse preference groups and cover types, one year after treatment.

| Preference Group | Cover Type | | | Upland brush |
|-----------------------------|------------|-----------|-----|--------------|
| | Aspen | Jack pine | Oak | |
| Group I | +115 | +182 | -27 | +24 |
| Amelanchier canadensis | | | | |
| Cornus alternifolia | | | | |
| Cornus racemosa | | | | |
| Cornus rugosa | | | | |
| Prunus serotina | | | | |
| Prunus virginiana | | | | |
| Quercus macrocarpa | | | | |
| Viburnum Rafinesquianum | | | | |
| Group II | + 5 | + 22 | - 6 | -30 |
| Betula papyrifera | | | | |
| Lonicera dioica | | | | |
| Lonicera hirsuta | | | | |
| Pinus banksiana | | | | |
| Prunus pensylvanica | | | | |
| Quercus rubra | | | | |
| Rhus radicans | | | | |
| Rosa blanda | | | | |
| Salix humilis | | | | |
| Vaccinium canadensis | | | | |
| Group III | + 25 | + 1 | -49 | -53 |
| Corylus americana | | | | |
| Corylus cornuta | | | | |
| Crataegus spp. | | | | |
| Diervilla Lonicera | | | | |
| Ostrya virginiana | | | | |
| Pinus resinosa | | | | |
| Populus tremuloides | | | | |
| Rubus idaeus var. strigosus | | | | |
| Symphoricarpos spp. | | | | |

