ODC 451.2--149.32:907.1 + 907.2--(755)

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WOODY PLANTS selected by BEAVERS in the Appalachian Ridge and Valley Province

USDA FOREST SERVICE RESEARCH PAPER NE-346
1976

FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE
NORTHEASTERN FOREST EXPERIMENT STATION
6816 MARKET STREET, UPPER DARBY, PA. 19082

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MANUSCRIPT RECEIVED FOR PUBLICATION 17 NOVEMBER 1975

ABSTRACT

The availability of woody plants and the selection of plants by beavers along mountain streams was studied in four areas of the Appalachian Ridge and Valley Province in Virginia. Beavers' choice of woody plants varied between areas. Many species of woody plants were cut by beavers. They climbed slopes with gradients up to 80 percent to cut trees. Large as well as small trees were cut and removed for food and dam construction; however, large trees were often girdled and left standing or felled, and the bark was removed. The topography and abundance of many species of woody plants in the Ridge and Valley Province provide suitable beaver habitat in which the plant and animal variety created by beaver impoundments would add to the esthetic and recreational values of these mountain areas.

IN THE EARLIEST DAYS of this country, beaver pelts provided not only clothing, but also an important medium of exchange. Trappers searching for new sources of pelts explored most of North America. More recently, the beaver's value to man has been questioned. Waters impounded by beaver dams have flooded roads, timberland, and farm land. The effects of beaver impoundments upon trout streams have often been debated.

A new benefit of beaver is now recognized by many environmentalists and by public land managers: the beavers' ability to increase the variety of plants and animals in forest ecosystems. This is especially valuable in large expanses of uniform xeric oak communities in the eastern mountains. In these situations beavers increase recreational opportunities and esthetic interest on many acres of public land.

Nuisance beavers trapped and removed from lowland areas could be released in wooded uplands, particularly on public land —and could contribute to the recreational value of the area. However, little information is available about the suitability of such areas for restocking. Will there be suitable trees for beavers to cut for food and for dam construction? What effect does topography have on the accessibility of trees to beavers? If suitable habitat conditions are not available, would stocked animals migrate and again become a nuisance? Many studies have shown that beavers are highly dependent upon aspen for winter food. Aspen is scarce in the mountains of Virginia and West Virginia and the states to the south. What plants are utilized by beavers to meet their needs in these mountain woodlands?

We sampled the woody plants cut by beavers on four sites in the Ridge-Valley Province (*Fenneman 1938*) of western Virginia. We also estimated the availability of these plants. Our objective was to determine if beaver populations might be limited by woody plants suitable for dam-building and for winter food in mountain woodlands. Our findings might help land managers form criteria of suitability of wooded uplands for beavers.

Study Areas

Three sites with active beaver colonies were selected for study in Giles County, Virginia, near the West Virginia border; and one site was studied in Rockbridge County, Virginia. All streams on these sites were narrow, with low summer water levels, and could be waded with knee or hip boots. In contrast, in the beaver ponds, the water often came over the tops of our waders. The elevation of the streams was approximately 3,000 feet in Giles County and about 1,700 feet in Rockbridge County.

White Rocks Branch is a meandering native trout stream that had one simple beaver dam about 1 chain in length, which backed up a small pond about 2 chains long. One active beaver lodge was located on the upper end of the pond. Older beaver activity was found downstream, but no beaver cuttings were found upstream from the study site. Large red maple, black birch, yellow-poplar, white oak, and red oak made up the overstory of the flood plain and the adjacent banks. Alder, witch hazel, deciduous holly, laurel, rhododendron, greenbrier, hemlock, and other less common species made up an understory of moderate density. (Scientific names are included in table 1.)

The North Fork Drainage, another meandering native trout stream, drains an area of old beaver meadows and a woodland with a mixed overstory of mature pitch pine, red maple, white oak, black gum, sassafras, and hemlock. Among other species, mountain laurel, blueberry, rhododendron, viburnum, pepperbush, greenbrier, alder, deciduous holly, and witch hazel make up a dense understory. A complex of dams have flooded an area about 5 chains wide and 10 chains

Table 1.—Stems available and cut on four beaver study areas.[1]

Species	White Rocks Branch			North Fork Drainage			Stony Creek			Pads Creek		
	Stems available per acre	Stems cut per acre by beavers		Stems available per acre	Stems cut per acre by beavers		Stems available per acre	Stems cut per acre by beavers		Stems available per acre	Stems cut per acre by beavers	
	No.	*No.*	*Pct.*	*No.*	*No.*	*Pct.*	*No.*	*No.*	*Pct.*	*No.*	*No.*	*Pct.*
Acer rubrum—red maple	145	1	1	146	11	8	150	60	40	289	50	17
Alnus spp.—alder	561	93	16	222	7	3	2,062	45	2	—	—	—
Amelanchier spp.—serviceberry	13	1	8	65	33	51	8	0	0	292	87	30
Aronia sp.—chokeberry	—	—	—	3	0	0	—	—	—	—	—	—
Betula lenta—black birch	16	8	50	7	1	14	—	—	—	—	—	—
Betula lutea—yellow birch	3	3	100	1	0	0	—	—	—	—	—	—
Carya spp.—hickory	5	1	20	—	—	—	—	—	—	279	8	3
Cercis canadensis—redbud	—	—	—	—	—	—	—	—	—	3	0	0
Chionanthus—fringetree	—	—	—	—	—	—	—	—	—	18	0	0
Clethra acuminata—pepperbush	—	—	—	330	4	1	—	—	—	—	—	—
Cornus alternifolia—alternate-leaved dogwood	—	—	—	—	—	—	22	0	0	—	—	—
C. florida—flowering dogwood	—	—	—	9	2	22	15	0	0	321	89	28
C. stolonifera—red osier dogwood	40	0	0	—	—	—	—	—	—	—	—	—
Crataegus spp.—hawthorn	32	0	0	3	1	33	—	—	—	76	0	0
Fagus grandifolia—beech	70	2	3	—	—	—	—	—	—	—	—	—
Fraxinus spp.—ash	2	2	100	—	—	—	—	—	—	60	16	26
Hamamelis virginiana—witch hazel	275	71	26	151	48	32	120	68	56	168	76	45
Hypericum spp.—St. John's-wort	—	—	—	14	0	0	—	—	—	—	—	—
Ilex spp.—holly	117	1	1	126	8	6	—	—	—	—	—	—
Kalmia latifolia—mountain laurel	1,108	4	(*)	1,459	33	2	832	8	1	24	0	0
Lindera benzoin—spicebush	87	11	13	—	—	—	—	—	—	60	0	0
Liriodendron tulipfera—yellow-poplar	14	6	43	(*)	(*)	(*)	—	—	—	—	—	—
Nyssa sylvatica—black gum	—	—	—	99	33	33	22	8	33	11	5	50
Pieris floribunda—mountain fetterbush	—	—	—	—	—	—	—	—	—	42	0	0
Pinus rigida—pitch pine	—	—	—	67	0	0	60	0	0	—	—	—
P. strobus—white pine	—	—	—	(*)	(*)	(*)	8	0	0	26	0	0
P. virginiana—virginia pine	—	—	—	—	—	—	—	—	—	47	24	50
Populus grandidentata—bigtooth aspen	—	—	—	1	1	100	—	—	—	—	—	—
Prunus serotina—black cherry	16	12	75	30	17	57	22	0	0	—	—	—
Pyrus spp.—pear	—	—	—	29	(*)	(*)	—	—	—	—	—	—
Quercus alba—white oak	25	1	4	40	8	20	22	15	67	379	237	62
Q. montana—chestnut oak	—	—	—	—	—	—	—	—	—	8	0	0
Q. rubra—red oak	12	(*)	(*)	9	5	56	45	8	17	113	13	12
Rhododendron spp.	393	5	1	822	23	3	458	0	0	—	—	—
Robinia pseudo-acacia—black locust	—	—	—	—	—	—	—	—	—	24	0	0
Rosa spp.—rose	—	—	—	—	—	—	8	0	0	—	—	—
Rubus spp.—brambles	2	2	100	2	0	0	30	8	25	3	0	0
Salix spp.—willow	—	—	—	—	—	—	292	195	67	—	—	—
Sambucus canadensis—elderberry	—	—	—	—	—	—	38	0	0	—	—	—
Sassafras albidum—sassafras	1	1	100	74	7	9	—	—	—	58	3	4
Smilax spp.—greenbriar	572	4	1	295	1	(*)	90	0	0	316	0	0
Tsuga canadensis—hemlock	237	1	(*)	65	2	3	99	0	0	—	—	—
Ulmus spp.—elm	—	—	—	—	—	—	—	—	—	116	21	18
Vaccinium spp.—blueberry	12	0	0	1,091	6	1	68	0	0	384	0	0
Viburnum spp.—viburnum	(*)	(*)	(*)	427	20	5	1,815	195	11	18	0	0
Vitis spp.—grape	—	—	—	—	—	—	—	—	—	3	3	100

[1] Percentages are based on computation from raw data and are correct; apparent errors are due to rounding-off per-acre figures.
* Negligible.

long. Two maintained lodges were found within the study area. Older evidence of beaver activity was found upstream from the area.

Stony Creek is a meandering stream that had one dam 1½ to 2 chains long, which formed a pond about 3 chains in length. One lodge was present. Other beaver activity was found downstream. The area had a dense shrubby growth of alder, mountain laurel, rhododendron, willow, and viburnum, with a scattered overstory of mature pitch pine, red oak, hemlock, and maple.

Pads Creek in Rockbridge County is located in a narrow flood plain. A dam about ½ chain long, but over 6 feet in height, backed up a deep narrow impoundment for approximately 4 chains. One lodge was present, and the area appeared to have been used for 2 years. White oak, red oak, chestnut oak, red maple, and hickory are common mature overstory species. Serviceberry, flowering dogwood, witch hazel, greenbrier, and blueberry are common in the relatively open understory. Beaver evidence from previous years was found downstream.

All study areas were located on National Forest lands. No evidence of fire or logging for at least 40 years was found on the sites.

Methods

We sampled two areas in Giles County during March and April 1973, and the other areas in April 1974. In 1973 all stems cut by beavers within the past year were counted on the study areas. The uncut stems were censused by a series of transects 0.2 chain wide, extending from the water to the limit of the most distal tree cutting. Transects were spaced 1 chain apart, parallel to each other, throughout the area of recent cutting. In 1974, both cut and uncut stems were sampled on the transects. Cut and uncut stems were tallied in 1-inch diameter classes, at cutting height, by species. For cut stems we also recorded the distance from water and the percent of slope, whether the stems were felled or partially cut, and whether the bark was removed.

Results

Enough difference in vegetation existed between study areas to give a broad perspective of the type of vegetation found in mountain forests in western Virginia. Our results should give a fair representation of the Province without being biased to one vegetation condition.

In White Rocks Branch, beavers cut alder and witch hazel in greatest numbers (table 1) : 93 and 71 stems per acre respectively, or 16 and 26 percent of the total number of available stems of each species respectively. The percentage of available stems cut was greater for black birch (50 percent), yellow birch (100 percent), ash (100 percent), yellow-poplar (43 percent), black cherry (75 percent), brambles (100 percent), and sassafras (100 percent)—but these species were not abundant. We found no evidence that beavers cut azalea, red osier dogwood, hawthorn, or blueberry.

Twenty-two species were cut. Size of trees was not a deterrent to beavers attempting cutting; however, the number of trees actually felled decreased as tree size increased. A black birch 29 inches in diameter at cutting height and a yellow-poplar 27 inches in diameter were partially cut. Almost all trees were cut within ½ chain of the water, and overland transport of stems was minimal. Steep stream banks, up to 20 feet in length, were traversed by beavers.

In the North Fork Drainage, beavers cut more stems of witch hazel than of any other species. Witch hazel was not as abundant in the North Fork Drainage as in White Rocks Branch—151 stems per acre vs. 275—but 32 percent of the available stems were cut in North Fork. Other species cut heavily were serviceberry (51 percent), black gum (33 percent), and black cherry (57 percent) ; but these species were not as abundant as witch hazel. Only five species or species groups were not found cut on the area: chokeberry, yellow birch, St. John's-wort, and brambles, all of which were scarce; and pitch pine, which was common.

In all, 24 species or species groups were

cut, almost identical to the number for White Rocks Branch. Stems of all diameters were cut. A bigtooth aspen 20 inches in diameter at cutting height was felled and the bark was removed. The flood plain was wider in North Fork than in White Rocks, and beavers moved a maximum distance of 165 feet in North Fork to cut stems. Beavers seldom had to travel on slopes greater than 5 percent.

In Stony Creek, beavers cut viburnum and willow most often: 195 stems per acre of each or 67 percent of the relatively scarce willows and 11 percent of the abundant viburnum. Red maple, witch hazel, black gum, and white oak were relatively scarce; but beavers cut a high percentage of the stems. Alder was abundant, but only a small percentage of stems were cut. Only 10 species or species groups were found cut in this area, while no cutting was detected on 13 species. A less intensive sample of cut stems accounts for the decrease from the previously discussed areas in number of species cut. Most cutting was restricted to small stems. The distance traveled to cut stems was not greater than 100 feet, and slopes were 5 percent or less.

On Pads Creek, beavers traveled 250 feet up 65- to 80-percent slopes to cut trees, mostly Virginia pine and serviceberry. Serviceberry occurred throughout the study area, and 30 percent of the stems were cut. Virginia pine was largely restricted to the upper limits of the steep slope located on one side of the stream, and here half of the available stems were cut. White oak occurred commonly on the flood plain and to a lesser degree on the slopes. Sixty percent of these stems were cut. Beavers cut more white oak than any other species. Twenty-eight percent of the abundant flowering dogwood stems, 45 percent of the less common witch hazel, and 26 percent of the 60 ash stems per acre were cut. Our samples indicated cutting of 16 species and no cutting of 13 other species or species groups.

Figure 1.—Beavers often selected white oak in preference to other species.

Discussion

In the Ridge-Valley Physiographic Province, mountain streams having flood plains with at least a slight meander in oak-pine and mixed hardwood types contain an adequate supply of woody plants suitable for beavers. Steep slopes at streamsides do not preclude use of an area and may enhance utilization of distant stems.

Beavers' choice of woody plants to cut seems to be quite flexible. In one area alder was important and moderately abundant; but in another area, where it was four or five times more abundant, it was cut at half the intensity while willow, even though less abundant than alder, was cut intensively. Cutting of witch hazel was common in all areas, ranging from 48 to 76 stems cut per acre. Where viburnum was abundant, it was cut in considerable numbers, but it was not a species that beavers commonly selected to the exclusion of others. However, white oak (fig. 1) could be considered as a species chosen to the exclusion of other species. Red maple was cut heavily on two areas and cut lightly on the other areas. This difference was not uniformly influenced by the availability of stems. Serviceberry was cut heavily in proportion to the available stems on two of the three areas where it occurred.

The heavy utilization of pine on a steep

slope destroyed some previously accepted ideas about beavers not cutting pine and the steepness of slopes climbed to cut trees (*McDonald 1956*). Apparently the ease of transporting cut stems a considerable distance down a slope offset any difficulty encountered in climbing the slopes (fig. 2). Such abundant plants as blueberry, greenbrier, mountain laurel, and rhododendron were seldom cut.

The greatest distance traveled from water to cut a tree in this study was 250 feet on a 70- to 80-percent slope. Stegeman (*1954*) found that 250 feet was normal distance traveled on the Huntington forest in New York. Swank (*1949*) found in a West Virginia study that the greatest distance traveled to cut a tree was 260 feet on a 40-percent slope.

Figure 2.—Steepness of slope was not a deterrent to beavers. They easily transported stems down steep slopes.

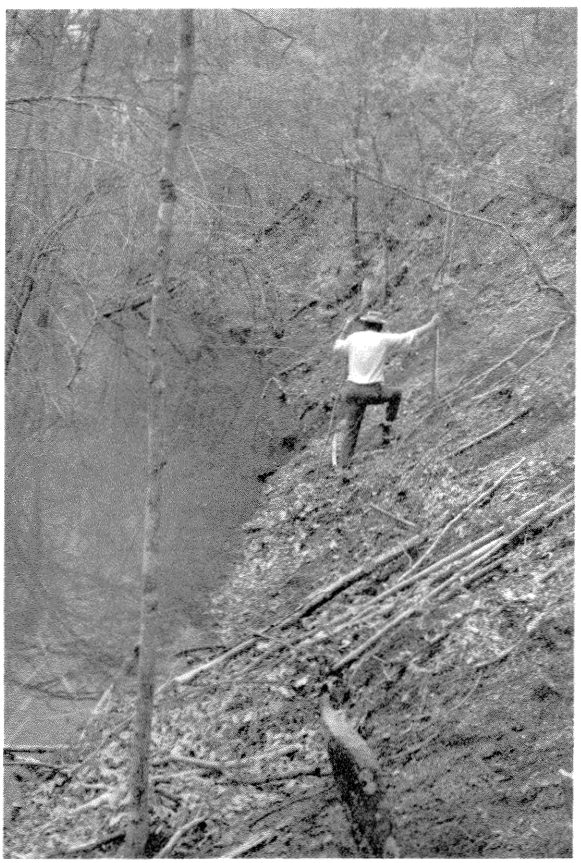

Figure 3.—Many standing trees were girdled as high as the beavers could reach.

Beavers cut both large and small trees. Standing large trees often were girdled as high as the animals could reach (fig. 3). Other large trees were felled, and the bark was removed from the bole. Though boles of large trees could not be transported to the water for use in dam-building, they did provide food throughout the winter. The branches of these trees were usually cut and removed. Thus areas with large trees are potentially valuable habitats for beaver.

The Ridge and Valley Province of Virginia and West Virginia—and probably Pennsylvania as well—seems to offer suitable habitat for beavers. All of this habitat has not been reoccupied by beavers, and it offers potential for accommodating nuisance beavers that cause damage in lowland areas.

The trellis drainage pattern found in the Ridge and Valley Province offers topography suitable for beaver impoundments; stream gradients are generally gentle, and flood plains have formed in the valley. Streamside slopes are often steep, but do not present a barrier to beavers. Beavers are not dependent on one or two woody plants species for winter food or dam-building, but utilize

several species of the abundant variety of woody plants.

Potential for beaver damage exists in the Ridge and Valley Province where beavers are reintroduced or move into agricultural areas, or where tree cutting or flooding is detrimental. However, loss of trees on public land could well be offset by increases in esthetic and recreational values, fostered by the increased variety of plants and animals around beaver impoundments and in the meadows formed after dams are abandoned and drained.

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