

**DISTRIBUTION OF THE BEAVER
OF MONTGOMERY COUNTY, TENNESSEE,
WITH NOTES ON FOREST UTILIZATION**

BY

LARRY RAY RICHARDSON

DISTRIBUTION OF THE BEAVER OF MONTGOMERY COUNTY, TENNESSEE,
WITH NOTES ON FOREST UTILIZATION

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by
Larry Ray Richardson

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To the Graduate Council:

I am submitting herewith a Research Paper written by
Larry Ray Richardson entitled "Distribution of the Beaver in Montgomery
County, Tennessee, With Notes on Forest Utilization." I recommend
that it be accepted in partial fulfillment of the requirements for
the degree of Master of Science, with a major in Biology.

Marvin M. Proers

Major Professor

Accepted for the Council:

Wayne E. Shantz

Dean of the Graduate School

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CHAPTER I

INTRODUCTION

Few studies of the beaver (Castor canadensis Kuhl.) have been made in Tennessee and there is very little literature concerning populations occurring in Montgomery County. In the latest publication, Shultz (1954) reported that several Montgomery Countians had sighted the animals or their signs.

Beavers were almost exterminated in the Southeast during the nineteenth century. Writings in the early twentieth century indicate that beavers were extinct or nearly so in Tennessee. Probably, trapping and unlimited killing created this drastic reduction. In the past two decades, the beavers of Montgomery County, Tennessee, have become re-established in suitable waterways and certain accessible impoundments. Although these animals are well distributed, it was noted that during this survey many persons who frequented the waterways of the county were not aware of the beaver's presence.

This study has been made to determine the extent of beaver activity in Montgomery County by surveying, as thoroughly as possible, all potentially habitable waters within the county's boundary. A record of distribution and certain habits of the beaver were ascertained. Also, an evaluation of beaver-forest relationships was made by determining the preference of woody plants utilized in the winter and spring and by calculating a value index.

It is hoped that this work will be beneficial in determining the status of the beaver and its management in Tennessee. It is

intended that this paper will be an aid to future investigators who wish to use the data in similar studies.

CHAPTER II

METHODS

Suitable beaver habitat was examined on foot and by boat from November 1969 to May 1970. Observations were made along streams at intervals to determine the extent of distribution. Some streams were surveyed their entire length. The presence of beaver was verified by tracks, utilized trees, lodges, bank dens and dams.

Areas where extensive activity was noted were selected for a beaver-forest utilization study. Thirty tenth-acre plots measuring 0.5 chain by 4.0 chains were selected along these locations. All woody plants within the plots with diameters greater than one inch at breast height (dbh) were recorded. Any stem greater than this diameter which had been barked (gnawed) or felled was considered utilized and recorded as such.

The method used by Chabreck (1958) was employed to establish an indicative utilization value for woody plants. The percentage of occurrence was calculated for each species by dividing the total number of each species by the total of all species recorded. The percentage of utilization was expressed by dividing the number of each species which had been used by the total number recorded for that species.

To determine the value of each species, these two percentages were multiplied (occurrence X utilization) to give a value index. For example, Celtis spp. accounted for 11.8% of all species and 60.2% of that species was utilized. Therefore, the value index was

the product 710. By using this method, a species ranking high in quantity and low in utilization was approximately equivalent to a species with low quantity and high utilization.

CHAPTER III

RESULTS

The results of the observations indicate that Montgomery County has a widespread beaver population. Beavers or their signs were seen on every major river and creek. At least three lakes are known to support beavers: Lake Taal, Ft. Campbell; Clarksville Lake, two miles south of Woodlawn; Haynes Lake, one mile east of Dotsonville. The animals were seldom observed because they are nocturnal in colder months. However, a few were observed in late morning and early afternoon as the weather became warmer.

Many felled trees were observed, but very few lodges and dams had been constructed. The majority of Montgomery County's beavers live in bank dens. Lodges were found in Marshall's Creek, Spring Creek and Haynes Lake. One lodge was located in each creek; three were noted in Haynes Lake.

The extent of distribution in Montgomery County's waterways is shown in Figure 1. Shaded areas on the map indicate beaver distribution. Although each stream was not surveyed in its entirety, it was assumed that if signs were found upstream, then beaver also occurred at other points downstream. Therefore, more time was spent surveying the headwaters to determine the extent of distribution. The entire lengths of the Cumberland River (Lake Barkley), Red River, Big West Fork Creek and Ringgold Creek contained in the county's boundary were surveyed. The signs most often recorded were barked or felled trees.

This indicated that beaver had ranged in the territory, even though they may have had a den or lodge elsewhere.

During high water in January, April, and May beavers utilized bark as high as ten feet above ground level. This was evident after the water level had returned to normal. The usual height for cutting was within approximately two feet above ground level. These high cuttings were not uncommon since they have been reported by Mills (1913), Warren (1927) and others.

The forest utilization data revealed that beavers preferred Celtis spp. and Acer spp. most often. However, the absence of these species in some localities did not discourage utilization of other species. The results of the forest utilization examination of Montgomery County are shown in Table I. The percentages were rounded off to the nearest tenth per cent before the value index was ascertained.

Beavers had felled or barked 37% of the 1,920 woody plants over one inch d.b.h. in the three acres examined. A total of 34 woody species exceeding the minimum diameter were recorded. Twenty-five were utilized. The following species were present but were not barked or felled: honey locust, Gleditsia triacanthos; black walnut, Juglans nigra; mossy locust, Robinia hispida; redbud, Cercis canadensis; black gum, Nyssa sylvatica; smooth summac, Rhus glabra; osage orange, Maclura pomifera; black cherry, Prunus serotina; and white basswood, Tilia heterophylla. These plants accounted for approximately 2.0% of all vegetation on the study areas.

Table 1

Woody Plants used by Beaver in
Montgomery County, Tennessee

| Woody Plant Species* | Percentage Availability | Percentage Utilization | Value Index |
|--|----------------------------|---------------------------|----------------|
| Sugarberry-Hackberry <u>Celtis spp.</u> | 11.8 | 60.2 | 710 |
| Box Elder <u>Acer negundo</u> | 17.7 | 29.7 | 526 |
| Sugar Maple <u>Acer saccharum</u> | 4.9 | 67.4 | 330 |
| Elm <u>Ulmus sp.</u> | 11.5 | 27.6 | 317 |
| Ash <u>Fraxinus sp.</u> | 6.8 | 46.2 | 314 |
| Silver Maple <u>Acer saccharinum</u> | 17.3 | 17.5 | 303 |
| Black Willow <u>Salix nigra</u> | 4.4 | 64.3 | 283 |
| River Birch <u>Betula nigra</u> | 2.8 | 52.8 | 148 |
| Blue Beech <u>Carpinus caroliniana</u> | 3.0 | 34.5 | 104 |
| Sassafras <u>Sassafras albidum</u> | 2.4 | 33.3 | 80 |
| Wild Grape <u>Vitis sp.</u> | 1.6 | 50.0 | 80 |
| Sycamore <u>Platanus occidentalis</u> | 4.1 | 19.2 | 79 |
| Spicebush <u>Lindera benzoin</u> | .7 | 57.0 | 40 |
| Sweetgum <u>Liquidambar styraciflua</u> | .6 | 50.0 | 30 |

Table 1 (continued)

| Woody Plant Species* | Percentage Availability | Percentage Utilization | Value Index |
|---|----------------------------|---------------------------|----------------|
| Mulberry <u>Morus sp.</u> | .9 | 29.4 | 27 |
| Red Maple <u>Acer rubrum</u> | .5 | 50.0 | 25 |
| Oak <u>Quercus sp.</u> | .9 | 22.2 | 20 |
| Hickory <u>Carya sp.</u> | 1.4 | 7.4 | 10 |
| Persimmon <u>Diosporus virginiana</u> | .1 | 100.0 | 10 |
| American Beech <u>Fagus Grandifolia</u> | .1 | 100.0 | 10 |
| Red Cedar <u>Juniperus virginiana</u> | .3 | 33.3 | 10 |
| Pawpaw <u>Asymina triloba</u> | .5 | 11.1 | 6 |
| Hop Hornbeam <u>Ostrya virginiana</u> | .3 | 16.7 | 5 |
| Southern Black Haw <u>Viburnum rufidulum</u> | .5 | 10.0 | 5 |

*According to Fernald, M. L. 1950. Gray's manual of botany. 8th ed.
American Book Co. N. Y. 1632p.

CHAPTER IV

DISCUSSION AND CONCLUSIONS

The survey of Montgomery County's waterways indicates that beavers are regaining much of their former territory. Ganier (1926) reported that no beaver had been in Middle Tennessee "in a generation." Caldwell et al. (1947) reported that beavers were extinct by 1884 in middle Tennessee, with last reports coming from Wayne County.

In 1954, Shultz published a status report on the beaver and otter in Tennessee. Using the results of a state-wide wildlife survey, he reported the beaver as inhabiting Yellow Creek and the Sailor's Rest areas of western Montgomery County. Also, Elk Fork Creek and the Red River in Robertson County, the Tharpe community in eastern Stewart County and Grices Creek in northeast Houston County were mentioned as being inhabited by beaver. These areas are near Montgomery County.

The beavers in Montgomery County are presently distributed on the Cumberland and Red Rivers and all major streams. If beaver were exterminated in the county, they probably re-entered by way of the Cumberland and Red Rivers. All streams are tributaries of these rivers. Shultz (1954) also indicates that re-establishment of colonies could have occurred via the Cumberland River from Kentucky.

Another factor in the beaver's extended range is the impoundment of the Cumberland River in 1965. The creation of Barkley Lake provided the beaver with a more stable water level and an increased shoreline. The increased level did not increase the habitable shoreline in all instances. Farming practices have cleared much of the land

on the river shores, thus, leaving little or no suitable woody vegetation. This factor plus the raised water level may have influenced many animals to migrate up the river's tributaries which contained some of the increased shoreline. Also, the extension of the beaver's range locally is probably due to the adult habit of expelling the two-year-olds from the colony.

Beaver have repopulated much of their original territory because of reduced harvesting and transplanting procedures by state game agencies (Arner et al., 1967). The U. S. Department of Commerce reported in 1966 that the beaver harvest in the United States, formerly in the millions, totaled approximately 250,000 (Johnson, 1967). The popularity of beaver-skin garments has led to a decrease in the value of pelts and the harvest has dropped in direct proportion to the demand. The demand of beaver for human consumption seems not to have endangered the species. Although Johnson (1967), Arner (1964) and others mentioned that the beaver is sometimes used for food, over 200 Montgomery County residents questioned had never heard of this practice.

This study did not include a population census because accurate estimates of population density are difficult to obtain in areas where there is wide-spread use of bank dens. The most accurate estimations can be made where lodges and food caches occur. Hay (1958) mentions the advantages of an aerial survey of food caches in the Rocky Mountains but points out the difficulty of such a method in flood plains. This is because there is usually a lack of caches and lodges and because of the presence of bank dens. Baily (1954) concluded from a census in West Virginia that an index of 5.3 beaver

per colony could be used allowing an additional 20 per cent for bank inhabitants. A colony (Bradt, 1938) is a group of beaver occupying a pond or stretch of stream in common, utilizing a common food supply and maintaining a common dam or dams. A "typical" colony consists of a family: two parents, yearlings and kits. Although the presence of lodges are often used as indications of one colony, Hay (1958) maintains that one colony may use several lodges.

Only five lodges were observed in this examination of Montgomery County: three in Haynes Lake, three miles east of Dotsonville; one in Marshall's Creek near the former Lock C on the Cumberland River; one in Spring Creek, one mile north of the Tennessee-Kentucky border. Even if there was a valid index for lodges in this region a census based on this criterion would not be reliable because of the scarcity of lodges.

Lodges are usually built behind beaver dams in resultant ponds and often are found in man-made impoundments. All five lodges observed were in this category. One dam was observed which did not have a lodge in its backwater. The dam was located on the East Fork of Yellow Creek. A large bank den was present just behind the dam. All dams were destroyed by a flood in early January, 1970.

Lawrence (1952) states that the longer the beaver are in an area, the more extensive becomes the chain of ponds and cuttings. The lack of dams on Montgomery County streams may indicate a relatively recent arrival of beaver in headwater areas which can be dammed. Arner et al., (1967) found that only 29% of the dams in Mississippi had been constructed on year-round streams. The remainder were located on intermittent streams or seepage areas. In many locations,

migration may be indicated by recent or one and two year old cuttings where older cuttings are not found.

Increased concern by land owners may occur if beaver become more prevalent in Montgomery County. In some areas of the county, widespread cutting is already evident, but the majority of damage to trees in the South by beaver is a result of flooding from dams rather than by cutting (Arner, 1964). Damage to agricultural crops is possible, also. There was one report (Sawyer, 1970) that in 1969, beaver dug canals into a corn field and ate some of the crop which bordered Spring Creek.

The beaver selects food and building materials that are near the shore. In this survey, the greatest distance traveled which was verified by cuttings was approximately 50 yards away from water. Bradt (1938) states that they may go as far as 215 yards in search of plants. Canals are often constructed leading into forests and meadows. These passages provide a safe avenue for obtaining food and building materials. The only canals observed were on Spring Creek, north of the Kentucky border and Fletcher's Fork Creek on the Fort Campbell Military Reservation. In many localities, high banks prevent canal digging.

Beaver utilize a variety of herbaceous and woody plants. During the summer months, herbaceous root and leaf material is the main diet (Davis, 1970). This study did not extend through the summer months; therefore, a comparison of local plants was not made.

Woody flora is the major constituent of the beaver's diet during winter at this latitude. The outer bark is peeled from trees and shrubs in order to obtain the softer cambium. Not all trees can be

counted as food species because some are used only as building materials.

The species which may be utilized varies in different locations. Trippensee (1953) lists aspen and cottonwood as being the preferred winter food, as does Mills (1913), Townsend (1953), Warren (1927) and Bradt (1938). Willow, ash and maple are listed as second choices. Along the Wisconsin River, cottonwood, ash, box elder, and willow are cut where aspen is scarce (Ellarson and Hickey, 1952). In the Southeast where aspen is absent, sweetgum, pine and ash are often prime selections (Martin et al., 1951). Although conifers are used for building materials in the northern and western states, they are used for food only in emergencies (Mills, 1913). In a Louisiana study, Chabreck (1958) found that loblolly pine, Pinus taeda, and spruce pine, P. glabra, were two of the most preferred trees. In Montgomery County, red cedar, Juniperus virginiana was the only conifer utilized by beaver. It had a low value index of ten.

The winter forest utilization study of Montgomery County indicated that hackberry-sugarberry, Celtis spp., had the greatest value index (710). Box elder, Acer negundo, was second (526) followed by sugar maple, A. saccharum (330), elm, Ulmus sp. (317), ash, Fraxinus sp. (314) and silver maple, A. saccharinum (303). These species accounted for 70 per cent of all the recorded woody flora. A similar study in Louisiana (Chabreck, 1958) resulted in the following value indices: loblolly pine, Pinus taeda (2345), sweetgum, Liquidambar styraciflua (433), spruce pine, P. glabra (391), bald cypress, Taxodium distichum (280), southern sweetbay, Magnolia virginiana (174) and tupelo gum, Nyssa aquatica (142). Besides sweetgum, the following which occurred in Louisiana were also utilized

in Montgomery County: blue beech, Carpinus caroliniana (87), ash, Fraxinus sp. (81), oak, Quercus sp. (71), black willow, Salix nigra (22) and red maple, Acer rubrum (7).

Willow, Salix sp. and cottonwood, Populus sp., which ranked high in other studies, placed seventh and eighth, respectively, in Montgomery County. Wherever these two species were present, the per cent of utilization was high. However, their availability was comparatively low. This is probably due to permanent flooding of the original Cumberland River and adjacent tributary banks where remnants of these two species exist at higher elevations.

Beavers had felled 441 and barked 267 of the 1,920 trees counted. Approximately 89% of those felled were less than five inches d.b.h. There were 1,307 plants which were less than five inches d.b.h. Only 4.5% of all utilized flora was greater than 15 inches in diameter. Warren (1927) found that the greatest number of trees felled by beaver were eight inches or less. Mills (1913) contends that beaver prefer trees less than six inches in diameter. Chabreck (1958) did not observe any utilized trees over five inches and only 18% of the trees examined in Louisiana were felled.

Two of the five species most important to beaver in Montgomery County are also valued commercially. Sugar maple and ash are valued as lumber; however, their percentage of availability ranked low with other bottomland and stream bank species.

It is believed by the author that at this time beaver are not a liability in Montgomery County. Their activity over a long period has not resulted in the destruction of valuable timber and flooding due to damming. Crop damage has been negligible.

It should be emphasized that beavers are an asset in most cases. Dams and the subsequent ponds are beneficial to other furbearers such as muskrat and mink. A wide variety of natural foods, roosting, nesting and rearing sites attract wood ducks to beaver ponds. Eugene Hester, noted authority on wood ducks, advocates management of beaver ponds for an increase in production (Davis, 1970). The management of beaver swamps creates a better dabbling duck habitat than man-made ponds (Johnson, 1967). Beaver pools improve the carrying capacity by increasing fertility, thus, better growths of primary producers such as algae and plankton are created (Hanson and Campbell, 1963). Studies by Arner (1963) in central Alabama demonstrated that plants such as Japanese millet, Echinochloa crusgalli var. frumentacea could be economically grown in beaver ponds to enhance inhabitation by ducks.

Warm-water game fish are more common in beaver ponds than feeder streams (Arner et al., 1967). A year-round water and food supply are provided by beaver ponds. Beaver are detrimental to trout in cases where the water temperature is raised due to slowing of the current by damming. Trout are stocked in McAdoo Creek, Piney Fork Creek, Little West Fork, Fletcher's Fork Creek and Jordan Creek. Further study is recommended to determine the effects of beaver dams on the put-and-take stocking program in Montgomery County.

Johnson (1967) states that perhaps the most important role of the beaver is as conservators of topsoil. Silt is trapped on smaller streams by dams and prevented from filling larger streams. Thus, beaver dams accomplish the same results as the Soil Conservation Service water shed programs. Beaver impoundments also improve

wildlife and fish habitat whereas S.C.S. programs often conflict with these interests.

The presence of beaver in Montgomery County requires further study before definite management procedures can be prescribed. It is the opinion of the writer that their habits have not appreciatively altered the forest communities. The low percentage of utilized woody flora and the high percentage of plants less than five inches d.b.h. recorded in selected areas of known activity support this observation. Valuable species were not selected in great numbers by the beaver.

It is hoped that those who seek to eradicate our largest rodent because of misunderstood values and shortsighted goals will keep in mind that the beaver can be feasibly controlled. After all, the species is recovering from near extirpation in this area.

CHAPTER V

SUMMARY

A study of Montgomery County, Tennessee's streams and certain impoundments was conducted from November 1969 through May 1970. Selected locations in and near these waterways were observed from the presence of beaver. Signs such as cuttings on woody plants, tracks, lodges, bank dens and dams were used as criteria for establishing their existence in an area.

The avenue of entry for the beaver into Montgomery County is the Cumberland River (Lake Barkley). Every major tributary supports beaver colonies to some extent. In some cases, the beavers have ranged several miles upstream. A few large lakes connected to the river or its tributaries also support beaver colonies. It is evident that beavers are increasing their range in Montgomery County. There appears to be a general movement upstream in most habitable waters.

Several areas throughout the county were surveyed extensively to determine the major woody plants utilized by beaver. An examination of 30 one-tenth acre plots shows that sugarberry-hackberry, maple, elm and ash were utilized most often. It was observed that damage to the forest by beaver was negligible.

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