Beaver Food Utilization Studies
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BEAVER FOOD UTILIZATION STUDIES

Shaler E. Aldous

The quest for beaver fur in the northern part of the United States and Canada was largely responsible for the early exploration of this territory. Today the beaver populations are much reduced, not only because of past trapping activities but also because of restriction by lumbering and farming operations of areas where the animals can maintain themselves. This north country still contains millions of acres, however, that are suitable for beaver habitation, and under present trapping laws and closed seasons the animals are gradually increasing.

As to the future, it is not unreasonable to visualize the beaver as one of the most valuable natural resources of the region. Good management will be needed to maintain this resource on a permanent basis. Two of the things we need to know to make a success of management are how many beaver can be supported on the food and water available and how we can manage these resources so that they will meet the needs of the animals.

In order to improve the basis for management, the writer in the fall of 1936 began a study of beavers in relation to the forest with the view of finding answers to the following questions:

1. What is the relative importance of the various food species and their size classes to the beaver?

2. What percentage of the trees cut by beavers are utilized and what proportion of the food available from them is actually consumed?

3. Considered as a standard ration how much of the best food do beaver require daily?

From the findings of such studies, it seemed that methods of estimating carrying capacity of beaver sites now occupied and of potential sites could be determined and that anyone contemplating beaver farming involving the artificial feeding of beavers could appraise available food in terms of beaver years.

The study was begun by having a group of CCC enrollees at the Superior Branch of the Lake States Forest Experiment Station, Ely, Minnesota, peel the bark and cut the twigs from a series of 74 aspens, 1–7 inches in diameter. The bark of each tree and its divisions down to branches ½ inch in diameter was peeled and weighed. The twigs less than ½ inch in thickness were then cut off and weighed separately and this amount added to the bark weight gave the total beaver food available. Use of the ½ inch diameter criterion in segregating twigs and bark was justified by observations that under normal conditions beavers will eat entire most twigs up to ½ inch in thickness. The figures obtained from these peeling experiments were worked up under two classifications: (1) inch classes based on outside stump diameter, and (2) those based on diameter breast high (d.b.h.). It seemed that both sets of figures might be needed to meet the varied requirements of foresters, wildlife managers, and research men. All timber cruising is done on a d.b.h.

basis and the forester needs this scale for interpretation. The wildlife manager and research man will often be working at occupied dams where stumps only are left, and the stump-diameter scale must be used.

Field studies had indicated that the greatest waste by beavers was in the larger diameter classes, where only the tops were utilized. A series of these trees, therefore, was cut and only the branches and the tops down to 3, 4, 5, and 6 inch diameters were peeled so that the waste factor could be determined. The proportion of twigs to bark of the upper trunk and branches of these larger trees was determined and that figure applied to trees of smaller diameters when the bark of the lower trunk was not utilized.

These latter figures will be of little use to the forester or wildlife manager; they are primarily for the research worker who is attempting to establish a utilization factor for colleagues in appraisal and management work.

Figure 1 shows curves by which the size classes of aspen can be appraised in ounces of available food. Ounces rather than pounds are used for greater accuracy. Figure 2 is the curve for determining according to diameter at the upper cut the food available from the tops of trees when the bark of the lower trunk is not eaten.

The next step in the study was to determine actual utilization and waste in relation to the available supply of aspen at occupied beaver ponds. In the fall of 1936 the cut stumps and logs around five beaver dams were spotted with a durable red paint so that when the survey in the fall of 1937 came to be made, only trees cut in the elapsed year would be measured. At each of these 5 sites every tree cut by beavers in that period was measured at the stump and note made of its utilization. Degrees of utilization were recorded as, completely used, partially used, and completely wasted. For the trees of the middle category a measurement was recorded of the diameter of the top where it was cut. With these figures it was possible to apply the curves of Figures 1 and 2 and estimate the quantity of food available from the trees that had been cut and also to determine the amount actually utilized. Table 1 gives the degrees of utilization of aspen and birch at these five dams. The term utilization is here used in a broad sense. Any trees or their parts removed from the immediate vicinity of cutting, regardless of ultimate disposition, were considered utilized. The material may have been eaten, used in dam or house construction, or lost in transport.

Applying the curves in Figures 1 and

TABLE 1

THE DEGREE OF UTILIZATION OF ASPEN AND BIRCH CUT BY BEAVERS AT FIVE DAMS IN THE SUPERIOR NATIONAL FOREST, FALL 1937

Species	Number of trees cut	Completely used		Partially used		Completely wasted	
		Number	Per cent	Number	Per cent	Number	Per cent
Aspen	456	122	27	200	44	134	29
White birch	32	5	16	20	62	7	22

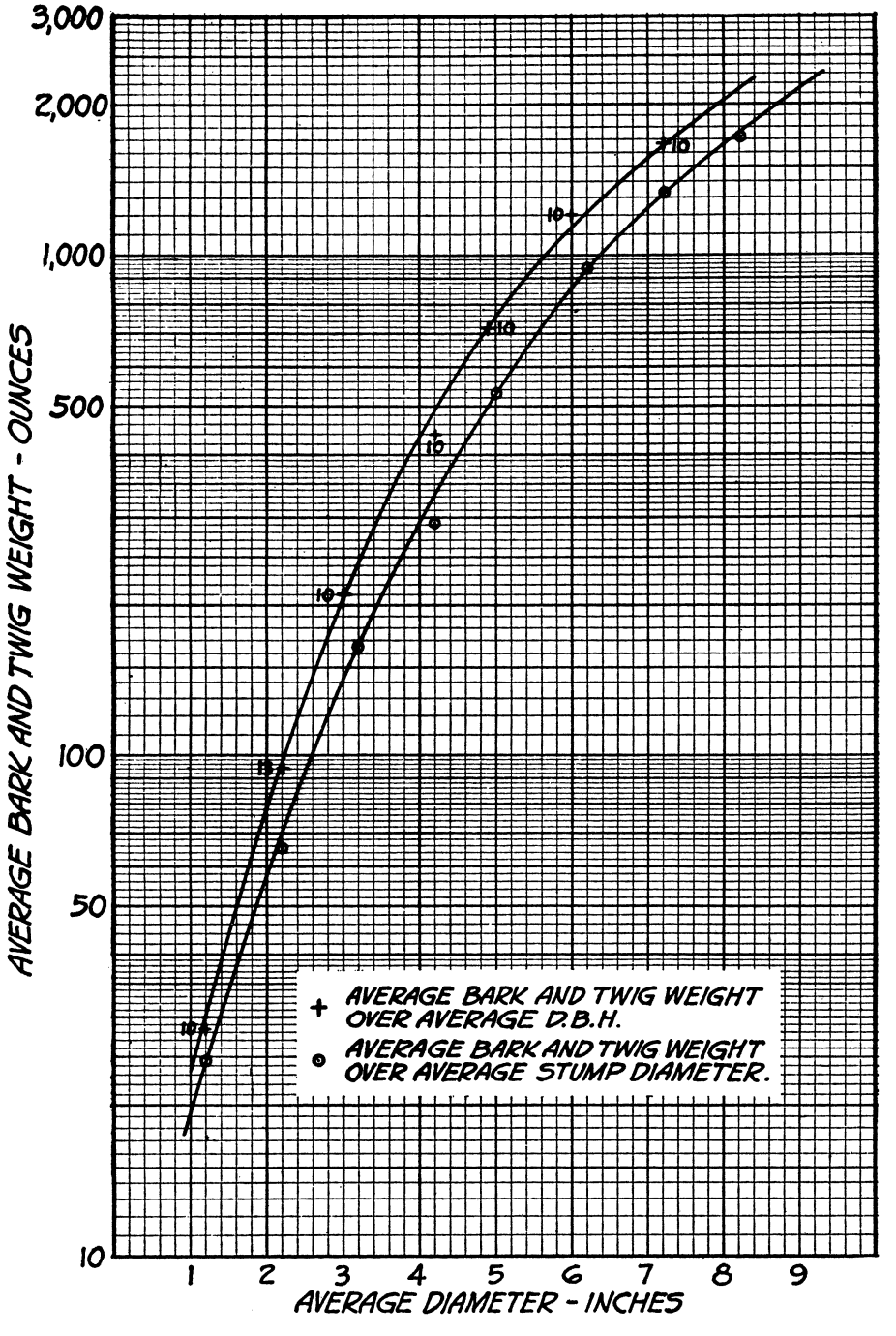


Fig. 1. Curves for computing the weight of bark and twigs from aspen trees of various diameters.

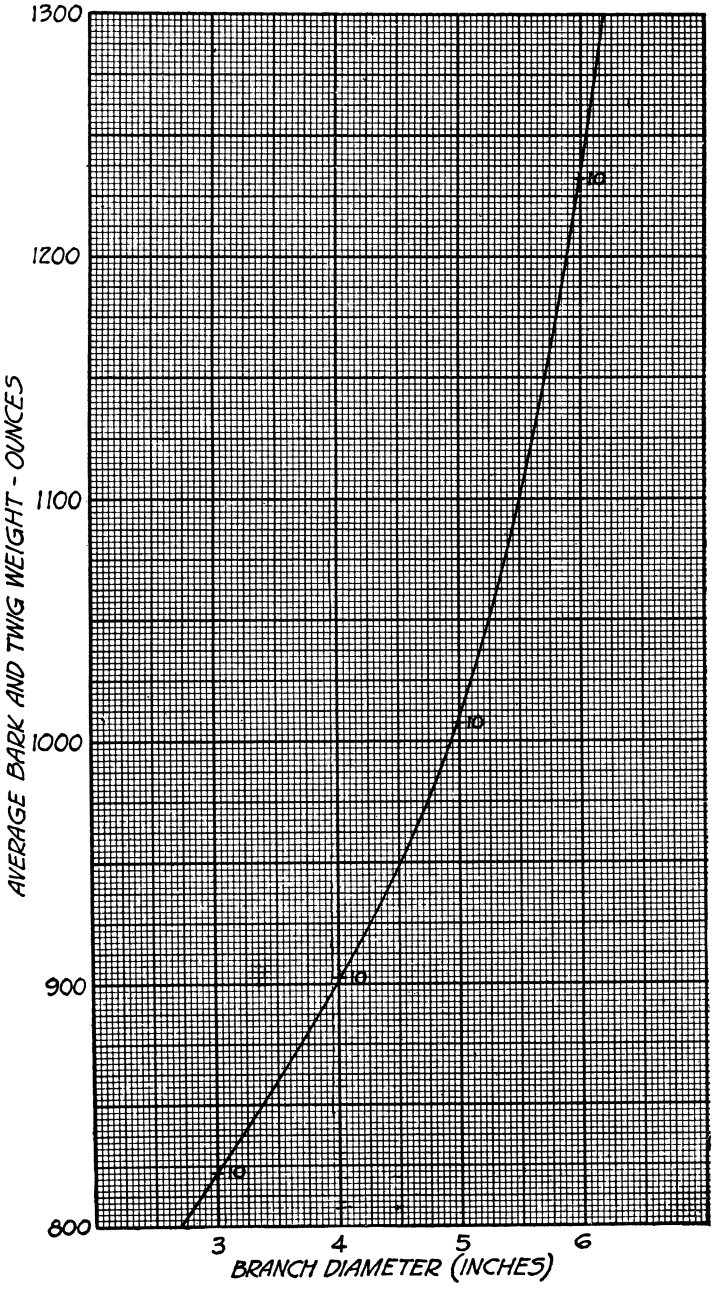


Fig. 2. Curve for computing the weight of bark and twigs from the tops of aspen trees according to the diameter at the upper cut when the bark of the lower trunk is not eaten.

2 to the 456 aspens cut at these five dams, it is estimated that they comprised a potential total of 19,420 pounds of food of which only 6,987 pounds or 36% was actually utilized. Bailey (1) estimated a 50% wastage by beavers at times but the present figures show that about 64% by weight was wasted. The greater part of the trees that were completely wasted were

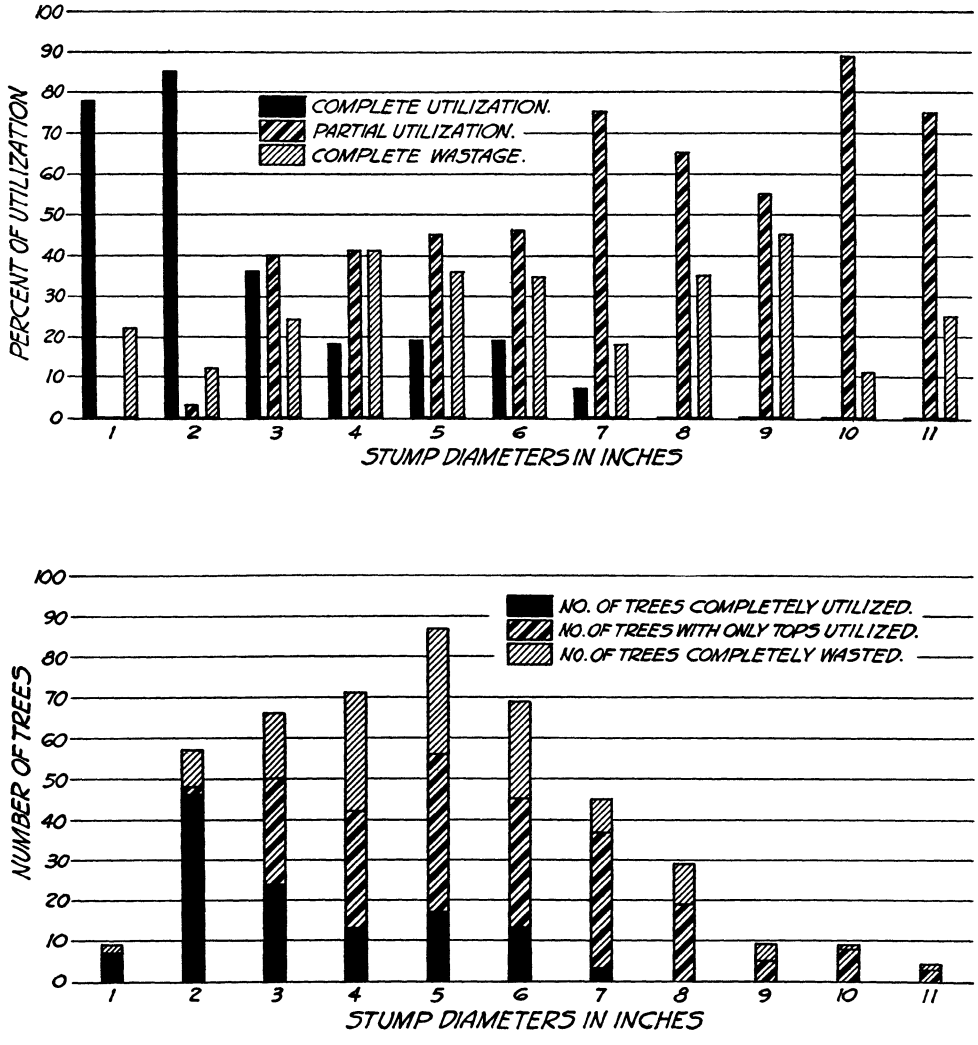


Fig. 3. The utilization of aspen by beavers.

A (*lower*). The bars represent the total number of trees in each diameter class that were cut by the beavers at five dams.

B (*upper*). The bars represent the percentage of trees variously utilized in the different diameter classes.

those lodged in falling after being cut. Other trees in dense timber and rock ledges are the usual obstacles keeping cut trees from falling within reach of the animals.

The bar-graphs (Figs. 3-A and 3-B) show the number of trees and the percentage of utilization in each stump diameter class of the 456 aspen trees that were cut at the dams studied. It will be noted that the greatest proportion of complete wastage was in trees 4 to 6 inches in diameter; beyond 9 inches there was seldom complete wastage. This is due to the failure of the lighter trees to crash through surrounding growth as do the larger ones, and the resultant high frequency of lodging.

The greatest total wastage, however, was not in lodged trees but in those of which only the tops were utilized (Pl. 22). This wastage occurs mostly in the larger trees and its degree seemed to be governed mainly by distance from the water and lay of the land.

There was a decided trend toward a greater percentage of total utilization of the available food in the 1, 2, and 3 inch stump diameter classes, but the quantity produced was small in comparison with that obtainable from the larger trees even though the latter were only partially used. For example: a 7 inch tree, 50% utilized, will provide approximately the same quantity of food as four 3 inch trees completely utilized. Because the beavers prefer the small twigs, and the bark of branches to that of the trunk, and because the ratio of top to trunk is greater in the larger diameter classes, there is more choice food available even though there is also a greater actual waste. The larger trees were used for the most part only after the smaller ones were gone, and in most cases were cut at dams that have been in existence for several years.

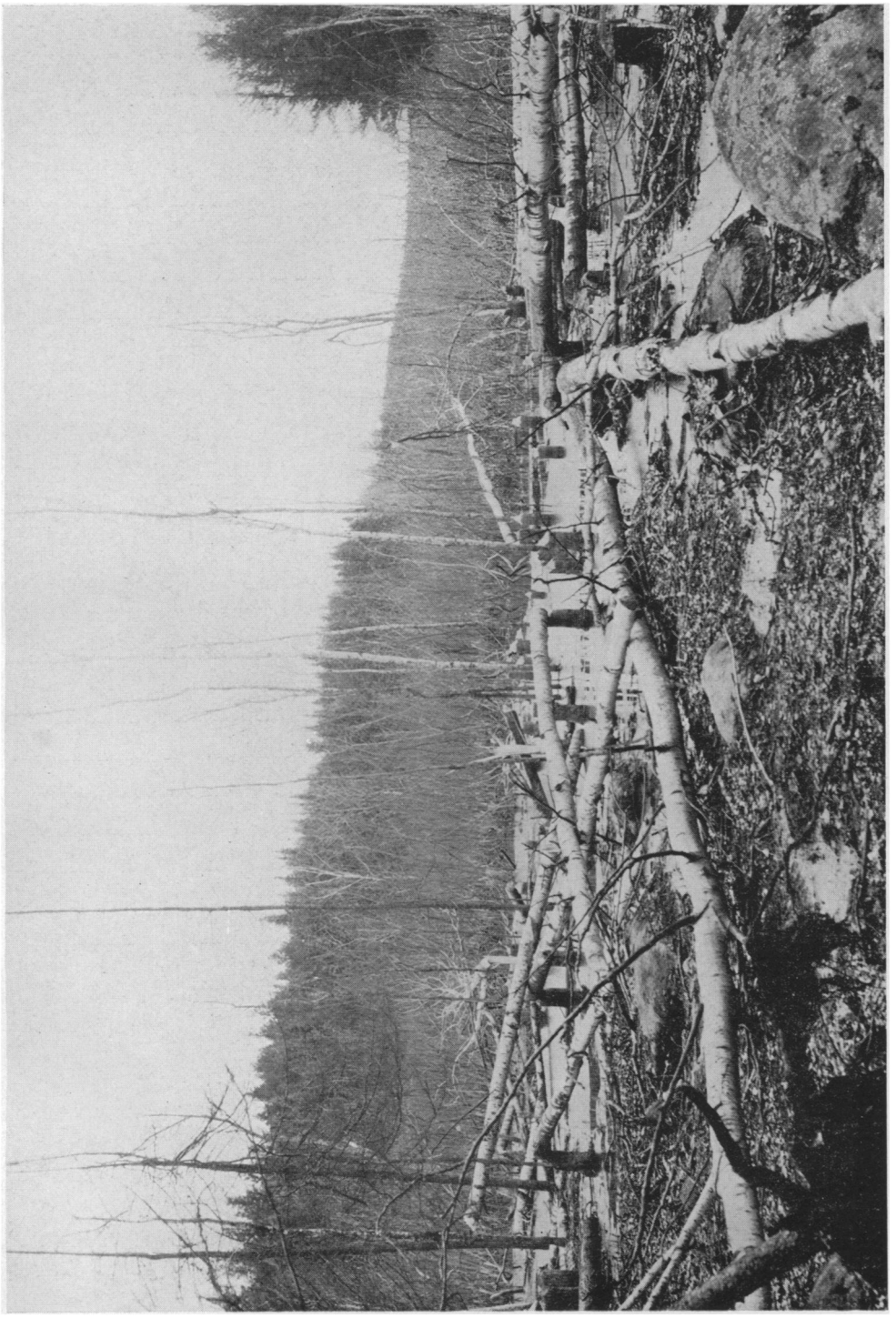
TABLE 2

UTILIZATION OF ASPEN CUT BY BEAVERS AT FIVE ACTIVE DAMS

Stump diameter	Number of trees	Pounds of food available	Pounds of food utilized	Per cent of utilization	Per cent of waste
(inches)					
1	9	19	15	80	20
2	57	276	244	88	12
3	66	730	367	50	50
4	72	1,474	530	36	64
5	87	3,020	1,119	37	63
6	69	4,080	1,407	35	65
7	45	3,943	1,362	34	66
8	29	3,238	970	30	70
9	9	1,080	280	26	74
10	9	1,080	495	46	54
11	4	480	198	41	59
Totals	456	19,420	6,987	36	64

Data on degree of utilization are summarized in Table 2, from which the degrees of utilization in the various size classes can be compared with each other and with the total.

An attempt was made at the beginning of the study to measure and mark all species of shrubs eaten by beaver. It was soon learned, however, that the



Felled aspens at a beaver dam in northeastern Minnesota, showing the excessive waste when only the tops are used.

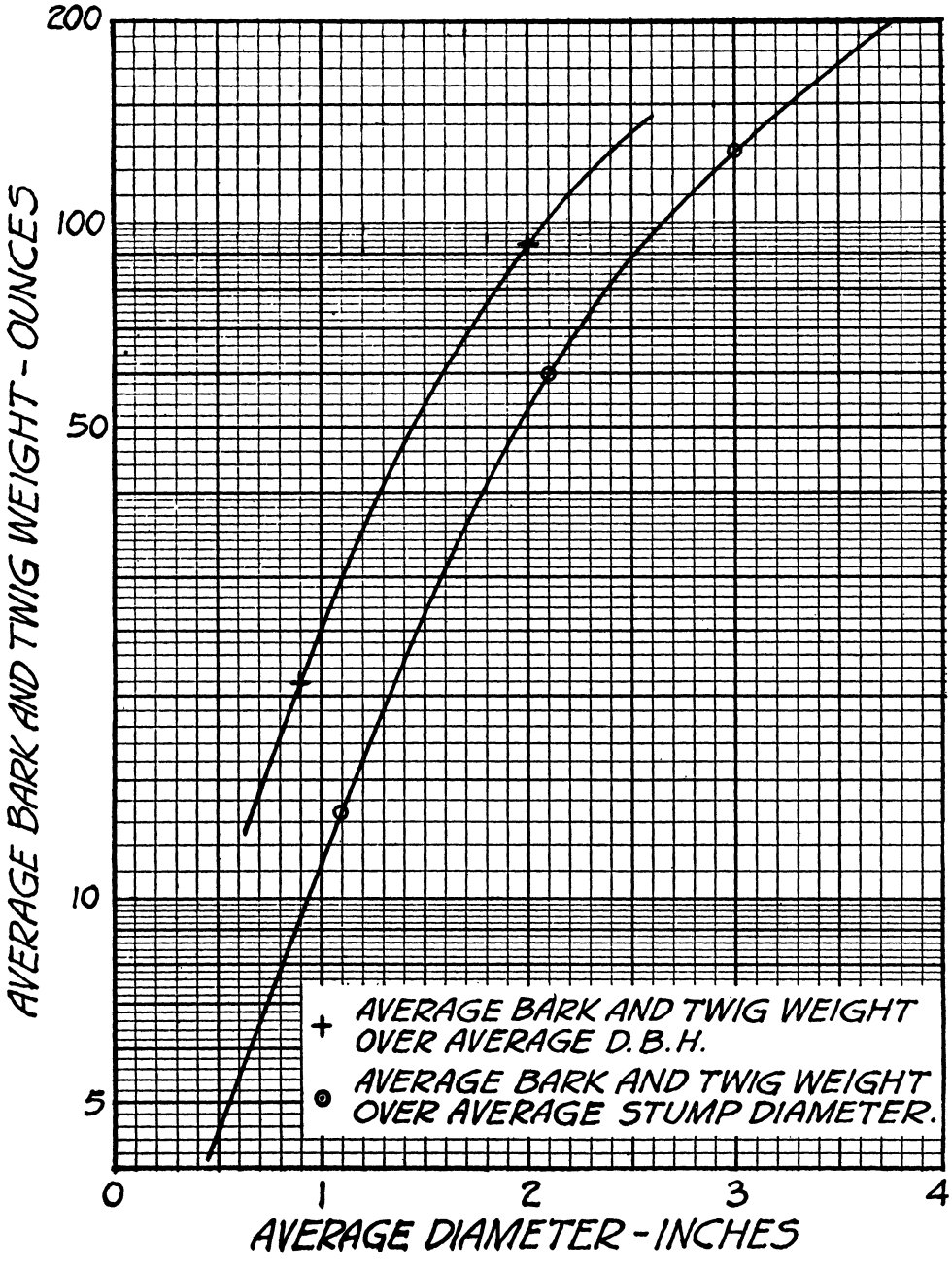


Fig. 4. Curves for computing the weight of bark and twigs from alder of small diameter classes.

percentage of error was great, many cut stems being unavoidably overlooked. Some of the dams studied have a shore line in excess of two miles, and islands that are inaccessible except when there is thick ice. When the ice is heavy enough to be used safely there is usually so much snow that the stumps are not visible. The figures obtained for the smaller species, chiefly alder and willow, are, therefore, omitted from this report. Since aspen is the primary food it is felt that its utilization by beaver should be given first consideration.

Notable beaver foods of less importance than aspen were alder, white birch, willow, red osier dogwood, and hazelnut. Alder, in the vicinity of beaver dams seldom exceeded two inches in diameter, so stems of the one and two inch classes were peeled and the bark and twigs weighed as described for the aspen. The curves in Figure 4 show the amount of food that can be expected from alders of small diameter. Where aspen was still easily obtainable only small numbers of the other species were cut, but as the aspen decreased larger quantities of the less choice foods were taken.

Birch and willow have not been studied in the same way so that their role in the beaver's diet cannot yet be interpreted in terms of the actual weight of food consumed.

Studies for determining the daily consumption of aspen by beavers have been started and results to date are included for their interest but not as settled criteria for management practices.

Two beavers, of 19 and 35 pounds, respectively, were fed aspen bark and twigs for a period of about a month; the average daily consumption for these animals was 33.2 ounces. The studies were terminated by a raiding bear that killed one beaver and wounded the other.

A beaver farmer, A. C. Tilden, located at Hill City, Minnesota, has been raising beavers for many years and he says that 80 animals eat the bark from a cord of aspen weekly. In order to obtain a weight factor for this consumption the writer had a cord of aspen, of the sizes fed by Mr. Tilden, peeled and the bark weighed. It amounted to 787.2 pounds. That quantity of bark fed to 80 beavers in a week would supply 22.5 ounces per animal per day. Until more figures on food consumption are available, however, no particular dependence for beaver management should be placed in those here presented.

CONCLUSIONS

1. Aspen is the most important of the food species of beavers in the Superior National Forest, with birch, alder, and willow next in rank.

2. The degree of utilization of aspen based on measurements of 456 trees was 36% and of waste 64%.

3. The greatest complete wastage occurs in trees between 4 and 6 inches in diameter because there is usually a heavier stand of these sizes and more of the cut trees lodge, thus preventing utilization.

4. Feeding experiences show that beavers consume between 22 and 33 ounces of aspen bark and twigs daily.

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