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Source: *American Midland Naturalist*, Vol. 52, No. 2 (Oct., 1954), pp. 510-512
Published by: The University of Notre Dame
Stable URL: http://www.jstor.org/stable/2422252
Accessed: 31/07/2009 17:40

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Notes and Discussion

Sizes of Wood Cuttings Handled by Beavers

Felling the trees which they use as food and building material, is only the first in a series of operations which the beavers must carry out, for they must dismember them and transport the pieces or sections to the location where the material will be used. When the smaller limbs and twigs are gnawed off, the beaver seizes them with his incisor teeth and draws or tows them to his dam or lodge. The larger limbs and even the bole of the smaller trees are cut into lengths according to their diameters, their weights, and the beaver's ability to handle the sections cut.

The literature contains numerous specific statements concerning the diameters of trees felled by beavers, and occasionally a general statement is found giving the approximate sizes of some cuttings. No specific study or analysis seems to have been made to determine the larger diameters and the longer lengths of the cuttings handled by beavers in their dam and lodge constructions. In August 1951 an opportunity to make such measurements furnished the data for this paper, and it is hoped that others may be stimulated to gather additional data from other areas. Eventually these accumulated data would be sufficient to make possible valuable comparisons of beaver work, in different areas, under different conditions, thus giving us a much better understanding of this phase of beaver work.

Through the kindness and cooperation of the Allegheny State Park Commission of Red House, New York, the author has for many years enjoyed the opportunity of studying the native animals and carrying on research in the 65,000 acre park area.

Procedure.—The cuttings studied were from a beaver dam on France Brook which has been occupied by an active beaver colony for over ten years.

The dam studied is 476 feet long and varies from a height of six feet, at the southeast angle, to a few inches at both its east and its west ends. Each year the dam has been repaired and usually some new cuttings have been added to it. Since the dam is several years old, many of the older and deeper cuttings are partly rotted or so deeply buried in the construction that no effort was made to dislodge them for measurement. The few cuttings which had to be dislodged from the dam were measured and immediately replaced in the dam as nearly as possible as they had been located and arranged previously. The measurements of the cuttings were made during August and early September 1951, all but six cuttings were a year or more old, and all of them were without the bark, except half a dozen soft maples from which the beavers had not used the bark for food.

In choosing the pieces of dam materials used for measurements, no attempt was made to measure all pieces used for, (1) that would have meant the unlawful destruction of the dam, (2) every effort was made to avoid damage or change in the dam structure by removing wood sections, and (3) the main interest was to get information particularly on the larger pieces (2 inches or more in diameter) and on the lengths of the longer sections rather than to get the length of all the sections.

The diameters to the nearest one eighth of an inch, taken with an outside calliper, were made at the base of the cutting. These measurements represented the diameter of the dry, seasoned, barkless logs, i.e. minimum diameters, as compared to the diameters including the green bark present when the cuttings were first harvested and handled, i.e. the maximum diameters. The green bark had been used for food, after which the peeled wood sections were used for dam and lodge construction. The length of each cutting and the kind of wood were also determined. After all of these data were entered on the data sheet, the log was immediately marked by an axe blaze to indicate that the data had been taken and recorded.

Trees represented.—Four woods made up the general bulk of the larger cuttings found in this dam, and the distribution of the 140 cuttings studied was as follows: 92 pieces (65.7%) poplar (*Populus tremuloides* and *grandidentata*), 21 pieces (15%) blue beech (*Carpinus caroliniana*), 16 pieces (11.4%) were shadbush (*Amelanchier canadensis*) and 10 pieces (7%) were maple (*Acer*) in which sugar, red, and silver maples were represented. One fair sized elm (*Ulmus* sp.) was observed.

The considerable use of both blue beech, and shadbush, has been characteristic of the work of beavers in the Allegheny State Park area. Shadle and Austin (1939, Jour. Mamm. 20(3):299-303) pointed out that a beaver colony in the upper Quaker Run area

had made many cuttings of these two genera. Shadle *et al.* (1949, *Ibid.* 24(1):32-39) in a comparative study of the above beaver colony and five others, pointed out that of the six colonies located in different parts of the park, (Quaker Run, Red House Creek and Lower France Brook), each one showed considerable utilization of the above two readily available genera, which were used along with the more common aspens and willows. They also stated that the blue beech and shadbush had not been reported as beaver food in any other lists which they had seen. In the present study of a dam in the Upper France Brook Valley, the seventh beaver colony adds additional evidence of the extensive use of blue beech and shadbush. Both the *Carpinus* and the *Amelchanier* are much harder, heavier woods than the *Populus,* yet the beavers handle long heavy pieces of each species.

In table 1 the 140 beaver cuttings measured are arranged in columns (1) according to their measured diameter (to the nearest quarter inch) and, (2) according to the lengths of the individual sections of a given diameter. The sections are not evenly distributed in all diameters, for by far the greater numbers of cuttings (74%) fell within the two and a quarter inch to the three and three quarter inch diameters, and only 22% of them were four inches or over in diameter.

TABLE 1.—Distribution of beaver cuttings according to diameter and length (in inches)

Base Diam.	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75
Length	P 72	P 30	P 53	P 48	P 52	P' 36	P 45	P 27
	P 78	P 39	P 57	C 48	C 55	P 55	P' 53	P 45
	P 104	C 45	P 64	P' 51	C 56	P 62	P 56	P' 47
	C 111	P 68	P 73	C 51	P' 56	P 66	P 59	P 52
	Ac 247*	P 68	P' 75	P 54	P 65	P 69	C 65	P 52
		P 80	P 76	C 68	C 70	Am 75	Ac 65	P 53
		P' 84	C 81	P 74	C 73	P 78	P 73	P 57
		P 89	Am 80	Ac 74	Am 74	P 85	C 75	P 59
		P 91	Am 85	P 79	C 80	P 95	P 82	P 60
		P 95	P 85	P 80	Am 80	Am 102	P 110	Ac 65
		C 98	Am 92	P 81	P 84	Am 116	Am 118*	P 73
		P 124	C 92	Ac 95	C 86		Ac 130	C 73
		Ac 126	P 95	P 97	P 90		P 152	C 75
		P 128	P 122	Ac 105	P 90			U 122*†
		Ac 161	P 133	P 156	P 94			P 161*
					P 100			
					P 102			
					P 106			
					P 112			
					C 115*			
Total lengths	612	1326	1263	1161	1640	839	1083	1020
No. of pieces	5	15	15	15	20	11	13	15
Av. lengths	102	84.4	84	77.4	82	76	83	68

TABLE 1.—(*Continued*)

Base Diam	4.00	4.25	4.50	4.75	5.00	5.25	5.75	6.25
Length	Am 38	P 40	P 45	P 81	P' 20	P 30	Am 82†	P 29
	P 53	C 46	P 52	Ac 138†	P 32	Am 47		P 42†
	P 63	Am 57	P 56		P 47	Am 51		
	P 68	P 66	P 58		C 77†	P 52		
	P' 78		Am 64		Am 88	P 58		
	P 86		P 74					
Total lengths	386	209	349	219	264	238	82	71
No. of pieces	6	4	6	2	5	5	1	2
Av. lengths	64	52	58	109	53	47	82	35.5

* Longest cutting of each kind of wood.

† Largest diameter of cutting of each kind of wood.

Where beavers have cut up a felled tree, it is quite evident from the location of the individual piles of chips which mark the successive sections into which the tree has been cut, that with the increase in the diameter of the successive cuts, the lengths into which the sections are cut are more or less progressively shorter. Through the kindness of Miss Mabel Montgomery of the Department of Mathematics a study of the measurements of the cuttings produced a chart which gave further definite corroboration of the general trend from long cuttings of small diameters through progressively shorter cuttings as the diameters of the sections of wood cut increased in size.

Measurements.—The longest piece handled by the beavers was a 247 inch sugar maple (*Acer saccharophorum*), 2.16 inches in diameter at the base. The longest aspen (*Populus* sp.) section measured 161 inches and was 3.75 inches in diameter. The longest blue beech (*Carpinus caroliniana*) was 115 inches long and 3 inches in diameter. A three and one half inch shadbush (*Amelanchier canadensis*) log was 118 inches long. The single large elm (*Ulmus* sp.) found, was a 122 inch log, 3.75 inches in diameter.

The largest diameter 6.37 inches was that of an aspen log 42 inches long. The largest shadbush 5.75 inches in diameter was 82 inches long; a 5 inch blue beech 77 inches long, and a 4.75 inch maple (*Acer* sp.) log 138 inches in length were the two largest cuttings of these last two kinds of wood.

The above figures were made from old, seasoned, barkless wood, and it would also be interesting to have measurements of the green cuttings, at the time they were made, and when they would show their maximum diameters and maximum weights. Such figures would also give a more adequate idea of the ability of the beavers in handling large sized and heavy cuttings.

Measurements of the weights of the heavy cuttings handled by the beavers and also measurements of the work expended by the animal in dragging these pieces would furnish interesting additional data which could be readily obtained.—ALBERT R. SHADLE, University of Buffalo, Buffalo, N. Y.

A Bloom of Nauplius Larvae

Bodies of freshwater occasionally give rise to a bloom of a particular organism which suddenly appears in very great abundance. Under certain favorable conditions a species will attain an abundance far beyond its normal density which cannot be maintained for long. Algal blooms are well known. On March 17, 1951, the writer encountered a bloom of nauplius larvae in a temporary pool while collecting phyllopod Crustacea. The water was murky with the swarming larvae. The collecting net in a single dip was completely coated with a scum of countless larvae. The older stages indicated they were larvae of copepods. The pool is a shallow (maximum depth of 2.5 ft. at the time) pasture pool near Brimfield in Portage County, Ohio. The temperature was 7.0° C and the pH 5.9. This was the only observation of such a bloom in this pond over a period of three years during which visits were made each week while water was present.—RALPH W. DEXTER, Kent State University, Kent, Ohio.