

A REPORT ON THE STUDY TO  
DETERMINE SOME CORRELATION  
BETWEEN BEAVER  
AND  
BEAVER FOOD

A THESIS SUBMITTED

by

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Approved:

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### PREFACE

The following pages are a report on the progress of a study that was designed to focus a stronger light upon a subject about which comparatively little is known. The fact that this problem, resolved around the handling of beaver in their natural state, has become more and more important within the last few years shows that a study of this nature will be both timely and profitable.

Again, this is but a report on the study and is in no way intended to be completed but instead, I hope that it will be taken as a step in the right direction.

Corvallis, Oregon  
April, 1940



*J J Y*

## INTRODUCTION

### The Problem

To provide the game manager, recreation manager or private individual the means of determining, as far as cover is concerned, the number of beaver that the area at his disposal will support. In short, it has been our attempt to minimize the guesswork that is so widely exercised in the establishment and maintenance of beaver colonies.

### The Importance of the Problem

The importance of determining some correlation between the beaver and the cover on the area so as to obtain the best and most satisfactory use of the area is great. To date, little is known about the cover requirements of this animal. This has led to many indiscriminate plantings of beaver to say nothing of improper handling of this animal in areas where it is already established. As evidenced by many similar attempts to control Mother Nature when insufficient or incorrect data was employed, the need for some criterion by which to operate is very great. To successfully control beaver one must have at hand the necessary data from which each move can be judged and made.

One phase of control in beaver work is the regulation of the number of animals that can safely be located upon a given area. The importance of this problem of correlation, then, becomes apparent in as much as it is so necessary to successful administration of a very important resource.



### The Purpose of This Study

The purpose of this study is to determine some degree of correlation between the number of beaver established or to be established on a given area and the amount, species and size of cover suitable for food and construction purposes that is available on the area. Included in the term "construction" and in the term "food", is the wastage factor that is concomitant to these uses of the cover. In short, we have attempted to enable any person interested in the planting or maintenance of beaver to determine just how many of these animals the area at his disposal will support.

When this study was started, we had in mind the problem presented in bringing together the beaver on one hand and the available cover on the other hand. To do this we proposed a correlation factor that would allow an accurate determination of the proper amount of beaver to be located on the area; one that could be applied simply and by nearly anyone.

The purpose of this study is, therefore, to determine this correlation factor as accurately as possible.

### A Review of Related Previous Studies

As near as could be determined, there have been no previous studies made along this line of thought so consequently we were unable to take advantage of the experience gained by others in attempting to solve this problem. Much has, however, been written upon the other phases of beaver control, having to do with such items as biology,

pounds of food consumed each day, species utilized in each locality and many others. Due to this scarcity of previous studies that would aid us in the operation of our experiment, we were forced to adopt a plan of action that was entirely new and untried. As will be brought out later on, this plan of procedure had its advantages and shortcomings but through its employment we learned many things that we believe will be of help to anyone carrying on our work.

It should be noted here that though there have been many studies made in relation to beaver damage, beaver control in regards to their dam building and the like, there has never been any work done in reference to cover and the number of beaver this cover would support.

#### Sources of Data

The data obtained through this study was taken from an area located approximately seven miles north west of the city of Corvallis, Oregon,\* during the fall and winter of the 1939-1940 school year. This area enclosed a planting of six male and female beavers situated in what is known as Oak Creek, a small, year-around stream that drains the east slopes of the Coast Range. In general, this stream is about ten feet in width though the stream type as a whole extends, on the average, about thirty feet on either side of the stream proper.

The plant was made during the month of July, 1939 and within a short time, a man-made lodge or house was constructed for their use at what is now the center of their workings. Though the plant was made during July, 1939, our work did not start until November of that year,

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\*See map A, appendix.



being intermittently carried on through the following months until January 26, 1940.

#### Method of Proceedure

The proceedure employed in attacking this problem was set up on the scene as it was needed. The method used in securing the data was laid out after thoroughly inspecting the area and the conditions thereon.

Specifically, the proceedure consisted of the following courses of action:

- (1) An occular survey of the area.
- (2) Preparation of the data sheets.
- (3) Field work consisting of the following:
  - a. Tabulation of the species utilized.
  - b. Measurement and tabulation of diameters by classes.
  - c. Observation of general conditions in the field with the attendant note keeping.
- (4) Interpretation of the data secured.

In making the occular survey of the area, we were assisted to a large extent by the two fish and game students who were working upon another phase of this problem. With them and by ourselves, we located the recent workings of the beaver as well as the older workings. The dams and the probable location of the boroughs were spotted, giving us an estimate of the extent of the project and the rate of its increase.

During this survey we noticed that much of the usual activity attendant to a beaver colony was lacking and we were told by Frank Groves of the Fish and Game department that this was a normal condition in view of the fact that the plant was comparatively new and that there is a normal suspension of activity during the mid-winter months. By lack of activity it is meant that the cutting and construction work is at a minimum.

As we looked over the area we formulated our plan of procedure. It became evident that a tabulation of the various species that were utilized must be made. This brings us to the preparation of the data sheets.

In order to most easily handle the immense amount of data that we would have to deal with, it was decided that a form should be set up, recording the species utilized by quarter inch diameter classes, sample ring counts and the distance in feet from the stream proper of the cuts made at the outer edge of the stream type. This is as shown in Figure 1., appendix.

At this point it would be well to state that it was our plan to make a cruise of the area, tabulating the work done by the beavers to date, and then make another cruise at a later date to again record their workings. This, we estimated, would give us a useable slant on the activities on the project. In other words, by recording the cuttings made to the date of the first measurement, we would know the amount, species and characteristics of the food requirements up to that time and then by repeating this work later on, we would again have a cross section of the cover requirements. As has been implied, a 100% cruise was to be made each time.

It was planned that sample height measurements would be taken, using the Abney, topography, hand level. This we did, giving us an idea of the total height of the average plant in each species.

Now let us consider the field work in detail. I have touched upon some of this work in the above paragraphs, but closer examination is needed.



Our equipment for this work consisted of the following:

1. Gunter's Chain (2 chain tape with trailer) (one).
2. Abney Hand Level (topography type) (one).
3. Increment Ruler (steel, 12 inches) (one per man).
4. Tatum (aluminum, large) (one per man).

As has been said above, it was decided that a 100% cruise was needed to obtain the best set of data possible. In short, we were to tally every cutting made by the animals up to date, and this we did.

The cruise started from the approximate center of the workings. This was at the man-made beaver house that has been spoken of before. Starting from this point we worked up stream, chaining the distance as we went. Each man's work alternated between measuring and recording the cuttings found. Careful inspection was given to every foot of the stream type in order that no cuts would be missed. As the stream type rarely exceeded thirty feet in width on each side of the water, this was possible. Along with recording the cuttings along the middle and inside of the stream type, those cuttings made at the outside of the stream type were noted and their distance from the stream edge was taken. It was thought that this latter observation would enable us to ascertain the maximum width of the cutting band that enclosed the water course. Since no canals were found, we believed that it would be safe to assume that almost all of the cuttings could be expected very near to the stream proper. In addition to this last named information the amount of waste was recorded for several cuttings were noted that once made, were apparently abandoned for some reason. Working up the stream in this manner, we went some forty chains at which point we were well past the last point of working. Thusly, the upper limits of the



project was reached.

Returning to the original starting point, we again layed out our course, this time in the opposite direction so as to cover the lower portion of the project. The same procedure was employed here as was in the first section of the work. At this end of the project, less cutting was found to be charactoristic. (For one thing, the cover thinned out and then the stream narrowed and became swifter as it nearer habitation).

In the tabulation of the species of cover that was utilized, it was decided that quarter inch diameter classes would be the most desirable to use. The measurements for this tabulation were taken at beaver height with the aid of the steel increment rules. Diameters were taken to the nearest quarter inch, being included within that class that the diameter was closest to. Except in working portions of the stream type that were extremely sparse in cover, one man measured the diameters while the other recorded the data and side notes.

Observations of the general conditions in the field were made by both members of the party and were recorded by the one who was note-keeper and tabulator at the time. These observations consisted of any information that we thought would be desireable in drawing the conclusions of this study. Such items as the distance of the dams from the original planting site, distance of the plant from the bridge (see Figure 2) and the fact that it appeared that the beaver had cut a Wild Rose bush were included in this accumulation.

This brings us to the consideration and interpretation of the data secured through this study.

The following is the condensed results from our field sheets. These results come from a 100% cruise of the project and represent the amount of cover that was cut to the date of the study.

Table I

Diameter Class	Species Utilized	Total Cuttings In Diameter Class	
1/4 in.	Salix nigra	162	
	Alnus rubra	3	
	Fraxinus oregona	1	
	Cornus nuttallii	1	167
1/2 in.	Salix nigra	179	
	Alnus rubra	3	
	Cornus nuttallii	3	185
3/4 in.	Salix nigra	183	
	Alnus rubra	7	
	Fraxinus oregona	3	
	Cornus nuttallii	1	194
1.0 in.	Salix nigra	155	
	Alnus rubra	2	
	Cornus nuttallii	2	
	Acer circinatum	1	160
1 1/4 in.	Salix nigra	125	
	Alnus rubra	2	
	Fraxinus oregona	1	
	Cornus nuttallii	1	129
1 1/2 in.	Salix nigra	82	
	Alnus rubra	2	
	Fraxinus oregona	3	87
1 3/4 in.	Salix nigra	49	
	Alnus rubra	1	
	Fraxinus oregona	1	51
2.0 in.	Salix nigra	45	
	Alnus rubra	3	
	Fraxinus oregona	1	<u>49</u>

--- Total cuttings so far --- 1022



Table I Cont'd.

Diameter Class	Species Utilized	Total Cuttings In Diameter Class	
2 1/4 in.	Salix nigra	30	
	Alnus rubra	2	
	Populus spp. (?)	1	
	Fraxinus oregona	1	34
2 1/2 in.	Salix nigra	27	
	Alnus rubra	4	31
2 3/4 in.	Salix nigra	5	5
3.0 in.	Salix nigra	14	
	Alnus rubra	3	17
3 1/4 in.	Salix nigra	6	6
3 1/2 in.	Salix nigra	10	
	Populus spp. (?)	1	11
3 3/4 in.	Salix nigra	6	6
4.0 in.	Salix nigra	5	
	Alnus rubra	2	7
4 1/4 in.	Salix nigra	2	2
4 1/2 in.	Salix nigra	3	3
4 3/4 in.	-----	-	-
5.0 in.	Salix nigra	2	2
5 1/4 in.	-----	-	-
5 1/2 in.	Salix nigra	2	2
5 3/4 in.	-----	-	-
6.0 in.	Salix nigra	5	5
7 1/2 in.	Salix nigra	1	1
8.0 in.	Salix nigra	2	2
Total Cuttings Continued -		134	
Total Cuttings Carr'd For-		1022	
		1156	

Total Cuttings Made To Date Of The  
Study e - - - - - 1156

### Findings

As is shown in Table I, 1156 individual cuttings were made to the date of the study. These cuttings, it is safe to assume, made up approximately 90% of the beaver's diet during the six months since the plant was made. Of course some of this cover was used in the construction of the three or four dams on the stream. The remainder of the diet was probably made up from much of the green, herbaceous vegetation attendant to a stream type such as this one. It has been said, "In addition to the bark of deciduous trees, the beaver probably eats a great variety of green matter of other sorts, such as buds, grasses, sedges, bark of shrubs, young leaves, berries, rhizomes, roots, flags and other plants growing in or about the water. Such variety is available only in the summer months, and at that time less is eaten of bark; in the winter, in its northern range, its (the beaver) sustenance is doubtlessly limited to the bark and buds of stored boughs"<sup>1</sup>. There are a great many of the list above that are present on this area. It was noted during the survey, that the beaver had made random cuttings of such items as Snowberry, Symphoricarpos albus, Sweet Brier Rosa rubiginosa, Syringa Philadelphus gordonianus and in one or two instances, we suspected these animals of eating the tops out of a patch of Horsetails Equisetum spp.

None of the coniferous species were found to be eaten by the beaver though it has been observed that they do occasionally browse a little on the firs, hemlocks, spruces and pines. One author states "here in this

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<sup>1</sup> The Beaver in the Adirondacks: Its Economics and Natural History, by Charles Eugene Johnson in a Roosevelt Wild Life Bulletin, Vol. 4 No. 4 of the Roosevelt Wild Life Forest Experiment Station, Syracuse, N.Y.



high valley there are none of these trees (cottonwood, willow and quaking aspen etc.) except alder and this is scarcely touched, while great trees<sup>2</sup> of cedar, hemlock, fir, pine and spruce are cut right and left". He speaks of the beaver in its Cascade Range home. In addition he says "It is entirely unusual for beaver to cut this class of trees at all yet here a large colony has, for years, cut the evergreens and lived on the bark"<sup>2</sup>.

In noting the cover that was cut near or outside of the outer edge of the stream type, we found that a dozen or more cutting had been made in this region of the type. In almost all of the cases the species varied but the diameter range held closely to the upper limits. That is to say, for the most part, these cuttings were made in cover ranging from 4" to 6" in diameter. The range of the distance of these cuttings from the stream edge was from eighteen to thirty feet, depending upon the width of the stream type at this point. The willows were cut the most, I believe. It is interesting to note that in nearly all cases these trees, cut so far from the edge of the water, were left as they fell; little being eaten from them, if any.

Waste, other than that just mentioned, was most pronounced as the larger diametered trees were cut. Several times some of the smaller, more succulent tips and branches were eaten or carried off but on the whole, these large trees were cut for another purpose other than food and one that we could not determine. Perhaps it was due to an instinctive urge.

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<sup>2</sup>The American Lumberman, February 28, 1925; pp. 45-47, by "El Comancho".

As to the general tenor of the colony, it was found that all indications pointed to the fact that the beaver were in a more or less "transition" stage as far as the establishment of a permanent home is concerned. We found that the beaver had apparently searched up the stream and a principle side branch first in their survey of suitable damsites and feeding grounds. Apparently no suitable site was located for they then turned and headed down stream, passing their plant site and bank den, until they found situations that met their requirements. This locates the beaver at the present time, spread out between the plant site and the county bridge (see map A). Throughout this stretch the beaver have taken up their dam sites and since several dams and the heaviest of the cuttings are here, indications are that the animals have come to stay.

In summing up the findings we have this: the beaver have eaten to date three principle species of the available cover and in order of their palatability they are: Black Willow, Red Alder and Oregon Ash; that in addition to the tree species of cover listed above, the animals require some sort of succulent, grass-like vegetation such as Snowberry, Syringa and Sweet Brier; that the greatest waste was found to be prevalent at the outer edge of the stream type and in the larger diameter classes and that apparently, the beaver are successfully making their adjustment to this area and are on the way to becoming fully established, providing no decimating factors enter into the picture too strongly.



### Conclusions

Through this study we have found the amount, size and kind of food that has been eaten by the beaver on the area. This data may be applied to six mature beaver during the period of the year taken in by the study, being fully aware that this section of the year encompassed the period of adjustment that necessarily followed the release of the beaver upon an area entirely new to them. Certainly any use of these results must take this last statement into consideration. We cannot say that beaver, comparable in size and maturity to these, will consistently consume an equal amount of cover throughout any given year but under similar conditions, a like plant of beaver will consume a portion of the cover just as these beaver have done (or very close to it).

In my opinion, one of the most important items of information brought out in this study is the fact that our procedure and general method of attacking the problem was far from what it should have been. I do not mean by this that incorrect methods were employed, disregarding all indications of what was correct, but that in view of the facts brought out and from the standpoint of looking back at the work instead of foreward to it, different actions should have been undertaken. First among these is that the study should have been undertaken at exactly the same time that the plant was made, if data on the readjustment period was desired, or at a time sufficiently beyond the date of the plant to eliminate the effects of this well-marked period of adjustment.

Secondly, the study should extend over a period long enough to take into consideration the influence of the seasons on the palatability of each member of the cover. It is well known that the palatability of a given species of cover used for food will vary in the amount eaten by an animal as the seasons of the year change. For example, consider the grasses and small, succulent items of the beaver's diet. These items will only be eaten during the period of the year when they are soft and lush if some other plant can be substituted for them. This substitution will come about when the grass becomes dry and course. In short, one cannot say that the complete diet of the beaver has been studied thoroughly until a period covering all of the seasons has been included in the survey. This period, at its minimum, will be a year and if it is at all possible, this should be made longer to cover a period of several years in order that the sampling will be from a large enough universe.

Not only should the period be made long enough to take in the changes of palatability, but it should also be made long enough to encompass the seasonal changes in the diet of the animals. Like any other animal, the beaver tends more strongly toward some items of diet for one period of the year than at other times. In this study, it soon became evident that we would not be able to justice to the problem because of the immense amount of time required to cover these seasonal variations in palatability an choice of food.

We further conclude that not enough consideration was given to



the biotic factors that exerted marked influence on the problem. Specifically, these are the sheep grazing throughout the stream type of the plant site and the fact that the workings of man (farms etc.) were so close to a portion of the stream. Both of these factors in combination probably, caused the withdrawal or absence of beavers in certain portions of the area. This was very marked at the lower end of the area, below the county bridge (see map A, app.) We found cuttings had been made (probably during exploring trips) but these were few in number, and concluded that the beavers had been frightened out of this section.

Another conclusion is that there is much doubt as to the feasibility of carrying out an experiment of this nature in view of the fact that so many variables are introduced into the picture. It is probable that through conscientious and extended study some degree of correlation could be worked out for this particular area, but it is also highly probable that the correlation found for this area would not agree with that in any other area unless every condition and factor bearing on the case were the same in both cases and this would be difficult to arrange.

In summary, it is the conclusion of the writer that no definite results can be shown from the work carried on in this study at the present time, at least. This fact is recognized but it should be remembered that through this study, a smoother and more efficient path

has been layed down for further work in this direction.

Therefore, it is my conclusion that though no direct results have come out of this study, a part, at least, of our goal has been attained; that of focusing a stronger light upon a subject about which little is known but is pertinent.

### Recommendations and Suggestions

1. If this study should prove to be desireable and further continuation of our work seems to be profitable, then it is recommended that the practical application of the results be kept foremost in the minds of the workers.

a. Should further work be carried on, it would be well to start anew on a fresh and better chosen location.

b. The area should be chosen with an eye to the location of near-by workings of man and the other biotic factors mentioned.

Perhaps fencing the area would solve some of the difficulties.

2. In striving for practicalness in the application of the results, it might well repay the workers to attempt a correlation of the feet of livestem consumed by the beaver and that available to them.

Example:

$$\frac{\text{Feet livestem cut / beaver}}{\text{Feet livestem available / beaver}} = \text{Correlation Factor to be well tempered by conditions on the area to which applied.}$$

3. The study should be so layed out that it can be continued for a number of years so as to gain the best sampling possible.



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2. El Commancho  
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## APPENDIX

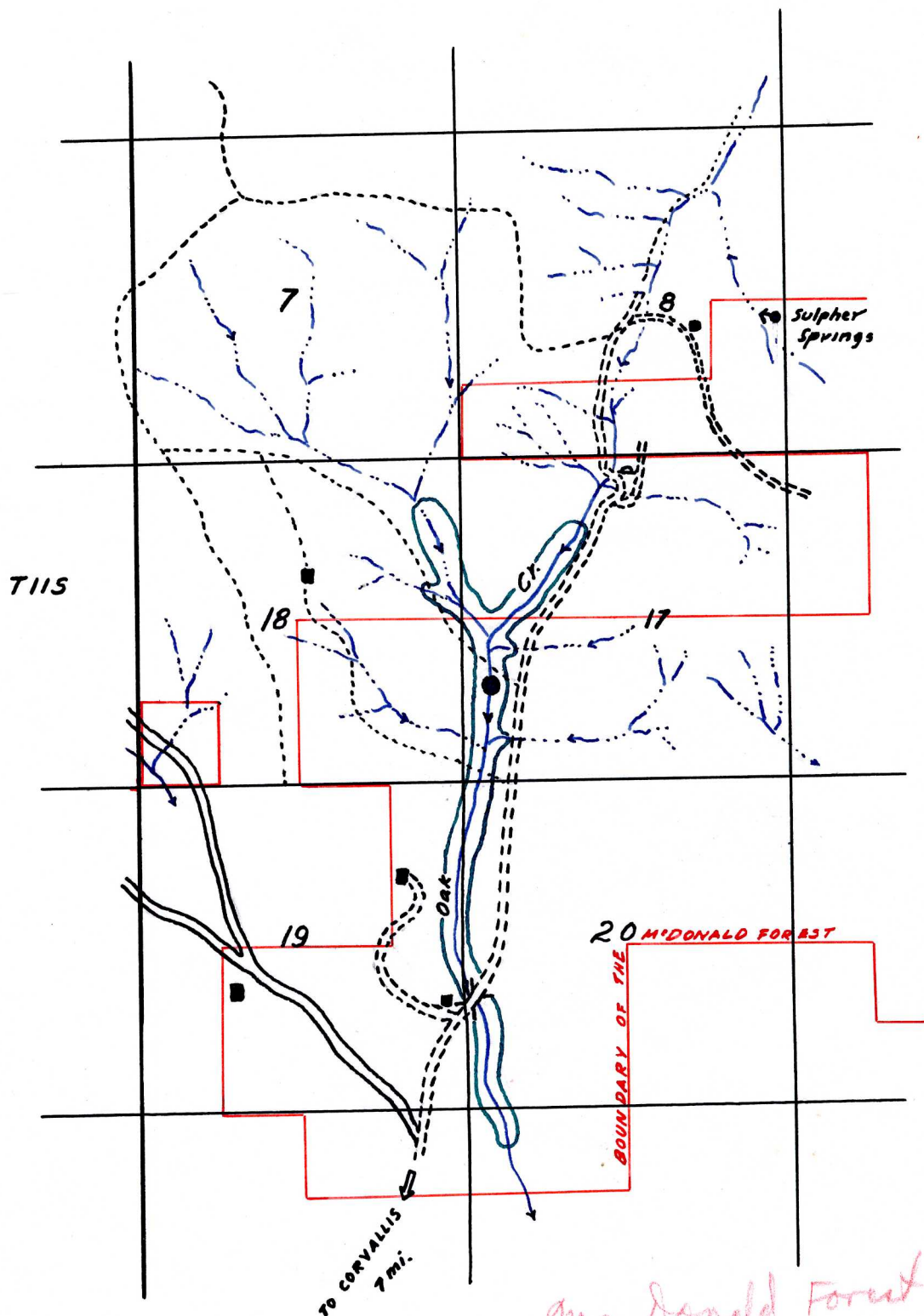
### Contents:

1. Map A Showing Plant And Vicinity.
2. Sample Data Sheet Used In the Work.



# MAP - A

- = Plant Site; Man-Made Bank Den.
- = Limits Of Stream Type Covered In Survey.



Mc Donald Forest Bdry  
is one mile too far south,  
Should redraw map.

Fig. 1

SURVEY DATA SHEET

Crew: \_\_\_\_\_  
 Recorder \_\_\_\_\_  
 Tallyman \_\_\_\_\_

Date \_\_\_\_\_ 19\_\_\_\_

1" DIAM. CLASS	1/4" DIAM. CLASS	Willow	WASTE*	Alder	WASTE	Ash	WASTE	Dogwood
to	1/4	☒ ☒ L	5, 5, 10 3, 6, 5					
	1/2							
	3/4							
1	1							
1	1							
to	1/4							
	1/2							
	3/4							
2	2							
2	2							
to	1/4							
	1/2							
	3/4							

\* Waste recorded on the basis of 10 as completely wasted.

☒ Equals 10 cuttings in the class.