

AN EVALUATION OF THE
ALDOUS BROWSE MEASUREMENT SYSTEM
AND ITS APPLICATION TO THE
MOUNTAINOUS AREAS OF VIRGINIA

by

Gordon Howard Brown

Thesis submitted to the Graduate Faculty of the
Virginia Polytechnic Institute
in candidacy for the degree of
MASTER OF SCIENCE

in

BIOLOGY

Major

WILDLIFE MANAGEMENT

APPROVED:

APPROVED:

Director of Graduate Studies

Head, Department of Biology

Dean of Agriculture

Major Professor

August, 1956

Blacksburg, Virginia

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS.....	10
INTRODUCTION.....	12
Purpose.....	12
Scope of Study.....	13
CONSIDERATION OF BROWSE MEASUREMENT TECHNIQUES.....	14
General.....	14
Clipping Measurements.....	14
Krefting Method.....	15
Line Intercept and Line Point Systems.....	16
Aldous Method.....	17
Selection of a System for Study.....	18
METHODS AND PROCEDURES.....	20
West Virginia Study.....	20
System Modification.....	22
Method of Operation.....	23
Analysis of Data.....	23
Barbour's Creek Salt Lick Study.....	24
Method of Operation.....	24
Analysis of Data.....	25
Barbour's Creek Cabin Study.....	25
Method of Operation.....	27
Analysis of Data.....	27

	Page
Big Stony Enclosure.....	28
Enclosure Construction.....	28
Acquisition and Disposition of Deer.....	29
System Modifications.....	29
Method of Operation.....	32
Analysis of Data.....	32
RESULTS AND DISCUSSION.....	34
West Virginia Study.....	34
Results.....	34
Discussion.....	35
Barbour's Creek Salt Lick Study.....	43
Results.....	43
Discussion.....	44
Barbour's Creek Cabin Study.....	51
Results.....	51
Discussion.....	52
Big Stony Enclosure.....	52
Results.....	52
Discussion.....	59
SUMMARY AND CONCLUSIONS.....	62
LITERATURE CITED.....	65
VITA.....	67
APPENDIX.....	68

LIST OF FIGURES

Figure		Page
1	Location of deer browse study lines at Barbour's Creek and Barbour's Creek Salt Lick, Craig County, Virginia.....	26
2	Two tires of four foot hog-fencing were used to construct a deer enclosure in Giles County, Virginia.....	30
3	Two deer were placed in the Big Stony enclosure in order to observe and measure their use of the available vegetation (photo by H. S. Mosby).....	31
4	Diagram of Big Stony Creek deer enclosure locating 1/100 acre sample plots.....	33
5	All available <u>Rhododendron maximum</u> had been browsed within the enclosure up to a height of five feet.....	61

LIST OF TABLES

Table	Page
1 Comparison of estimates of browse density as recorded by different observers using the Aldous Method, on four study areas in West Virginia, 1950 and 1951.....	21
2 Results of analysis of variance of results obtained by measuring per cent of plots present of browse species by the Aldous Method in Tucker County, West Virginia, May 6, 1952.....	36
3 Results of analysis of variance of results obtained by measuring average density by the Aldous Method in Tucker County, West Virginia, May 6, 1952.....	37
4 Results of analysis of variance of results obtained by measuring average browsing by the Aldous Method in Tucker County, West Virginia, May 6, 1952.....	38
5 Results of analysis of variance of results obtained by measuring utilization factor by the Aldous Method in Tucker County, West Virginia, May 6, 1952.....	39
6 Results of analysis of variance of results obtained by measuring per cent of food eaten by the Aldous Method in Tucker County, West Virginia May 6, 1952.....	40
7 Results of analysis of variance of results obtained by measuring per cent of browse available by the Aldous Method in Tucker County, West Virginia, May 6, 1952.....	41
8 Results of analysis of variance of results obtained by measuring per cent of plots present by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952.....	45
9 Results of analysis of variance of results obtained by measuring average density by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952.....	46

Table	Page
10 Results of analysis of variance of results obtained by measuring average degree of browsing by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952.....	47
11 Results of analysis of variance of results obtained by measuring utilization factor by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952.....	48
12 Results of analysis of variance of results obtained by measuring per cent of food eaten by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952.....	49
13 Results of analysis of variance of results obtained by measuring per cent of browse available by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952.....	50
14 Results of analysis of variance of results obtained by measuring per cent of plots present by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952.....	53
15 Results of analysis of variance of results obtained by measuring average density by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952.....	54
16 Results of analysis of variance of results obtained by measuring average degree of browsing by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952.....	55
17 Results of analysis of variance of results obtained by measuring utilization factor by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952.....	56
18 Results of analysis of variance of results obtained by measuring per cent of food eaten by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952.....	57
19 Results of analysis of variance of results obtained by measuring per cent of browse available by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952.....	58

LIST OF APPENDIX FIGURES

Figure		Page
1	West Virginia version of the Aldous Method deer range browse analysis form.....	69
2	Aldous Method deer range recording form.....	70
3	Aldous Method plot analysis form.....	71

LIST OF APPENDIX TABLES

Tables	Page
1 Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure March 5, 1952.....	72
2 Analysis of data recorded by the Aldous Method, 10 percent modification, in the Big Stony deer enclosure March 12, 1952.....	73
3 Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure March 19, 1952.....	74
4 Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure March 24, 1952.....	75
5 Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure April 3, 1952.....	76
6 Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure April 10, 1952.....	77
7 Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure April 20, 1952.....	78
8 Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, March 5, 1952.....	79
9 Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, March 12, 1952.....	80
10 Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, March 19, 1952.....	81
11 Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, March 24, 1952.....	82

Table	Page
12 Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, April 3, 1952.....	83
13 Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, April 10, 1952.....	84
14 Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, April 20, 1952.....	85
15 Analysis of data recorded by the Aldous Method, in the Big Stony deer enclosure, March 5, 1952....	86
16 Analysis of data recorded by the Aldous Method, in the Big Stony deer enclosure, March 12, 1952...	87
17 Analysis of data recorded by the Aldous Method, in the Big Stony deer enclosure, March 19, 1952...	88
18 Analysis of data recorded by the Aldous Method, in the Big Stony deer enclosure, March 24, 1952...	89
19 Analysis of data recorded by the Aldous Method, in the Big Stony deer enclosure, April 3, 1952....	90
20 Analysis of data recorded by the Aldous Method, in the Big Stony deer enclosure, April 10, 1952...	91
21 Analysis of data recorded by the Aldous Method, in the Big Stony deer enclosure, April 20, 1952...	92

ACKNOWLEDGEMENTS

The writer wishes to express his appreciation to the following organizations and individuals for their support, cooperation, and assistance in carrying out this study. Its completion would not have been possible without it.

To the Virginia Cooperative Wildlife Research Unit sponsored by the Commission of Game and Inland Fisheries of the Commonwealth of Virginia, the United States Fish and Wildlife Service, the Wildlife Management Institute, and Virginia Polytechnic Institute for providing financial assistance, equipment, and workspace.

To the Commission of Game and Inland Fisheries for providing the two deer from their Cumberland Game Farm on whose feeding habits part of the study was based.

To the graduate committee composed of Professor A. B. Massey, Chairman, Dr. Henry S. Mosby, and Professor J. J. Aulbauch. Special appreciation is expressed to Dr. Mosby for his unending patience, and his many suggestions.

To District Game Technician Richard Cross for providing the materials for constructing a deer enclosure and the services of personnel in his district.

To Game Warden Bill Jamison, and Game Managers Lon Oliver and Bent Medley for the great assistance which they rendered in their districts.

To the Wildlife Biologists, Russell Degarmo and John Gill, of the Conservation Commission of West Virginia for their cooperation in demonstrating their deer browse studies in that State and permitting an evaluation of their technique and results.

To Dr. Boyd Harshbarger and Clyde Y. Kramer of the Virginia Polytechnic Institute Statistics Laboratory for their counsel and advice during the course of the study and assistance in analysing the data.

To my fellow students who were always a source of encouragement.

Appreciation is expressed to N. R. Bowman III, J. C. Harvey, W. C. Kellner, J. H. McLaughlin, and D. R. Progulske for their assistance in making measurements on the browse study lines.

INTRODUCTION

Purpose

Deer range, like a cow pasture, may be wisely utilized only to the extent that it is not damaged. (Bartlett, 1950). Regardless of the number of deer which are present, if the range forage is being overutilized, a reduction of the deer herd is a prerequisite to practical management. This is an obvious step to a trained wildlife biologist, but may not be so comprehensible to a hunter who thinks only in terms of the total number of deer present on a given area. Consequences of this type of reasoning are close at hand in West Virginia (Gill, 1951) as well as in other states farther removed. Pennsylvania (Latham, 1950) and Michigan (Bartlett, 1950) provide classic examples of the damage which can be inflicted on a forest by numbers of deer in excess of the populations which the range is capable of supporting. The buck law which is in effect in many states aggravates the situation by conditioning hunters to the complete protection of does and other antlerless deer, so that it is extremely difficult to remove this protection in order to reduce the size of the deer herd. To bring about public acceptance of deer herd management techniques including sizable reduction in herd numbers, necessitates education of the sportsmen in advance of the time when such steps are necessary (Gill, 1950). In order to recognize the building up of an excessive number of deer on a given area, it is necessary to have some system

of measuring, from year to year, the deer use of the available vegetation. Wise conservation dictates that the size of the deer herd should be reduced before--not after--the deer are consuming more vegetation than is being produced. As this use approaches the danger point, corrective measures can be undertaken.

Other factors which affect the available forage for deer herds are the ecological changes which are constantly taking place in a forest community, and competition with other browsing and grazing animals which may be present on the range.

The purpose of this study is to evaluate systems of browse measurement to determine if browse measurement techniques may be used effectively as a basic guide for manipulating deer numbers in the mountainous regions of Virginia.

Scope of Study

For reasons discussed later this study was largely confined to an evaluation of the Aldous technique of browse measurement. It was tested in the mountainous areas of Virginia and West Virginia for reliability between operators, ease of measuring, and practicality for use in that region.

CONSIDERATION OF BROWSE MEASUREMENT TECHNIQUES

General

A number of techniques have been suggested for measuring the availability and utilization of deer browse. Each method has certain advantages and disadvantages (Muncy, 1954).

While ocular estimates are easily made, rapid, and adaptable to large areas, they are not exact, may be biased, and are subject to individual variation.

More precise measurements which weigh twigs or count stems are exact and allow comparisons between individuals. They are, however, very time-consuming and this fact limits the areas which can be sampled by these procedures.

The system of browse measurement which would be of greatest value to the wildlife biologist should require a minimum of time per sample plot in order to permit a larger sample area to be measured. This consideration favors an ocular estimate system, with frequent checking by measurement of the ocular estimates, if the results of such browse evaluation can be shown to be reliable.

Clipping Measurements

Twig clippings can be collected, weighed, and converted directly to the number of pounds per acre of food which is available to deer as browse. Similar studies carried out after a definite time interval can be made to determine

utilization by deer in pounds per acre for the various species of browse. Collecting, drying and weighing the clippings, however, is a tedious operation and the number of sample plots which can be measured is limited.

The Virginia Polytechnic Institute Statistical Laboratory advised that rather extensive studies should first be made on the trees and shrubs of the mountainous areas to determine the differences in growth and weight of each plant attributable to its particular environment. A plant growing on a north slope could vary considerably from one of the same species growing on a south slope. Other factors influencing differences in growth are altitude, moisture, and shade. It was felt that these differences should be measured in the area to be studied so that sampling could then be made on a stratified basis. This one phase alone would take up the full time of the study, and would result in a system requiring presampling determinations too complex and too unwieldy for use by most wildlife biologists. Further study of systems involving the measurements of browse clippings over a varied range was abandoned, therefore.

Krefting Method

Krefting suggested a technique primarily devised to measure the ecological changes within a forest in order that the effects of deer browsing on a forest vegetation could be determined and demonstrated. It was not designed

as a method for measuring amounts of browse utilized by deer, but does make provision for measuring the amounts of browse available within a given area. This available browse figure can then be converted to pounds per acre. The method used however, involves weighing clippings which entails the handicaps of any clipping study. The Krefting Method was therefore discarded as being unsuited for extensive study of browse utilization in the mountains of Virginia.

Line Intercept and Line Point Systems

The Line Intercept and Line Point systems of vegetation measurement have been widely used, especially in the western range states (Canfield, 1942, 1944). Canfield (1941) states that the advantages of the Line Intercept system over previous methods of range reconnaissance are: 1. Field measurements and compilation of data is faster than most systems (15 to 30 plots a day can be measured with a two-man crew). 2. Data obtained are based on actual measurements. 3. Personnel requires no specialized knowledge and need little training to obtain accurate results. 4. Reliability of the results may be determined statistically. 5. The results obtained by different operators are directly comparable.

Disadvantages of the Line Intercept and Line Point methods are: 1. Measurements must be exact and can often be tedious. 2. While the techniques may be more rapid than previous range measurement methods, they are still more time consuming

than visual estimates. 3. The number of samples than can be made is limited by the time it takes to measure each sample. 4. These techniques are best suited to a homogeneous population such as is found on the western grass plains. For example, a Line Point method developed in California (Dasmann, 1951) lists only five plant species on one of their sample record sheets; the number of plants in Virginia would be considerably greater.

In a trial run of the California Line Point system, it was found that when several strata of plants occurred above or below the line, as was generally true under Virginia conditions, then the total added up to more than 100 per cent. The system was evidently designed for use in open country where there was little likelihood of encountering vegetation growing on more than one level at the same point. When this system was tried out in the deer enclosure at Big Stony Creek, however, it was often found that an herb, a shrub, and a tree would be recorded over and under the same point which resulted in readings of three hundred per cent.

Further evaluation of the Line Intercept and Line Point systems was therefore discontinued as the systems were not considered adaptable to the heterogeneous vegetation conditions found in the mountainous areas of Virginia.

Aldous Method

The major advantages of the method developed by Aldous (1944) are: (1) measurements can be quickly recorded in the

field, and (2) it is a system designed specifically to measure the availability and utilization of deer browse plants.

The disadvantages of the method as pointed out by DeGarmo (1951) are: 1. Measurement accuracy is difficult if not impossible to determine. 2. Observations are based on personal judgement which is variable between individuals and may vary in the same individual from time to time. 3. Experience in estimating is necessary to acquire suitable accuracy. 4. Accuracy levels of a study may be disrupted by personnel changes. 5. Any bias on the part of the operator produces a cumulative error.

Table 1 lists the per cents of variation in average plant density which DeGarmo found in four Aldous Method samples run in West Virginia in 1950 and 1951. The sample plots had been undisturbed between observations and the differences in measurements were attributed to errors of estimation or to changes in basis of estimate. These findings, however, were not treated statistically to determine if these differences were significant.

Selection of a System for Study

In making the selection of methods to be considered for the measurement of deer browse, primary emphasis was given to the needs of the field biologist with a great many other duties to perform. This ruled out those systems which involved a great deal of time in setting up and making

measurements such as the Line Intercept and Line Point methods. Sample stratification and the preliminary work involved in setting up the system eliminated studies involving clipping measurements. The time required for clipping studies for the determination of plant use also ruled out the Krefting Method.

The Aldous Method appears to be the most promising technique. It is comparatively fast to handle in the field, and is specifically for the measurement of deer browse and is designed to supply the answers of most importance to the field biologist. If the disadvantages as brought out by DeGarmo could be demonstrated to be insignificant, that is, if the system really measures what it was designed for, despite differences in measurement recordings, then the Aldous Method would be well suited for use in measuring deer browse availability and utilization in the mountainous areas of Virginia. Consequently, the Aldous Method was selected as the technique for detailed study.

METHODS AND PROCEDURES

West Virginia Study

This study included work in West Virginia in order to collaborate with technicians who had been using the Aldous system as part of their investigations of deer range, and to obtain in the field data from an area where DeGarmo (1951) had reported a wide discrepancy in the findings of successive years (Table 1). These data were then analyzed statistically to determine if these recorded differences were significant.

Measurements were taken on the sample line established by DeGarmo in Tucker and Grant Counties, West Virginia, some ten miles east of Davis, West Virginia. The line went up the western side of Canaan Mountain in a northeast direction and extended partway down the east slope.

Measurements were taken on May 6, 1952. This was late enough to be able to measure the total amount of browse utilization for the winter and was early enough so that measurements were recorded before the new spring growth had started.

Operators making the measurements were Russell DeGarmo and John Gill of the Conservation Commission of West Virginia and Dr. Henry S. Mosby and the author of Virginia Polytechnic Institute. The West Virginia technicians had been working with their system for two years so could be considered to be

Table 1. Comparison of estimates of browse density as recorded by different observers using the Aldous Method, on four study areas in West Virginia, 1950 and 1951

Line	Total average density		Variation
	1950	1951	1950-1951
Stony Creek	41.2%	20.3%	-50.7%
Red Creek	22.8%	15.0%	-34.2%
Little Blackwater	23.6%	21.2%	-10.2%
Canaan Mountain	49.3%	35.7%	-27.5%

more experienced than the Virginia men who were familiar with it, but unpracticed in its applications.

System Modification. The West Virginia modification of the Aldous system attempts to minimize the differences in measurement as recorded between individuals. This was done by setting up definite standards for measurements of browse availability and utilization. The basic system calls for a visualization on the part of the operator of the plant before it had been browsed and then, after careful inspection, an estimation of the amount which had been removed by browsing. The per cent of browse available and its utilization is estimated as the percentage of a cylinder six feet in height with a basal area of $1/100$ acre. The West Virginia square foot density measurement is made by projecting to the ground the amount of area covered by each plant species within the $1/100$ acre circle. The density as recorded for each species is the total number of square feet of ground "covered" by the individual species throughout the $1/100$ acre plot.

In order to measure rather than estimate the browse utilized by deer, the total number of stems per plot were counted, and then the number of browsed stems counted. From these two data a percentage figure was calculated to indicate the utilization by deer.

Method of Operation. Observations were recorded on thirty 1/100 acre circular plots spaced eight chains apart. Each plot had been previously established and marked with a permanent stake.

Data from each plot were recorded on the form shown in Appendix Figure 1. This form, devised by the West Virginia technicians provides for notation of the character of the immediate vicinity of each plot as to direction of exposure, relative degree of slope, and cover type. All woody plants in a zone from one to six feet above the ground in each plot were measured. For each species a measurement was made of its density, and the extent of deer browsing on its last year's annual growth.

The method of taking and recording the several measurements was discussed in detail by the four man group before starting the field sampling. Following this discussion each investigator acted independently.

Analysis of Data. The data collected were treated in the standard manner as set up by Aldous (see Appendix Figure 3). The eight plants showing the highest utilization factor were then selected for analysis of variance tests to determine if the differences in measurement between operators possessed significance. The findings of these tests are presented in the section RESULTS AND DISCUSSION.

Barbour's Creek Salt Lick Study

The Barbour's Creek Salt Lick investigation was made to determine statistically the degree of differences in measurements between several operators with no previous experience in the use of the Aldous Method.

Operators making the measurements were graduate students of the Virginia Cooperative Wildlife Research Unit. They were J. H. McLaughlin, J. C. Harvey, N. R. Bowman III, D. R. Progulske, and the author.

All operators understood how the Aldous Method worked, but were inexperienced in making field estimates with it.

The salt lick about a mile from the home of Game Manager Bent Medley at Barbour's Creek in Craig County, Virginia was chosen for this study. The attraction of the lick for the deer in the vicinity created a localized heavy use condition where various degrees of browsing could be measured.

Measurements were made on March 7 and 12, 1952. This was at the end of the winter when maximum browsing should have occurred and before the new spring growth had begun.

Method of Operation. Two parallel lines of ten stations each were established one chain apart. The stations on each line were also established one chain apart. The center of each line was located within the heavily used salt lick area.

Estimates of availability and utilization were recorded on the standard form (Appendix Figure 2). The estimates were

made on a volume basis rather than on a square foot density basis. The operators worked independently with no collaboration.

Analysis of Data. The data collected were treated in the standard manner. The eight plants having the highest utilization factor figure were then selected for analysis of variance tests to determine if the differences in estimations between operators were significant. The findings of these tests are presented in the section RESULTS AND DISCUSSION.

Barbour's Creek Cabin Study

The reasons for this investigation were to obtain additional data for analysis to determine if the differences in estimations between operators were significant and to establish a permanent study line for remeasurement in the future.

The area chosen for study was at Barbour's Creek, Craig County, Virginia, in the vicinity of the Forest Service Cabin (see Figure 1). This made a convenient location and was one where deer were known to be and where existing vegetation was representative of the deer range in the Barbour's Creek drainage area.

Measurements were taken on May 16, 1952. This enabled the maximum deer browsing for the winter to be estimated.

Operators participating in the study were graduate students of the Virginia Cooperative Wildlife Research Unit

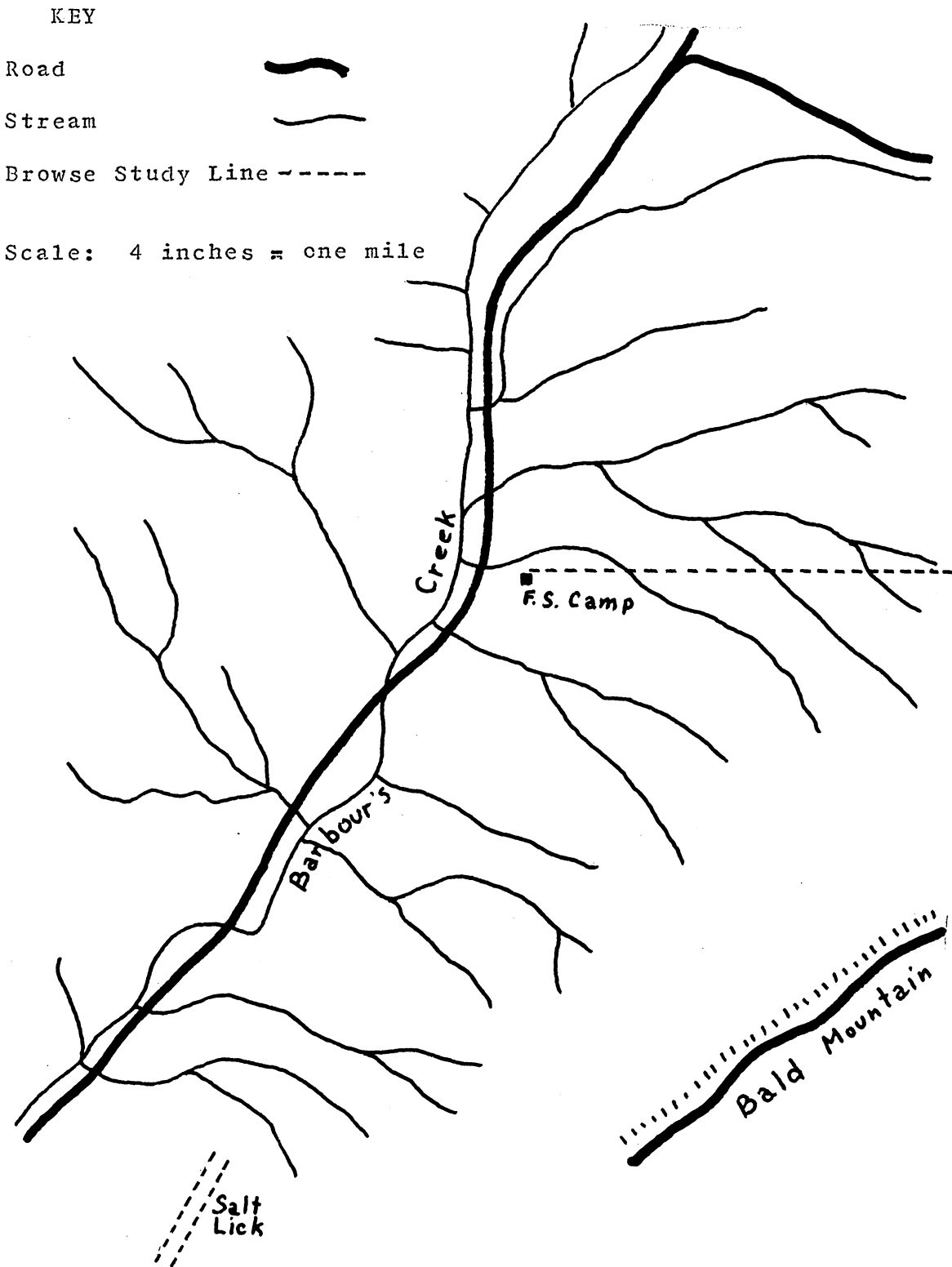


Figure 1. Location of deer browse study lines at Barbours's Creek Cabin and Barbours's Creek Salt Lick, Craig County, Virginia.

and the Unit Leader. They were N. R. Bowman III, J. C. Harvey, J. H. McLaughlin, W. C. Kellner, and Dr. H. S. Mosby.

Dr. Mosby was the more experienced of the group in the use of the Aldous system. While each of the other operators had been instructed on how to make measurements, they had taken measurements in only one previous study.

Method of Operation. A permanent browse study line was established in an easterly direction up the side of Bald Mountain. The line was forty-eight chains long with twelve stations, each plot being four chains apart. The first station was located fifty yards north of the Forest Service Cabin. Each station was marked with two yellow rings, one above the other, at chest height, on a tree or post. The line was blazed with yellow paint.

Measurements of availability and utilization were recorded on the form shown in Appendix Figure 2. These measurements were made on the square foot density basis after the manner of the West Virginia modification.

Analysis of Data. The data collected were treated in the standard manner. The six plants having the highest utilization factor figure were then selected for analysis of variance tests to determine if the differences in measurements between operators possessed significance. The findings of these tests are presented in the section RESULTS AND DISCUSSION.

Big Stony Enclosure

A study enclosure for deer was established for two reasons. The first was to test the Aldous System by using it to measure the availability and utilization of browse under changing conditions to see if these changes were adequately measured by the system. The second reason was to study the plant species which the deer preferred and measure the amounts and order in which they were taken.

A suitable site for an enclosure was selected in the Big Stony Creek area five miles from Gold Bond, Virginia. In addition to possessing a good selection of typical mountain plants and trees, it was ideally situated on a small stream and close to the home of Game Manager Lon Oliver who was able to keep a watch over the deer with a minimum of inconvenience. A road going past the area made the transportation of the deer a simple matter.

Construction of the deer enclosure was completed in February, 1952. Two one-half year old deer were placed in it on the twentieth of that month. Measurements on browse availability and utilization were taken through March and April until termination of the study.

Enclosure Construction. The enclosure dimensions were 110 by 100 feet, giving a total of 11,000 square feet, or about one-fourth acre. It was laid out on both sides of a small stream so as to insure a constant water supply.

Four foot hog fencing was used and erected two tiers high to give an eight foot fence (Figure 2). It was very tightly constructed, and the two tiers were held together with hog ringers spaced a foot apart. Growing trees were used for posts where possible with cut locust posts being used where necessary. Barbed wire was strung across the gullies and low spots to discourage stray dogs from attempting to dig under the fence.

Acquisition and Disposition of Deer. Two yearling deer, a buck and doe, were obtained from the Cumberland Game Farm (Figure 3). These deer had been picked up as orphans and raised at the Game Farm and were exceedingly tame. They very quickly adapted themselves to the enclosure and began feeding in typical deer fashion.

At the end of eight weeks the deer had consumed nearly all the available food in the enclosure, and had lost considerable flesh. This caused some complaint from the people of the area, so the study was terminated. As the deer were too tame to be released in the wild they were removed to the grounds of the Radford Arsenal at Radford, Virginia, where they could receive protection.

System Modifications. The standard Aldous Method was used to measure available and utilized browse, as well as two modifications of the system. One modification recorded estimates at ten per cent intervals, the other recorded estimates at

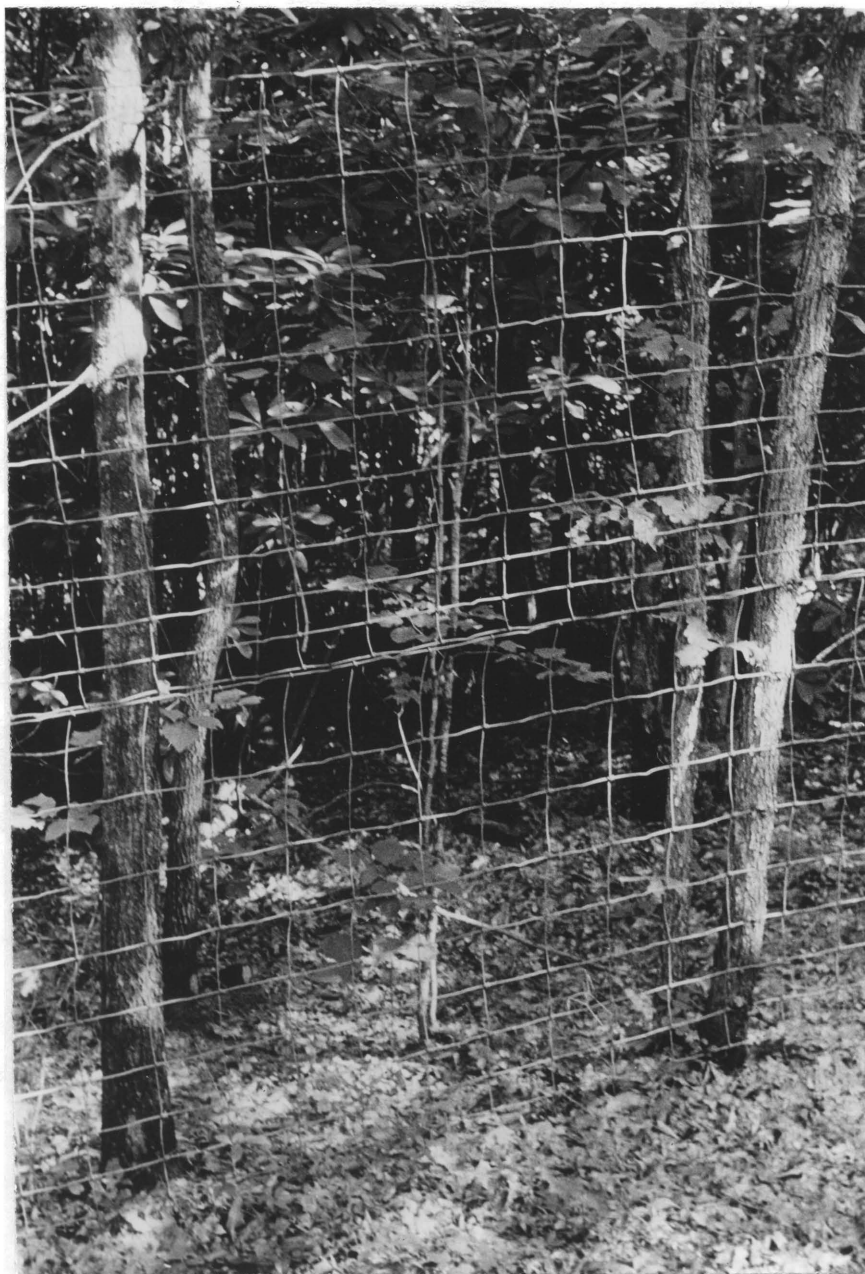


Figure 2. Two tiers of four foot hog-fencing were used to construct a deer enclosure in Giles County, Virginia.



Figure 3. Two deer were placed in the Big Stony enclosure in order to observe and measure their use of the available vegetation. (photo by H. S. Mosby)

the midpoints between the ten per cent intervals. These were compared directly with the results of the standard system to determine if the finer readings presented a better interpretation of range conditions.

Method of Operation. A stick 11.7 feet long was used to measure the radius of the sample plots whenever browse estimations were taken (Aldous, 1944). The dimensions of the enclosure allowed 16 sample plots each with an 11.7 foot diameter to be established. The centers of these plots were not permanently located as they were all adjoining and did not allow for shifting very far in any direction. Essentially, the identical shrubs and trees were included in each plot each time they were measured. The plots represented 64 per cent of the total enclosure (Figure 4).

Recordings were made on a standard form (Appendix Figure 2). Three different recordings of estimates were used as explained under System Modification. Readings were taken once a week except for the seventh week, which was missed because of sickness.

Estimates were made on a volume basis.

Analysis of Data. The data were treated as described by Aldous (1944) to obtain an interpretation of the deer range condition. The two modified techniques were then compared with the regular Aldous Method to determine if their interpretations were at variance. These results are presented under the section RESULTS AND DISCUSSION.

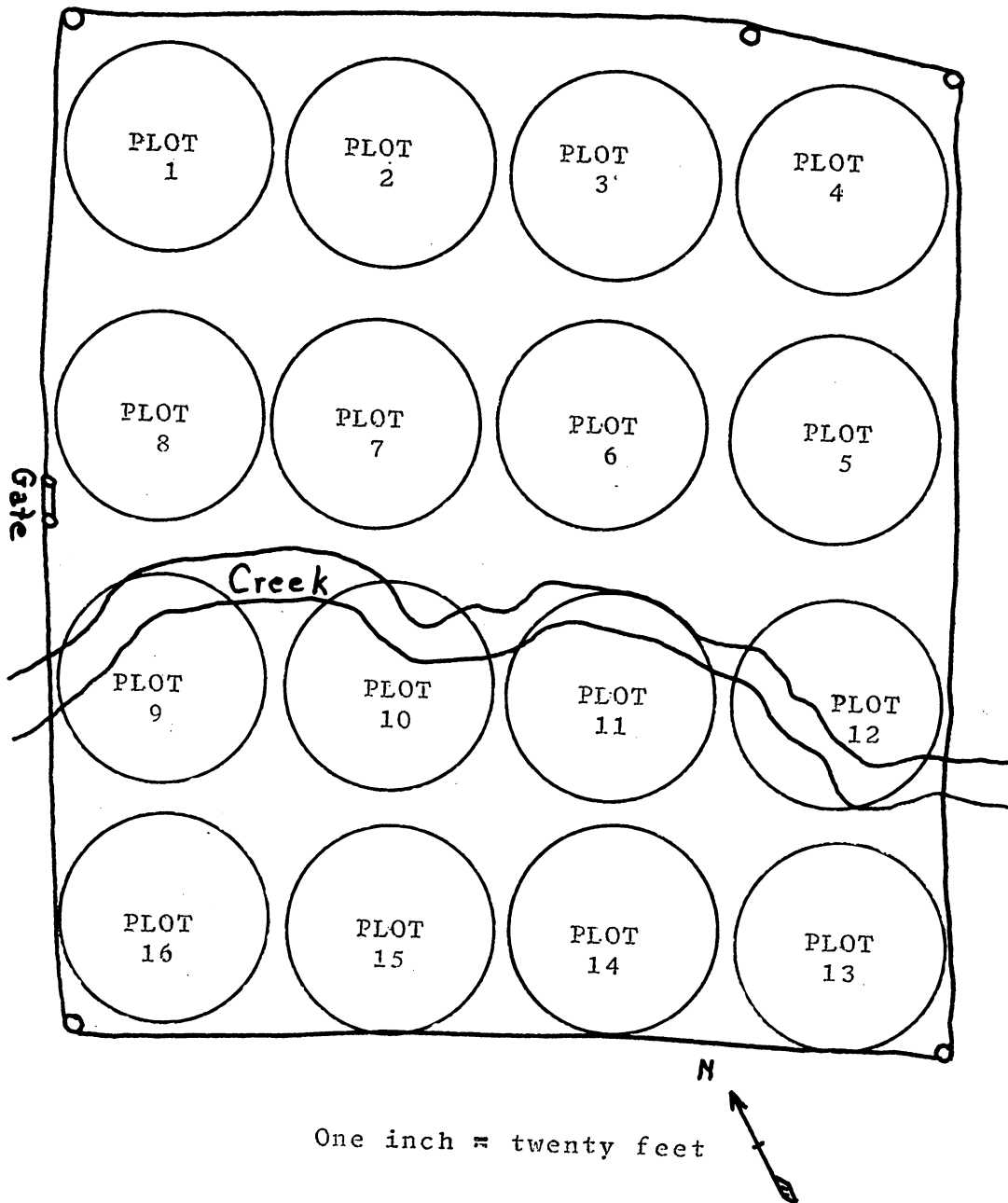


Figure 4. Diagram of Big Stony Creek deer enclosure locating 1/100 acre sample plots

RESULTS AND DISCUSSION

West Virginia Study

Results. Analysis of variance of "per cent of plots present" data (Table 2) showed no significant difference at either the 1 per cent or 5 per cent level between the measurements of the different operators. There was a great degree of difference, however, between plant species present.

Analysis of variance of "average density" data (Table 3) showed no significant difference between the measurements of the different operators, but did indicate a significant difference between the plant species density.

Analysis of variance of "average browsing" data (Table 4) showed a significant difference at the 5 per cent level, but not at the 1 per cent level, between the measurements of the different operators. There was a significant difference between the plant species browsed.

Analysis of variance of "utilization factor" data (Table 5) showed no significant difference at either the 1 per cent or the 5 per cent level between the measurements of the different operators. There was a significant difference between the utilization factor for different plant species.

Analysis of variance of "per cent of food eaten" data (Table 6) showed no significant difference at either the 1 per cent or the 5 per cent level between the measurements of

the different operators. The differences between plant species was significant at the 5 per cent level, but not at the 1 per cent level.

Analysis of variance of "per cent of browse available" data (Table 7) showed no significant difference at either the 1 per cent or the 5 per cent level between the measurements of the different operators, but a significant difference between the different plant species.

Discussion. The significant difference at the 5 per cent level in the "average browsing" data undoubtedly reflects some difference in the method of applying the standards of measurement. A greater familiarity with the method of measurement will bring about a closer agreement.

The square-foot density modification has an outstanding weakness (Dasman, 1948:192). In projecting plant density onto a square-foot plane, the three dimensional, or volume, aspects of vegetation are ignored. This method of showing plant density does not measure the browse present and the browse used, but merely gives an index of these two factors.

Smith (1944:441) in comparing estimates of density with clipping measurements, determined that there was a great difference in the results of the two systems and that square-foot density figures produced a very poor index of available browse, even within a single plant species.

Table 2. Results of analysis of variance of results obtained by measuring per cent of plots present of browse species by the Aldous Method in Tucker County, West Virginia, May 6, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	3	3.7636	1.2545	3.07	4.87	1.63
Species	7	7915.3634	1130.7662	2.49	3.65	1467.77
Error	21	16.1790	.7704	-----	-----	-----
Total	31	7935.3060	-----	-----	-----	-----

Table 3. Results of analysis of variance of results obtained by measuring average density by the Aldous Method in Tucker County, West Virginia, May 6, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	3	1.2286	.4095	3.07	4.87	.5154
Species	7	909.3815	129.9116	2.49	3.65	163.5342
Error	21	16.6830	.7944	----	----	----
Total	31	927.2931	----	----	----	----

Table 4. Results of analysis of variance of results obtained by measuring average browsing by the Aldous Method in Tucker County, West Virginia, May 6, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-value		Computed F
				F .05	F .01	
Men	3	324.2240	108.0747	3.07	4.87	3.63
Species	7	3654.6872	522.0982	2.49	3.65	17.52
Error	21	625.8225	29.8011	----	----	----
Total	31	4614.7337	-----	----	----	----

Table 5. Results of analysis of variance of results obtained by measuring utilization factor by the Aldous Method in Tucker County, West Virginia, May 6, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	3	2048.3210	682.7737	3.07	4.87	1.64
Species	7	12945.6147	1849.3735	2.49	3.65	4.45
Error	21	8731.9165	415.8005	----	----	----
Total	31	23725.8522	----	----	----	----

Table 6. Results of analysis of variance of results obtained by measuring per cent of food eaten by the Aldous Method in Tucker County, West Virginia, May 6, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-value		Computed F
				F .05	F .01	
Men	3	19.1820	6.3940	3.07	4.87	.1902
Species	7	810.1517	115.7359	2.49	3.65	3.4435
Error	21	705.7904	33.6090	-----	-----	-----
Total	31	1535.1241	-----	-----	-----	-----

Table 7. Results of analysis of variance of results obtained by measuring per cent of browse available by the Aldous Method in Tucker County, West Virginia, May 6, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-value		Computed F
				F .05	F .01	
Men	3	1.7302	.5767	3.07	4.87	.25
Species	7	2591.1836	370.1691	2.49	3.65	162.30
Error	21	47.8972	2.2808	----	----	----
Total	31	2640.8110	----	----	----	----

Schwan and Swift (1941:118) state that a square-foot density can not be a true index of browse availability because, (1) volume differences are not considered, (2) index figures for each species are in terms of a ratio and do not give a volume measurement of available browse, (3) even the measurement of plant density is difficult to determine because of the presence of older growth, unavailability of current growth and the layering of available browse.

The amount of browsing on each plot was converted into a percentage figure which gave a browsing index rather than a figure measuring the amount of browse utilized. No distinction was made on the amount of each twig that was browsed. A 5 per cent nibbling would be recorded the same as a 100 per cent utilization of the available browse for each twig.

Results of analysis of variance showed that although there were differences in the measurements made by the various operators participating in the 1952 study, these differences were not significant at either the 1 per cent or 5 per cent level, with the exception of the "average browsing" data. In view of this fact it would be advisable to subject the differences of the 1950-1951 West Virginia study, as determined by DeGarmo, to analysis of variance technique to determine if these differences are attributable to chance rather than to some error on the part of the Aldous Method or interpretation by the operators.

Barbour's Creek Salt Lick Study

Results. Analysis of variance of "per cent of plots present" data (Table 8) showed that there is no significant difference at either the 1 per cent or 5 per cent level between the measurements of the different operators. There is a significant difference, however, between the plant species recorded.

Analysis of variance of "average density" data (Table 9) showed no significant difference at either the 1 per cent or 5 per cent level between the measurements of the different operators. There is a significant difference in the average density of the plant species recorded at the 5 per cent level, but not at the 1 per cent level.

Analysis of variance of "average degree of browsing" data (Table 10) showed no significant difference between the measurements of the operators. There is a significant difference, however, in the "average degree of browsing" on the different plant species.

Analysis of variance of "utilization factor" data (Table 11) showed a significant difference in both the measurements of the different operators, and the utilization factors for the various plant species recorded.

Analysis of variance of "per cent of food eaten" data (Table 12) showed no significant difference between the measurements of the different operators. A significant difference does exist between the amounts of food eaten from the various plant species present.

Analysis of variance of "per cent of browse available" data (Table 13) showed no significant difference between the measurements of the different operators. A significant difference did exist at the 5 per cent level in the amounts of browse available of the different species, but not at the 1 per cent level.

Discussion. This study made use of the Aldous Method in its standard form which calls for an estimation on the part of the operator on a three-dimensional or volume basis. A mental picture of the unbrowsed tree or shrub must be re-created in the mind of the observer, and the amount of browse removed estimated. Such estimates, will of course be more variable than are those based on projecting to the ground the area covered by the browse into square feet and thus obtaining an index figure, and of obtaining a ratio of browsed to unbrowsed twigs. These greater variations, however, are taken into consideration by the analysis of variance technique when determination is made of the degree of significance of the variations. In the study involving inexperienced operators only, the "utilization factor" measurements showed a significant difference between different operators. This difference between inexperienced operators indicates that a familiarity with (1) normal shape and form of the plant species and (2) a standardized frame of reference resulting from continued practice with the Aldous Method will enable wildlife technicians to obtain data which are both consistent and comparable.

Table 8. Results of analysis of variance of results obtained by measuring per cent of plots present by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-value		Computed F
				F .05	F .01	
Men	4	163.5138	40.8785	2.71	4.07	.36
Species	7	4502.5708	643.2244	2.36	3.36	5.62
Error	28	3206.7485	114.5267	----	----	----
Total	39	7872.8331	----	----	----	----

Table 9. Results of analysis of variance of results obtained by measuring average density by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-value		Computed F
				F .05	F .01	
Men	4	73.1365	18.2841	2.71	4.07	1.43
Species	7	255.5479	36.5068	2.36	3.36	2.85
Error	28	359.2337	12.8297	----	----	----
Total	39	687.9181	----	----	----	----

Table 10. Results of analysis of variance of results obtained by measuring average degree of browsing by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-value		Computed F
				F .05	F .01	
Men	4	723.4660	180.8665	2.71	4.07	1.77
Species	7	2607.8193	372.5456	2.36	3.36	3.64
Error	28	2867.8432	102.4230	----	----	----
Total	39	6199.1285	----	----	----	----

Table 11. Results of analysis of variance of results obtained by measuring utilization factor by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952.

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-value		Computed F
				F .05	F .01	
Men	4	4679.9807	1169.9950	2.71	4.07	6.86
Species	7	7902.1672	1128.8810	2.36	3.36	6.62
Error	28	4773.4554	170.4806	-----	-----	-----
Total	39	17355.5032	-----	-----	-----	-----

Table 12. Results of analysis of variance of results obtained by measuring per cent of food eaten by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	4	50.0793	12.5198	2.71	4.07	.08
Species	7	3670.5257	524.3608	2.36	3.36	3.40
Error	28	4320.0393	154.2871	----	----	----
Total	39	8040.6443	----	----	----	----

Table 13. Results of analysis of variance of results obtained by measuring per cent of browse available by the Aldous Method at Barbour's Creek Salt Lick, Craig County, Virginia, March 7, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	4	23.5509	5.8877	2.71	4.07	.05
Species	7	2564.8493	366.4070	2.36	3.36	3.32
Error	28	3086.7022	110.2393	-----	-----	-----
Total	39	5675.1024	-----	-----	-----	-----

Barbour's Creek Cabin Study

Results. Analysis of variance of "per cent of plots present" data (Table 14) showed a significant difference between operators at the 5 per cent level, but not at the 1 per cent level. A very significant difference exists in the various plant species present.

Analysis of variance of "average density" data (Table 15) showed a significant difference between the measurements of the different operators as well as between the different plant species.

Analysis of variance of the "average degree of browsing" data (Table 16) showed no significant difference at either the 1 per cent or 5 per cent level between the measurements of the different operators. There was a significant difference between the plant species being browsed.

Analysis of variance of "utilization factor" data (Table 17) showed a significant difference (at the 5 per cent level, but not at the 1 per cent level) between the measurements of the different operators. There is a very significant difference between the utilization factors for the different plant species.

Analysis of variance of "per cent of food eaten" data (Table 18) showed no significant difference between the measurements of the different operators. There was a significant difference in the per cent of browsing on the different plant species.

Analysis of variance of "per cent of browse available" data showed no significant difference between the measurement of the different operators, but a significant difference existed between the plant species available.

Discussion. This study was made using the same modifications as were used in the West Virginia study. Measurements were made by the square-foot density method and the shortcomings of this method have been discussed previously.

Considering the unfamiliarity of four of the five operators with the field application of the Aldous Method, it is surprising that greater differences in making measurements did not occur than was the case. Significant differences did occur at the 5 per cent level, but not at the 1 per cent level for the "utilization factor" and "per cent of plots present". The greatest difference in measurements was for the "average density" figures.

A greater familiarity with (1) normal plant shape and (2) a standardized frame of reference resulting from continued practice with the Aldous Method will produce measurements which will be consistent and comparable.

Big Stony Enclosure

Results. The three modifications of the Aldous Method gave essentially the same results. Range condition and use are interpreted from the "per cent of food eaten" and "per cent of browse available" columns of the plot analysis forms

Table 14. Results of analysis of variance of results obtained by measuring per cent of plots present by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	4	329.7247	82.4311	2.87	4.43	3.16
Species	5	6373.1373	1274.6274	2.71	4.10	48.82
Error	20	522.1364	26.1068	----	----	----
Total	29	7224.9984	----	----	----	----

Table 15. Results of analysis of variance of results obtained by measuring average density by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	4	161.1400	40.2850	2.87	4.43	6.23
Species	5	1966.9665	393.3933	2.71	4.10	60.82
Error	20	129.3596	6.4679	----	----	----
Total	29	2257.4661	----	----	----	----

Table 16. Results of analysis of variance of results obtained by measuring average degree of browsing by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	4	45.1781	11.2945	2.87	4.43	1.02
Species	5	398.0940	79.6188	2.71	4.10	7.18
Error	20	221.7294	11.0865	----	----	----
Total	29	665.0015	----	----	----	----

Table 17. Results of analysis of variance of results obtained by measuring utilization factor by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	4	1363.0347	340.7587	2.87	4.43	3.71
Species	5	13933.5070	2786.7014	2.71	4.10	30.34
Error	20	1837.1013	91.8551	----	----	----
Total	29	17133.6430	----	----	----	----

Table 18. Results of analysis of variance of results obtained by measuring per cent of food eaten by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	4	87.5378	21.8845	2.87	4.43	.38
Species	5	5378.6169	1075.7214	2.71	4.10	18.81
Error	20	1143.7416	57.1871	----	----	----
Total	29	6609.8863	----	----	----	----

Table 19. Results of analysis of variance of results obtained by measuring per cent of browse available by the Aldous Method at Barbour's Creek, Craig County, Virginia, May 16, 1952

Source of variation	Degrees of freedom	Sums of squares	Mean square	F-values		Computed F
				F .05	F .01	
Men	4	67.2425	16.8106	2.87	4.43	.64
Species	5	5372.1040	1074.4208	2.71	4.10	41.09
Error	20	523.0175	26.1509	-----	-----	-----
Total	29	5962.3640	-----	-----	-----	-----

(Appendix Tables 1-21). In all three modifications the interpretation for use and occurrence was the same despite the small variation which occurred because of the nature of the modifications.

During the first week of their enclosure the deer fed on the herbaceous ground cover which consisted primarily of Mountain Teaberry, Gaultheria procumbens, Mayflower, Epigea repens and the various young fern shoots. Browse plants utilized during this early period were Witch Hazel, Hamemalis virginiana, Sassafras, Sassafras albidum, Mountain Laurel, Kalmia latifolia, White Pine, Pinus strobus, Flowering Dogwood, Cornus florida, and Rhododendron, Rhododendron maximum. Feeding on these plants did not reach the point where it could be measured in ten per cent intervals until the second week. At the end of six weeks the deer had created a distinct browse line, having eaten everything up to five feet. They were not yet "reaching" for food. The deer had lost some flesh by this time and were constantly hungry.

By the end of eight weeks they had eaten everything palatable that they could reach by standing up on their hind legs.

Discussion. The standard Aldous Method is to be preferred over the two modifications tested. Although the method records in relatively coarse measurements of light, medium, and heavy, the interpretation is still the same as when recordings are

made in the finer ten per cent intervals. The greater accuracy in numbers obtained by using the ten per cent intervals of recording is not warranted because of the extra time it takes in the field making the measurements. If a ten per cent interval technique should be used it should record at the midpoint of the interval (5, 15, 25, 35, etc.) so that the plants which may be present only in small percentages will be recorded. Many such plants may be highly significant as indicator plants.

At the end of the first measuring period the pattern of plant utilization had become firmly established. Rhododendron, Rhododendron maximum (see Figure 5) furnished the greater part of the diet, with Flowering Dogwood, Cornus florida, Witch-Hazel, Hamemalis virginiana, Mountain Laurel, Kalmia latifolia, and Sassafras, Sassafras albidum constituting the plants which were of secondary importance. As the less available plants were eaten up the more available Rhododendron, Rhododendron maximum, made up an increasingly larger part of the food taken.



Figure 5. All available *Rhododendron maximum* had been browsed within the enclosure up to a height of five feet.

SUMMARY AND CONCLUSIONS

In order to successfully manage a deer herd in relation to its range the wildlife biologist must be able to determine the availability and utilization of browse on that range. The Aldous Method has been designed for this purpose. It is based on a visual estimation, however, on the part of the operator, and has been criticized by field workers on the grounds that these estimations between workers or by the same worker at different times tends to be too variable for comparison.

Other systems have been devised based on Line Intercept and Line Point systems of vegetation study, and on the actual measurement of browse clippings. The Line Intercept and Line Point systems are not adaptable to a forest possessing several strata of plants while the measurement of browse clippings is too tedious and time consuming to allow extensive sampling.

The Aldous Method was selected for study to determine if it provided information which was valid and consistent.

One study was made by four operators on a browse line which had been established in Tucker County, West Virginia by the Conservation Commission of West Virginia. Analysis of variance techniques were applied to the findings of the operators and showed a significant difference to exist in only the "average browsing" data.

In study made on the salt lick area at Barbour's Creek in Craig County, Virginia with five operators, analysis of

variance techniques applied to the data showed a significant difference only in the "utilization factor".

Data obtained at Barbour's Creek Cabin by five operators, when subjected to analysis of variance technique, showed significant differences to exist in the computations of "per cent of plots present", "average density", and "utilization factor". These differences, however, were not great.

Recordings made over a period of eight weeks of the browse availability and utilization in a deer enclosure containing two deer in Giles County, Virginia, were consistent and adequately portrayed the conditions as they existed.

Instances in which significant differences did appear can be explained by the inexperience of the operators in applying the system. A familiarity with (1) the normal forms of the different plant species, and (2) a standardized frame of reference resulting from continued practice with the Aldous Method will enable operators to obtain data which are both consistent and comparable.

The standard recording technique of the Aldous Method is to be preferred over any attempted refinements. It allows a more rapid sampling to be done and adequately records both the availability and use of the plants.

Plant species which were preferred in the early stages of the deer enclosure study were: Mountain Teaberry, Gaultheria procumbens, Mayflower, Epigea repens, various ferns, Witch-Hazel,

Hamemalis virginiana, Sassafras, Sassafras albidum, Mountain Laurel, Kalmia latifolia, White Pine, Pinus strobus, Flowering Dogwood, Cornus florida, and Rhododendron, Rhododendron maximum.
By the end of the second week of enclosure the two deer had already established their pattern of browse utilization which changed only slightly during the rest of the study.

LITERATURE CITED

- Aldous, Shaler E. 1944. A deer browse survey method. Jour. Mamm., 25(2):130-136.
- Bartlett, I. H. 1950. Michigan deer. Game Division, Michigan Dept. of Conservation.
- Canfield, R. H. 1941. Application of the line interception method in sampling range vegetation. Jour. For. 39(4):388-394.
- Canfield, R. H. 1942. Sampling ranges by the line interception method. Southwestern Forest and Range Experimental Sta. Report No. 4. 28 pp. mimeo.
- Canfield, R. H. 1944. Measurement of grazing use by the line interception method. Jour. For., 42(3):192-194.
- Dasmann, W. P. 1951. Some deer range survey methods. Calif. Fish and Game. 37(1):43-52.
- DeGarmo, W. R. 1951. Quarterly Progress Report 25-R-2. (July 17, 1951). Conservation Comm. of West Virginia, Charleston, W. Va., 31 pp.
- Gill, John D. 1951. The 1950 West Virginia special deer season. Proceedings of the Northeastern Fish and Wildlife Conference 1951. (mimeograph).
- Krefting, L. W. undated. Plan for recording vegetation in deer exclosures and control plots. mimeo.
- Latham, Roger M. 1950. Pennsylvania's deer problem. Pennsylvania Game News, Special Issue No. 1. September, 1950.

Muncy, Robert J. 1954. The status of the white-tailed deer in Bath County, Virginia. Unpub. Master's thesis, Virginia Polytechnic Institute, Blacksburg, Virginia, 76 pp.

**The vita has been removed from
the scanned document**

APPENDIX

Appendix Figure 1. West Virginia version of the Aldous
Method deer range browse analysis
form

County _____ Drainage _____
 Start Point _____
 Date _____ Compass Bearing _____
 Total No. Plots _____ Interval between Plots: _____ chains
 By _____ End Point _____

Plot number	1	2	3	4	5	6	7	8	9	10
Type										
Slope										

Percentage Class	0	Tr-10	11-30	31-50	51-70	71-100
Browsing	0	5	20	40	60	85
Density	0	5	20	40	60	85
Area in Sq. Ft.	0	0-46	47-132	133-120	221-308	309-436

Appendix Figure 2. Aldous Method deer range recording form

Name of Yard Forest
 Yard No. County
 Date of Survey Location
 Type Miles to Nearest Road
 Plot Size Surveyors

SPECIES	PLOT NUMBERS (DENSITY OVER BROWSING)										TOTALS
	1	2	3	4	5	6	7	8	9	10	

DENSITY
 D-dominant (50% or more)
 M-moderate (10%-50%)
 S-sparse (trace-10%)

BROWSING
 H-heavy (more than 50%)
 M-moderate (10%-50%)
 L-light (Trace-10%)
 O-no browsing

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILIZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE

Calculation of data: (Column 1) No. plots with species present divided by total no plots; (Column 2) Average per cent of plots covered by indicated species; (Column 3) The average per cent of species browsed by deer in all plots; (Column 4) Product of columns 2 and 3; (Column 5) Total of column 4 divided into the utilization factor for the individual plant species; (Column 6) Total of column 2 divided into the average density for individual species.

Area analysed _____ Location _____
 Date plots examined _____ Total number of plots _____
 Size per plot _____ Plots examined by _____
 Analysis by _____ Remarks _____

Appendix Table 1. Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure March 5, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	50.0	0.	.0	.0	.0	.0
<i>Alnus rugosa</i>	12.5	1.25	.0	.0	.0	2.40
<i>Betula lenta</i>	25.0	0.	.0	.0	.0	.0
<i>Cornus florida</i>	56.25	4.4	2.2	9.68	2.04	8.46
<i>Diospyros virginiana</i>	6.25	0.	.0	.0	.0	.0
<i>Hamamelis virginiana</i>	37.5	3.8	11.7	44.46	9.39	7.31
<i>Kalmia latifolia</i>	12.5	0.	80.0	.0	.0	.0
<i>Oxydendron arboreum</i>	18.75	0.	0.	.0	.0	.0
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	18.75	0.	20.0	.0	.0	.0
<i>Quercus alba</i>	0.					
<i>Rhododendron maximum</i>	56.25	41.9	10.0	419.0	88.55	80.65
<i>Salix nigra</i>	6.25	.6	.0	.0	.0	1.15
<i>Sassafras albidum</i>	50.0	0.	65.0	.0	.0	.0
<i>Smilax albidum</i>	0.					
<i>Tsuga canadensis</i>	56.25	0.	1.1	.0	.0	.0
<i>Vaccinium sp.</i>	43.75	0.	.0	.0	.0	.0
		51.95		473.14		

Appendix Table 2. Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure March 12, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	50.0	0.	2.5	.0	.0	.0
<i>Alnus rugosa</i>	12.5	1.25	5.0	6.25	.26	2.40
<i>Betula lenta</i>	25.0	0.	10.0	.0	.0	.0
<i>Cornus florida</i>	56.25	4.4	20.0	88.0	3.74	8.46
<i>Diospyros virginiana</i>	6.25	0.	.0	.0	.0	.0
<i>Hamamelis virginiana</i>	37.5	3.8	26.7	101.46	4.31	7.31
<i>Kalmia latifolia</i>	12.5	0.	80.0	.0	.0	.0
<i>Oxydendron arboreum</i>	18.75	0.	.0	.0	.0	.0
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	18.75	0.	46.7	.0	.0	.0
<i>Quercus alba</i>	0.					
<i>Rhododendron maximum</i>	56.25	41.9	51.1	2141.09	91.15	80.65
<i>Salix nigra</i>	6.25	.6	20.0	12.0	.51	1.15
<i>Sassafras albidum</i>	25.0	0.	70.0	.0	.0	.0
<i>Smilax albidum</i>	0.					
<i>Tsuga canadensis</i>	56.25	0.	8.9	.0	.0	.0
<i>Vaccinium sp.</i>	43.75	0.	.0	.0	.0	.0
		51.95		2348.80		

Appendix Table 3. Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure March 19, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
Acer rubrum	50.0	0.	27.5	.0	.0	.0
Alnus rugosa	12.5	1.25	15.0	18.75	.51	2.40
Betula lenta	25.0	0.	22.5	.0	.0	.0
Cornus florida	56.25	4.4	34.4	151.36	4.12	8.46
Diospyros virginiana	6.25	0.	.0	.0	.0	.0
Hamamelis virginiana	37.5	3.8	43.3	164.54	4.48	7.31
Kalmia latifolia	12.5	0.	80.0	.0	.0	.0
Oxydendron arboreum	18.75	0.	13.3	.0	.0	.0
Pinus rigida	0.					
Pinus Strobus	18.75	0.	70.0	.0	.0	.0
Quercus alba	0.					
Rhododendron maximum	56.25	41.9	78.9	3305.91	90.06	80.65
Salix nigra	6.25	.6	50.0	30.0	.81	1.15
Sassafras albidum	25.0	0.	75.0	.0	.0	.0
Smilax albidum	0.					
Tsuga canadensis	56.25	0.	25.6	.0	.0	.0
Vaccinium sp.	43.75	0.	5.7	.0	.0	.0
		51.95		3670.56		

Appendix Table 4. Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure March 24, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
Acer rubrum	37.5	0.	18.3	.0	.0	.0
Alnus rugosa	12.5	.6	15.0	9.0	.25	1.35
Betula lenta	12.5	0.	40.0	.0	.0	.0
Cornus florida	50.0	3.8	28.8	109.44	3.08	8.55
Diospyros virginiana	6.25	0.	.0	.0	.0	.0
Hamamelis virginiana	43.75	1.9	57.1	108.49	3.05	4.27
Kalmia latifolia	12.5	0.	90.0	.0	.0	.0
Oxydendron arboreum	25.0	0.	15.0	.0	.0	.0
Pinus rigida	0.					
Pinus Strobus	18.75	0.	56.7	.0	.0	.0
Quercus alba	0.	0.	.0	.0	.0	.0
Rhododendron maximum	56.25	37.5	87.8	3292.5	92.76	84.45
Salix nigra	6.25	.6	50.0	30.0	.84	1.35
Sassafras albidum	25.0	0.	75.0	.0	.0	.0
Smilax albidum	0.					
Tsuga canadensis	43.75	0.	34.3	.0	.0	.0
Vaccinium sp.	37.5	0.	13.3	.0	.0	.0
		44.4		3549.43		

Appendix Table 5. Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure April 3, 1952.

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	6.25	0.	100.0	.0	.0	.0
<i>Alnus rugosa</i>	12.5	.6	45.0	27.0	.64	1.17
<i>Betula lenta</i>	25.0	0.	82.5	.0	.0	.0
<i>Cornus florida</i>	50.0	3.1	31.1	96.41	2.30	6.06
<i>Diospyros virginiana</i>	0.					
<i>Hamamelis virginiana</i>	31.25	3.1	60.0	186.0	4.43	6.06
<i>Kalmia latifolia</i>	6.25	0.	90.0	.0	.0	.0
<i>Oxydendron arboreum</i>	18.75	0.	16.7	.0	.0	.0
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	6.25	.6	60.0	36.0	.85	1.17
<i>Quercus alba</i>	6.25	0.	80.0	.0	.0	.0
<i>Rhododendron maximum</i>	62.5	42.5	89.0	3782.5	90.29	83.17
<i>Salix nigra</i>	6.25	.6	90.0	54.	1.28	1.17
<i>Sassafras albidum</i>	18.75	0.	93.3	.0	.0	.0
<i>Smilax albidum</i>	0.					
<i>Tsuga canadensis</i>	56.25	0.	37.8	.0	.0	.0
<i>Vaccinium sp.</i>	31.25	.6	12.0	7.2	.17	1.17
		51.1		4189.11		

Appendix Table 6. Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure April 10, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
Acer rubrum	6.25	0.	.0	.0	.0	.0
Alnus rugosa	12.5	.6	5.0	3.	.06	1.21
Betula lenta	12.5	0.	60.0	.0	.0	.0
Cornus florida	43.75	4.4	45.7	201.08	4.67	8.91
Diospyros virginiana	0.					
Hamamelis virginiana	31.25	1.25	46.0	57.5	1.33	2.53
Kalmia latifolia	12.5	0.	95.0	.0	.0	.0
Oxydendron arboreum	12.5	0.	20.0	.0	.0	.0
Pinus rigida	0.					
Pinus Strobus	6.25	.6	30.0	18.0	.41	1.21
Quercus alba	0.					
Rhododendron maximum	56.25	41.9	95.6	4005.64	93.11	84.90
Salix nigra	6.25	0.	100.0	.0	.0	.0
Sassafras albidum	12.5	0.	100.0	.0	.0	.0
Smilax albidum	0.					
Tsuga canadensis	43.75	0.	40.0	.0	.0	.0
Vaccinium sp.	31.25	.6	28.0	16.8	.39	1.21
		49.35		4302.02		

Appendix Table 7. Analysis of data recorded by the Aldous Method, 10 per cent modification, in the Big Stony deer enclosure April 20, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	31.25	0.	100.0	.0	.0	.0
<i>Alnus rugosa</i>	12.5	0.	100.0	.0	.0	.0
<i>Betula lenta</i>	31.25	0.	100.0	.0	.0	.0
<i>Cornus florida</i>	37.5	1.9	96.7	183.73	3.69	3.74
<i>Diospyros virginiana</i>	0.					
<i>Hamamelis virginiana</i>	18.75	.6	100.0	60.0	1.20	1.18
<i>Kalmia latifolia</i>	6.25	0.	90.0	.0	.0	.0
<i>Oxydendron arboreum</i>	18.75	0.	26.7	.0	.0	.0
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	12.5	0.	20.0	.0	.0	.0
<i>Quercus alba</i>	6.25	0.	100.0	.0	.0	.0
<i>Rhododendron maximum</i>	62.5	46.3	100.0	4630.0	93.11	91.32
<i>Salix nigra</i>	6.25	0.	100.0	.0	.0	.0
<i>Sassafras albidum</i>	12.5	0.	100.0	.0	.0	.0
<i>Smilax albidum</i>	0.					
<i>Tsuga canadensis</i>	43.75	0.	40.0	.0	.0	.0
<i>Vaccinium sp.</i>	31.25	1.9	52.0	98.8	1.98	3.74
		50.7		4972.53		

Appendix Table 8. Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stoney deer enclosure, March 5, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
Acer Rubrum	50.0	2.5	5.0	12.5	1.24	3.54
Alnus rugosa	12.5	1.9	5.0	9.5	.94	2.69
Betula lenta	25.0	1.25	5.0	6.25	.62	1.77
Cornus florida	56.25	6.6	7.2	47.52	4.72	9.36
Diospyros virginiana	6.25	.3	5.0	1.5	.14	.42
Hamamelis virginiana	37.5	5.6	16.7	93.52	9.29	7.94
Kalmia latifolia	12.5	.6	85.0	51.0	5.06	.85
Oxydendron arboreum	18.75	.9	5.0	4.5	.44	1.27
Pinus rigida	0.0					
Pinus Strobus	18.75	.9	25.0	22.5	2.23	1.27
Quercus alba	0.0					
Rhododendron maximum	56.25	42.8	15.0	642.0	63.79	60.70
Salix nigra	6.25	.9	5.0	4.5	.44	1.27
Sassafras albidum	25.0	1.25	67.5	84.38	8.38	1.77
Smilax albidum	0.0					
Tsuga canadensis	56.25	2.8	5.6	15.68	1.55	3.97
Vaccinium sp.	43.75	2.2	5.0	11.0	1.09	2.93
		70.5		1006.35		

Appendix Table 9. Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, March 12, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE OF BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	50.0	2.5	7.5	18.75	.61	3.54
<i>Alnus rugosa</i>	12.5	1.9	10.0	19.0	.62	2.69
<i>Betula lenta</i>	25.0	1.25	15.0	18.75	.61	1.77
<i>Cornus florida</i>	56.25	6.6	25.0	165.0	5.38	9.36
<i>Diospyros virginiana</i>	6.25	.3	5.0	1.5	.04	.42
<i>Hamamelis virginiana</i>	37.25	5.6	31.7	177.52	5.79	7.94
<i>Kalmia latifolia</i>	12.5	.6	85.0	51.0	1.66	.85
<i>Oxydendron arboreum</i>	18.75	.9	5.0	4.5	.14	1.27
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	18.75	.9	51.7	46.53	1.51	1.27
<i>Quercus alba</i>	0.					
<i>Rhododendron maximum</i>	56.25	42.8	56.1	2401.08	78.37	60.70
<i>Salix nigra</i>	6.25	.9	25.0	22.5	.73	1.27
<i>Sassafras albidum</i>	25.0	1.25	70.0	87.5	2.85	1.77
<i>Smilax albidum</i>	0.					
<i>Tsuga canadensis</i>	56.25	2.8	13.9	38.92	1.27	3.97
<i>Vaccinium sp.</i>	43.75	2.2	5.0	11.0	.35	2.93
		70.5		3063.55		

Appendix Table 10. Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stoney deer enclosure, March 19, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
Acer Rubrum	50.0	2.5	31.3	78.25	1.69	3.54
Alnus rugosa	12.5	1.9	20.0	38.0	.82	2.69
Betula lenta	25.0	1.25	27.5	34.38	.74	1.77
Cornus florida	56.25	6.6	39.4	260.04	5.64	9.36
Diospyros virginiana	6.25	.3	.0	.0	.0	.42
Hamamelis virginiana	37.5	5.6	48.3	270.48	5.87	7.94
Kalmia latifolia	12.5	.6	85.0	51.0	1.10	.85
Oxydendron arboreum	18.75	.9	18.3	16.47	.35	1.27
Pinus rigida	0.					
Pinus Strobus	18.75	.9	75.0	67.5	1.46	1.27
Quercus alba	0.					
Rhododendron maximum	56.25	42.8	82.7	3539.56	76.86	60.70
Salix nigra	6.25	.9	55.0	49.5	1.07	1.27
Sassafras albidum	25.0	1.25	72.5	90.63	1.96	1.77
Smilax albidum	0.					
Tsuga canadensis	56.25	2.8	30.6	85.68	1.86	3.97
Vaccinium sp.	43.75	2.2	10.7	23.54	.51	2.93
		70.5		4605.03		

Appendix Table 11. Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, March 24, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	37.5	1.9	23.3	44.27	.98	3.04
<i>Alnus rugosa</i>	12.5	1.25	20.0	25.0	.55	2.00
<i>Betula lenta</i>	12.5	.6	45.0	27.0	.60	.96
<i>Cornus florida</i>	50.0	5.6	35.0	196.0	4.37	8.96
<i>Diospyros virginiana</i>	6.25	.3	5.0	1.5	.03	.48
<i>Hamamelis virginiana</i>	43.75	4.1	60.7	248.87	5.55	6.56
<i>Kalmia latifolia</i>	12.5	.6	90.0	54.0	1.20	.96
<i>Oxydendron arboreum</i>	25.0	1.25	20.0	25.0	.55	2.00
<i>Pinus rigida</i>	0.0					
<i>Pinus Strobus</i>	18.75	.9	61.7	55.53	1.24	1.44
<i>Quercus alba</i>	12.5	.6	5.0	3.0	.06	.96
<i>Rhododendron maximum</i>	56.25	39.1	90.6	3542.46	79.00	62.61
<i>Salix nigra</i>	6.25	.9	55.0	49.5	1.10	1.44
<i>Sassafras albidum</i>	25.0	1.25	72.5	90.63	2.02	2.00
<i>Smilax albidum</i>	0.0					
<i>Tsuga canadensis</i>	43.75	2.2	39.3	86.46	1.92	3.52
<i>Vaccinium sp.</i>	37.5	1.9	18.3	34.77	.77	3.04
		62.45		4483.99		

Appendix Table 12. Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, April 3, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	6.25	.3	95.0	28.5	.54	.45
<i>Alnus rugosa</i>	12.5	1.25	50.0	62.5	1.19	1.89
<i>Betula lenta</i>	25.0	1.25	87.5	109.38	2.09	1.89
<i>Cornus florida</i>	50.0	5.6	40.0	224.0	4.28	8.47
<i>Diospyros virginiana</i>	0.0					
<i>Hamamelis virginiana</i>	31.25	4.1	63.0	258.3	4.94	6.20
<i>Kalmia latifolia</i>	6.25	.3	95.0	28.5	.54	.45
<i>Oxydendron arboreum</i>	18.75	.9	21.7	19.53	.37	1.36
<i>Pinus rigida</i>	0.0					
<i>Pinus Strobus</i>	6.25	.9	65.0	58.5	1.11	1.36
<i>Quercus alba</i>	6.25	.3	85.0	25.5	.48	.45
<i>Rhododendron maximum</i>	62.5	44.4	92.0	4084.8	78.13	67.17
<i>Salix nigra</i>	6.25	.9	95.0	85.5	1.63	1.36
<i>Sassafras albidum</i>	18.75	.9	95.0	85.5	1.63	1.36
<i>Smilax albidum</i>	0.0					
<i>Tsuga canadensis</i>	56.25	2.8	42.8	119.84	2.29	4.23
<i>Vaccinium sp.</i>	31.25	2.2	17.0	37.4	.71	3.32
		66.1		5227.75		

Appendix Table 13. Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, April 10, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	6.25	.3	5.	1.5	.03	.49
<i>Alnus rugosa</i>	12.5	1.25	10.0	12.5	.25	2.04
<i>Betula lenta</i>	12.5	.6	60.0	36.0	.73	.98
<i>Cornus florida</i>	43.75	6.6	49.3	325.38	6.66	10.79
<i>Diospyros virginiana</i>	0.0					
<i>Hamamelis virginiana</i>	31.25	2.8	49.0	138.04	2.82	4.57
<i>Kalmia latifolia</i>	12.5	.6	95.0	57.0	1.16	.98
<i>Oxydendron arboreum</i>	12.5	.6	25.0	15.0	.30	.98
<i>Pinus rigida</i>	0.0					
<i>Pinus Strobus</i>	6.25	.9	35.0	31.5	.64	1.47
<i>Quercus alba</i>	0.0					
<i>Rhododendron maximum</i>	56.25	42.2	95.0	4009.0	82.10	69.01
<i>Salix nigra</i>	6.25	.3	95.0	28.5	.58	.49
<i>Sassafras albidum</i>	12.5	.6	95.0	57.0	1.16	.98
<i>Smilax albidum</i>	0.0					
<i>Tsuga canadensis</i>	43.75	2.2	45.0	99.0	2.02	3.59
<i>Vaccinium sp.</i>	31.25	2.2	33.0	72.6	1.48	3.59
		61.15		4883.02		

Appendix Table 14. Analysis of data recorded by the Aldous Method, 10 per cent midpoint modification, in the Big Stony deer enclosure, April 20, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	31.25	1.6	95.0	152.0	2.59	2.45
<i>Alnus rugosa</i>	12.5	.6	95.0	57.0	.97	.91
<i>Betula lenta</i>	31.25	1.6	95.0	152.0	2.59	2.45
<i>Cornus florida</i>	37.5	3.8	93.3	354.54	6.05	5.81
<i>Diospyros virginiana</i>	0.0					
<i>Hamamelis virginiana</i>	18.75	1.6	95.0	152.0	2.59	2.45
<i>Kalmia latifolia</i>	6.25	.3	95.0	28.5	.48	.45
<i>Oxydendron arboreum</i>	18.75	.9	31.7	28.53	.48	1.37
<i>Pinus rigida</i>	0.0					
<i>Pinus Strobus</i>	12.5	.6	25.0	15.0	.25	.91
<i>Quercus alba</i>	6.25	.3	95.0	28.5	.48	.45
<i>Rhododendron maximum</i>	62.5	47.5	95.0	4512.5	77.10	72.74
<i>Salix nigra</i>	6.25	.3	95.0	28.5	.48	.45
<i>Sassafras albidum</i>	12.5	.6	95.0	57.0	.97	.91
<i>Smilax albidum</i>	0.0					
<i>Tsuga canadensis</i>	43.75	2.2	45.0	99.0	1.69	3.36
<i>Vaccinium sp.</i>	31.25	3.4	55.0	187.0	3.19	5.28
		65.3		5852.07		

Appendix Table 15. Analysis of data recorded by the Aldous Method in the Big Stony deer enclosure, March 5, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	50.0	2.5	1.3	3.75	.51	3.96
<i>Alnus rugosa</i>	12.5	2.2	.0	.0	.0	3.49
<i>Betula lenta</i>	25.0	1.25	1.3	1.63	.25	1.98
<i>Cornus florida</i>	56.25	5.9	5.0	29.5	4.66	9.36
<i>Diospyros virginiana</i>	6.25	.3	.0	.0	.0	.47
<i>Hamamelis virginiana</i>	37.5	6.6	13.3	87.78	13.88	10.47
<i>Kalmia latifolia</i>	12.5	.6	70.0	42.0	6.64	.95
<i>Oxydendron arboreum</i>	18.75	.9	.0	.0	.0	1.42
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	18.75	.9	21.6	19.44	3.07	1.42
<i>Quercus alba</i>	0.					
<i>Rhododendron maximum</i>	56.25	35.3	10.6	374.18	59.17	56.03
<i>Salix nigra</i>	6.25	.3	5.0	1.5	.23	.47
<i>Sassafras albidum</i>	25.0	1.25	52.5	65.25	10.31	1.98
<i>Smilax albidum</i>	0.					
<i>Tsuga canadensis</i>	56.25	2.8	2.8	7.84	1.23	4.44
<i>Vaccinium sp.</i>	43.75	2.2	.0	.0	.0	3.49
		63.0		632.37		

Appendix Table 16. Analysis of data recorded by the Aldous Method in the Big Stony deer enclosure, March 12, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	50.0	2.5	11.9	29.75	1.24	3.92
<i>Alnus rugosa</i>	12.5	2.2	2.5	5.5	.22	3.45
<i>Betula lenta</i>	25.0	1.25	7.5	9.38	.39	1.96
<i>Cornus florida</i>	56.25	7.5	22.8	171.0	7.14	11.77
<i>Diospyros virginiana</i>	6.25	.3	.0	.0	.0	.47
<i>Hamamelis virginiana</i>	37.5	6.6	30.8	203.28	8.49	10.36
<i>Kalmia latifolia</i>	12.5	.6	70.0	42.0	1.75	.94
<i>Oxydendron arboreum</i>	18.75	.9	5.0	4.5	.18	1.41
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	18.75	.9	56.6	50.94	2.12	1.41
<i>Quercus alba</i>	0.					
<i>Rhododendron maximum</i>	56.25	32.8	52.2	1712.16	71.54	51.49
<i>Salix nigro</i>	6.25	1.9	30.0	57.0	2.38	2.98
<i>Sassafras albidum</i>	25.0	1.25	52.5	65.63	2.74	1.96
<i>Smilax albidum</i>						
<i>Tsuga canadensis</i>	56.25	2.8	15.0	42.0	1.75	4.39
<i>Vaccinium sp.</i>	43.75	2.2	.0	.0	.0	3.45
		63.7		2393.14		

Appendix Table 17. Analysis of data recorded by the Aldous Method in the Big Stony deer enclosure, March 19, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	50.0	2.5	20.0	50.0	1.61	4.15
<i>Alnus rugosa</i>	12.5	2.2	17.5	38.5	1.24	3.65
<i>Betula lenta</i>	25.0	1.25	25.0	31.25	1.0	2.07
<i>Cornus florida</i>	56.25	5.9	33.3	196.47	6.33	9.80
<i>Diospyros virginiana</i>	6.25	.3	.0	.0	.0	.49
<i>Hamamelis virginiana</i>	37.5	6.6	35.0	231.0	7.45	10.96
<i>Kalmia latifolia</i>	12.5	.6	70.0	42.0	1.35	.99
<i>Oxydendron arboreum</i>	18.75	.9	13.3	11.97	.38	1.49
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	18.75	.9	56.7	51.03	1.64	1.49
<i>Quercus alba</i>	0.					
<i>Rhododendron maximum</i>	56.25	32.8	70.0	2296.00	74.07	54.48
<i>Salix nigra</i>	6.25	.3	30.0	9.0	.29	.49
<i>Sassafras albidum</i>	25.0	1.25	52.5	65.63	2.11	2.07
<i>Smilax albidum</i>	0.					
<i>Tsuga canadensis</i>	56.25	2.5	25.6	64.0	2.06	4.15
<i>Vaccinium sp.</i>	43.75	2.2	5.7	12.54	.40	3.65
		60.2		3099.39		

Appendix Table 18. Analysis of data recorded by the Aldous Method in the Big Stony deer enclosure, March 24, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILIZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	37.5	1.9	21.7	41.23	1.38	3.44
<i>Alnus rugosa</i>	12.5	2.2	30.0	66.0	2.21	3.98
<i>Betula lenta</i>	12.5	.6	37.5	22.5	.75	1.08
<i>Cornus florida</i>	50.0	5.6	32.5	182.0	6.1	10.14
<i>Diospyros virginiana</i>	6.25	.3	.0	.0	.0	.54
<i>Hamamelis virginiana</i>	43.75	5.3	47.1	249.63	8.37	9.60
<i>Kalmia latifolia</i>	12.5	.6	70.0	42.0	1.40	1.08
<i>Oxydendron arboreum</i>	25.0	1.25	23.8	29.75	.99	2.26
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	18.75	.9	56.7	51.03	1.71	1.63
<i>Quercus red</i>	12.5	.6	2.5	1.5	.05	1.08
<i>Rhododendron maximum</i>	56.25	30.3	70.0	2121.0	71.12	54.89
<i>Salix nigra</i>	6.25	.3	30.0	9.0	.3	.54
<i>Sassafras albidum</i>	25.0	1.25	53.8	67.25	2.25	2.26
<i>Smilax albidum</i>	0.					
<i>Tsuga canadensis</i>	43.75	2.2	34.9	76.78	2.57	3.98
<i>Vaccinium sp.</i>	37.5	1.9	11.7	22.23	.74	3.44
		55.2		2981.90		

Appendix Table 19. Analysis of data recorded by the Aldous Method in the Big Stony deer enclosure, April 3, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	6.25	.3	70.0	21.0	.62	.52
<i>Alnus rugosa</i>	12.5	2.2	50.0	110.0	3.26	3.96
<i>Betula lenta</i>	25.0	1.25	70.0	87.5	2.59	2.25
<i>Cornus florida</i>	50.0	5.6	33.1	185.36	5.49	10.09
<i>Diospyros virginiana</i>	0.					
<i>Hamamelis virginiana</i>	31.25	3.1	54.0	167.4	4.96	5.59
<i>Kalmia latifolia</i>	6.25	.3	70.0	21.0	.62	.52
<i>Oxydendron arboreum</i>	18.75	.9	21.7	19.53	.57	1.62
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	6.25	.3	70.0	21.0	.62	.52
<i>Quercus red</i>	6.25	.3	70.0	21.0	.62	.52
<i>Rhododendron maximum</i>	62.5	35.6	70.0	2492.0	73.86	64.20
<i>Salix nigra</i>	6.25	.3	70.0	21.0	.62	.52
<i>Sassafras albidum</i>	18.75	.9	70.0	63.0	1.86	1.62
<i>Smilax albidum</i>	0.					
<i>Tsuga canadensis</i>	56.25	2.8	41.1	115.08	3.41	5.04
<i>Vaccinium sp.</i>	31.25	1.6	18.0	28.8	.85	2.88
		55.45		3373.67		

Appendix Table 20. Analysis of data recorded by the Aldous Method in the Big Stony deer enclosure, April 10, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
<i>Acer rubrum</i>	6.25	.3	5.0	1.5	.04	.56
<i>Alnus rugosa</i>	12.5	.6	30.0	18.0	.55	1.13
<i>Betula lenta</i>	12.5	.6	50.0	30.0	.91	1.13
<i>Cornus florida</i>	43.75	5.3	52.9	280.37	8.59	10.01
<i>Diospyros virginiana</i>	0.					
<i>Hamamelis virginiana</i>	31.25	3.1	44.0	136.4	4.18	5.86
<i>Kalmia latifolia</i>	12.5	.6	70.0	42.0	1.28	1.13
<i>Oxydendron arboreum</i>	12.5	.6	30.0	18.0	.55	1.13
<i>Pinus rigida</i>	0.					
<i>Pinus Strobus</i>	6.25	.3	30.0	9.0	.27	.56
<i>Quercus alba</i>	0.					
<i>Rhododendron maximum</i>	56.25	35.3	70.0	2471.0	75.73	66.72
<i>Salix nigra</i>	6.25	.3	70.0	21.0	.64	.56
<i>Sassafras albidum</i>	12.5	.6	70.0	42.0	1.28	1.13
<i>Smilax albidum</i>	0.					
<i>Tsuga canadensis</i>	43.75	2.2	41.4	91.08	2.79	4.15
<i>Vaccinium sp.</i>	31.25	3.1	33.0	102.3	3.13	5.86
		52.9		3262.65		

Appendix Table 21. Analysis of data recorded by the Aldous Method in the Big Stony deer enclosure, April 20, 1952

BROWSE SPECIES	% of PLOTS PRESENT	AVERAGE DENSITY	AVERAGE DEGREE of BROWSING	UTILI-ZATION FACTOR	% of FOOD EATEN	% of BROWSE AVAILABLE
Acer rubrum	31.25	1.6	70.0	112.0	3.42	2.81
Alnus rugosa	12.5	.6	70.0	42.0	1.28	1.05
Betula lenta	31.25	1.6	70.0	112.0	3.42	2.81
Cornus florida	37.5	5.0	70.0	35.0	1.06	8.80
Diospyros virginiana	0.					
Hamamelis virginiana	18.75	2.5	70.0	17.5	.53	4.40
Kalmia latifolia	6.25	.3	70.0	21.0	.64	.52
Oxydendron arboreum	18.75	.9	30.0	27.0	.82	1.58
Pinus rigida	0.					
Pinus Strobus	12.5	.6	17.5	10.5	.32	1.05
Quercus alba	6.25	.3	70.0	21.0	.64	.52
Rhododendron maximum	62.5	35.6	70.0	2492.0	76.10	62.67
Salix nigra	6.25	.3	70.0	21.0	.64	.52
Sassafras albidum	12.5	.6	70.0	42.0	1.28	1.05
Smilax albidum	0.					
Tsuga canadensis	43.75	2.2	41.4	91.08	2.78	3.87
Vaccinium sp.	31.25	4.7	49.0	230.3	7.03	8.27
		56.8		3274.38		