PROBLEMS IN MEASURING FOOD PRODUCTION ON FOREST WILDLIFE CLEARINGS

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INTRODUCTION

Since 1935 forest game managers in the eastern and southeastern United States have used forage clearings to create diversity and produce supplemental food for forest wildlife. These clearings are usually of one to three acres and created in dense forest cover. Supplemental food is produced through planting and maintaining an agricultural forage crop such as a clover-grass combination (Larson, 1966).

Despite a long history of use, few attempts have been made to estimate wildlife utilization of clearings. Davis (1961) used moveable cages to contrast utilization of several forage species in Alabama and plot values were converted to an acre basis. Handy and Scharnagle (1961) used permanent cages in Georgia and converted plot values to pounds per acre as did Webb (1963) in South Carolina and Weber (1963) in North Carolina. The caged plot approach has been used to contrast forage preferences of deer on the Pisgah National Forest, North Carolina (Moore and Johnson 1963, Moore, *et al.*, 1964). Prior to the research reported herein, the Pisgah study appeared to be the only one which employed a statistical design and analysis. It was concerned with detecting preferences and was not designed to estimate total utilization as such.

Measurement of forage production and utilization is a well-developed and commonly used technique among agronomists and range managers (National Academy of Sciences/National Research Council 1962, Joint Committee 1962, Brown 1954 and U. S. Forest Service 1958 and 1962). Wildlife managers have not applied this knowledge to forage clearings and it was decided to test a statistical sampling approach on selected clearings on the Jefferson National Forest, Virginia.

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METHODS

Three clearings similar in aspect and treatment were selected at Patterson Creek on the New Castle Ranger District. Clearings 28 and 29 were essentially level, square, and entering the third growing season since establishment. Clearing 40, a long rectangle, sloped slightly to the southeast and was entering its second growing season. Each clearing had been planted to pure ladino clover (*Trifolium repens*). Each clearing was gridded into 4′ x 4′ squares and irregular edges blocked to accommodate the square plots. The 4′ x 4′ plots constituted the base for forage sampling and on the basis of trials conducted earlier on other clearings, it was decided that 10 caged plots, each with an adjacent open plot, would provide an adequate sample of forage production and utilization.

Clearings 28 and 29 were stratified into arbitrary "edge" and

"center" to investigate possible differences in utilization between these sections. On January 28, 1964, 10 aluminum welded wire cages (4" mesh), 4' x 4' x 4' were randomly located in the "center" and six in the "edge." The cages were used without tops. An open plot adjacent to each caged plot was randomly chosen as a companion plot. Figure 1 depicts the gridded clearings and the locations of caged and open plots for the sample clippings.

To avoid cage influences on the vegetation and to use the convenient 3.1' x 3.1' sample area (Hughes, 1958), a 4' x 4' clipping frame was constructed of one-inch square aluminum tubing. Corners were braced with angle irons and wires were run between from two points on each side to describe the 3.1' x 3.1' sample.

As soon as a difference in quantity of clover was evident between the caged and open plots, these were clipped to a standard height of one inch, as determined by the height of the clipping frame. Only clover was clipped. Invading species (if any) were weeded out prior to clipping. Clipped clover from each plot was placed in cloth bags, dried in forced air ovens at 160°F for 24 hours, and then weighed. Following the clip, cages in each clearing were randomly relocated, excluding plots used in the prior clip. The entire procedure was repeated as soon as differences were evident between caged and open plots.

To examine deer pellet groups as an index to utilization, each clearing was cleared of recent pellet groups when spring growth started (April 2). A 100% census and removal of fresh pellet groups was conducted weekly.

The clover sampled from within caged plots was regarded as a sample of the amount of forage available since the date of cage installation. Clover from the companion outside plots was considered a sample of the amount of forage remaining after grazing for the same period. Differences between each pair of plots were considered to be an observation (10 in total) of forage eaten. All forage eaten was attributed to white-tailed deer since no evidence was found of woodchucks, rabbits or other herbivores. The use wild turkeys made of the clover was too slight to be significant. Clearing 40 was analyzed as a simple random sample and Clearings 28 and 29 were analyzed as stratified random samples.

Utilization of the clover was heavy and clover never exceeded one inch in height outside the caged plots. Only the spring growing season was examined since it was felt that this was the critical period in terms of food supply for deer and the one period most likely to be examined for supplemental food production.

RESULTS

Had these clearings been sampled for the first clipping period using any one of the 10 plots and converting the single sample to an acre basis, the estimates would have ranged from 35 lbs./acre to 725 lbs./acre for Clearing 28; 60 lbs./acre to 360 lbs./acre for Clearing 29, and 165 lbs./acre to 650 lbs./acre for Clearing 40. Had the 10 samples been simply averaged and this single value expanded to a per acre basis for the first clipping period, the following estimates would have been generated: Clearing 28, 152 lbs./acre; Clearing 29, 115.5 lbs./acre; and Clearing 40, 359 lbs./acre. However, this procedure gives no indication of the precision of the estimate and ignores possible sources of variation.

Table 1 presents the results of the statistical analysis of the data in a quantitative and qualitative fashion. Table 2 presents the data from the weekly pellet census, indicating that this was not a reliable index to deer use.

Stratification of Clearings 28 and 29 showed that both production and variation were higher in the "edge" than in the "center." Greater production in the "edge" may be due to increased moisture due to afternoon shading. Variation may be greater in the "edge" due to orientation of the clearings to the sun. This suggests that a better sampling scheme should consider further stratification of the "edge." However, for

clearings of this size more than 10 caged plots might affect results by impeding or directing deer movements.

It was interesting to note that during this study clover was not available in measurable quantities to supplement the deer diet prior to the appearance of new growth on woody species in the surrounding forest.

DISCUSSION

Although it is evident that a sound statistical sampling scheme is necessary for reliable results, there are other considerations to be weighed before wildlife agencies put much effort into measuring production and utilization of forage in clearings. Game managers have generally concluded that agricultural forage clearings supplement the food base of forest game. However, to reasonably evaluate the supplemental role of clearings in terms of the food base, is is necessary to obtain information on "natural" foods available on management areas where clearings are to be installed. While it is fairly easy to accurately estimate the quantity and quality of agricultural foods grown on forage clearings, this is of no value unless accompanied by baseline information on what is already available to game before clearings are created. The writer, in another study (Larson, 1966), examined the total complex of the clearing practice in 23 eastern states and was unable to discover any instance where such information had been acquired in conjunction with use of forage clearings. This suggests that while the techniques for increased precision in forage utilization estimates are available, the results of such studies will have meaning only after much improved methods have been devised for measuring both quantity and quality of "natural" food supplies in forested game habitat itself.

LITERATURE CITED

Brown, D. 1954. Methods of surveying and measuring vegetation. *Commonwealth Agric. Bureaux Bull. 42.* 233 p.

Davis, J. R. 1961. Utilization and management of prepared food plots. p. 11c-38c. *In* Ann. Report for 1961. *Alabama Dept. Conserv., Montgomery.* Variously paged.

Handy, J. and J. Scharnagel. 1961. Growth and usage of permanent forage by deer and turkeys. *Proc. Ann. Conf. Southeastern Assn. Game and Fish Commrs.* 15:24-26.

Hughes, R. H. 1958. The weight-estimate method in herbage production determinations. p. 17-19. *In* U. S. Forest Serv. 1958. Techniques and methods of measuring understory vegetation. *Southeastern Forest Expt. Sta., Asheville, N. C.* 174 p.

Joint Committee of Amer. Soc Agron., Amer. Dairy Sci. Assn., Amer. Soc. Animal Prod. and Amer. Soc. Range Mgt. 1962. Pasture and range research techniques. *Cornell Univ. Press. Ithaca, N. Y.* 242 p.

Larson, J. S. 1966. Wildlife forage clearings on forest lands — a critical appraisal and research needs. *Ph.D. dissertation, Virginia Polytechnic Institute, Blacksburg.* 143 p.

Moore, W. H. and F. M. Johnson. 1963. A study of deer feeding preference on agricultural forage. *Final Report FS-SE-1801-9. Southeastern Forest Expt. Sta., Asheville, N. C.* 35 p.

Moore, W. H., F. M. Johnson, J. Oberheu and D. D. Strode. 1964. Forage for deer. *Wildlife in North Carolina.* 28(7):14-15.

National Academy of Sciences/National Research Council. 1962. Basic problems and techniques in range research. *NAS/NRC Pub. 890. Washington, D. C.* 341 p.

U. S. Forest Service. 1958. Techniques and methods of measuring understory vegetation. *Southeastern Forest Expt. Sta., Asheville, N. C.* 174 p.

U. S. Forest Service. 1962. Range research methods. *U. S. Dept. Agric. Misc. Pub. 940. Washington, D. C.* 172 p.

Webb, L. G. 1963. Utilization of domestic forage crops by deer and wild turkeys with notes on insects inhabiting the crops. *Proc. Ann. Conf. Southeastern Assn. Game and Fish Commrs.* 17:92-100.

Weber, A. J. 1963. Forage production of pasture plantings. *Job Completion Report. W-44-R. North Carolina Wildlife Resources Comm. Raleigh.* 3 p.

Figure 1. Clearings and location of sample plots used at Patterson Creek.

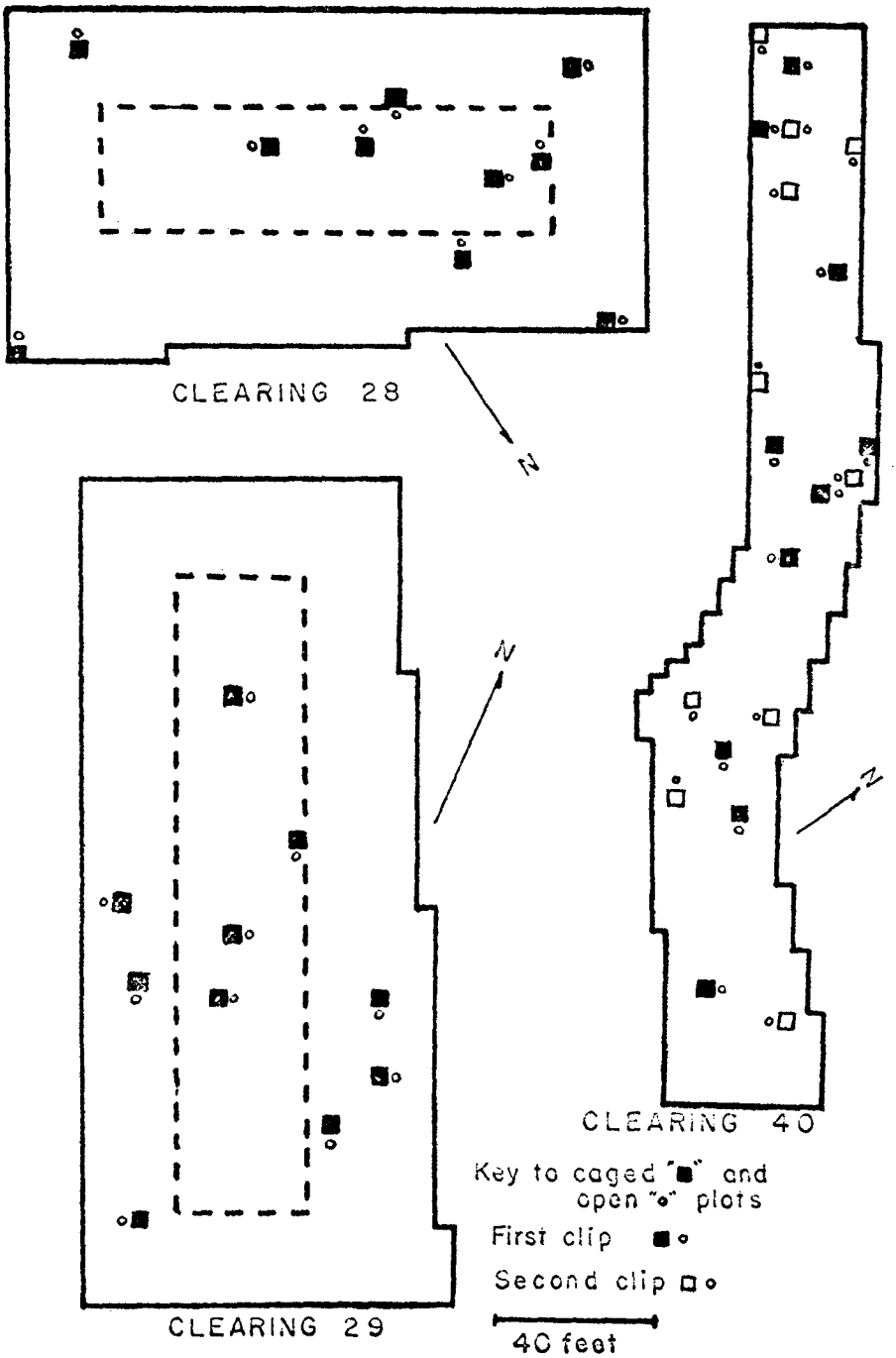

TABLE 1

PRODUCTION AND UTILIZATION OF LADINO CLOVER ON THE PATTERSON CREEK CLEARINGS, PERIOD STARTING JANUARY 30, 1964.

Clearing	Date Clipped	Clearing Segment	Pounds/acre, oven-dry weight[1] Estimate	Standard error	n
#28	May 12	"Edge"	180.6	109.2	6
		"Center"	108.8	29.9	4
		Total	161.4	80.3	
#29	May 19	"Edge"	133.2	46.2	6
		"Center"	88.7	13.6	4
		Total	120.3	10.5	
#40	April 23	Total [2]	299.2	43.7	10
	June 4	Total	496.3	21.1	10
Two Clip Season		Total	795.5	48.4	

[1] Deer utilized all clover produced.
[2] Clearing 40 not stratified for "edge" and "center."

TABLE 2

PELLET GROUP CENSUS ON CLEARINGS AT THE PATTERSON CREEK STUDY AREA.

Date	Number of pellet groups, by clearing 28	29	40
April 2	All recent pellet groups removed		
8	6	11	6
14	7	9	5
23	0	4	3
29	0	1	1
May 5	0	2	2
12	0	1	4
June 4	(Invasion by native plants too		15
9	thick for accurate counts)		6

A SURVEY OF STREAMBANK WILDLIFE HABITAT

Presented at the Twentieth Annual Meeting of the Southeastern Association of Game and Fish Commissioners

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By DAN M. RUSSELL

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INTRODUCTION

Most of our wildlife species use streambank cover as part of their daily range and many may live their entire life-span in this habitat. Yet it is strange that any mention of preserving a stream seems to be automatically thought of as a benefit to fishing. There is nothing wrong with this idea, except that it is a bit nearsighted. Whatever the reasons for the professional neglect of streambanks as wildlife habitat, they have been costly. Much of this particular type has been lost by default.