

DEPARTMENT OF FORESTRY AND WILDLIFE

**ESTIMATED HUNTING EXPENDITURES
IN VIRGINIA**

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ESTIMATED HUNTING EXPENDITURES IN VIRGINIA ^{1/}

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SUMMARY

During the 1963-64 hunting season, 373,730 persons purchased resident or non-resident hunting licenses in Virginia. These hunters spent approximately \$87 million in connection with hunting--an average of \$233 per hunter.

The data for the study were collected by mail questionnaires after Virginia hunting license purchasers had been stratified by type of license and geographic area. A total of 725 questionnaires were returned.

Interpretation of results is difficult in any expenditure study. It seems obvious, however, that hunting makes a significant contribution to Virginia's economy.

INTRODUCTION

During the past 2 to 3 decades, a number of conservation agencies have attempted to estimate the amount of money spent on hunting. The results have proven useful to administrators in formulating policy and in estimating the contribution of hunting to the general economy.

A study to estimate hunting expenditures had not previously been conducted in Virginia. Consequently, administrative agencies have not had the benefit of expenditure estimates nor has the general public been informed of the level of hunter expenditure.

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This study was conducted as part of a Master of Science graduate program. The study was partially financed by the Virginia Commission of Game and Inland Fisheries.

THE AUTHORS: Thompson is assistant professor of forest management and McGinnes is professor of wildlife management and leader, Virginia Co-operative Wildlife Research Unit (Virginia Polytechnic Institute, Virginia Commission of Game and Inland Fisheries, Wildlife Management Institute, and U. S. Fish and Wildlife Service cooperating), Department of Forestry and Wildlife, Virginia Polytechnic Institute, Blacksburg. Gray is currently on active duty with the U. S. Army. The study is based, in part, upon Gray's thesis submitted to the Department of Forestry and Wildlife, Virginia Polytechnic Institute, in partial fulfillment of the requirements for the Master of Science degree.

The objective of the study was to provide an initial estimate of hunting expenditures in Virginia and to provide information on the variability associated with the expenditures. The data on variability will be particularly useful to persons conducting subsequent studies.

DATA COLLECTION

The procedure for collecting the data consisted of: (1) identifying the population of hunters, (2) drawing a sample from the population, and (3) mailing a questionnaire to each member of the sample. The discussion of data collection is separated into 2 areas: (1) construction of the questionnaire, and (2) sampling procedure.

The Questionnaire

The questionnaire asked recipients to indicate expenditures by checking an expenditure interval rather than by recalling a specific amount. There were 2 reasons for using intervals. First, most persons cannot recall exact amounts. Second, it was believed that allowing recipients to check an interval rather than give a specific figure would increase response. The questionnaire was composed of 3 parts: an introductory letter explaining the study, the main questionnaire, and an inquiry about hunting license purchases. Thirty-two expenditure categories ranging from arms and ammunition to dog food and books on hunting were included in the main questionnaire. All 3 sections of the questionnaire are contained in the Appendix. Gray (1964, p. 33-34) recommended a number of changes which he felt would improve the questionnaire.

Sampling Procedure

The population was defined as: all persons who purchased a county resident hunting-fishing license, or a state resident hunting license, or a non-resident hunting license in Virginia between July 1, 1963, and June 30, 1964, inclusive (Virginia's license year is July 1 - June 30). The population included 373,730 persons (Table 1).

When a heterogeneous population is sampled, a more precise estimate of the population average and total may be obtained if the population can be stratified into homogeneous segments (Cochran, 1963). For this study, the population was stratified 2 ways: by the type of license purchase and by the geographic location of the license purchase (Table 1). Without previous Virginia data for substantiation, it seemed a logical assumption that persons who purchased different types of licenses might have had different average expenditures. White (1955) found this situation existed in New Hampshire. Virginia is naturally divided into 3 distinct physiographic regions: coastal plain, piedmont, and mountains (Fig. 1). Since types of game and length of seasons vary between regions, it is reasonable

to assume that hunting expenditures might also vary.

Table 1. Number of Virginia hunting license purchasers, by geographic area and type of license, 1963-64

Type of license	Geographic area			Total
	Coastal plain	Piedmont	Mountains	
State resident	107,427	32,989	79,226	219,642
County resident	36,830	26,318	75,485	138,633
Non-resident	5,808	1,606	8,041	15,455
Total	150,065	60,913	162,752	373,730

Previous estimates of population variance were not available. Therefore, budgetary limitations were used to establish sample size. The budget set an upper limit of 1,800 observations. These observations were then allocated to the various categories primarily on the basis of judgment (Table 2).

Table 2. Allocation, by geographic area and type of license, for sample of Virginia hunting license purchasers, 1963-64

Type of license	Geographic area			Total
	Coastal plain	Piedmont	Mountains	
State resident	300	150	300	750
County resident	300	150	300	750
Non-resident	100	100	100	300
Total	700	400	700	1,800

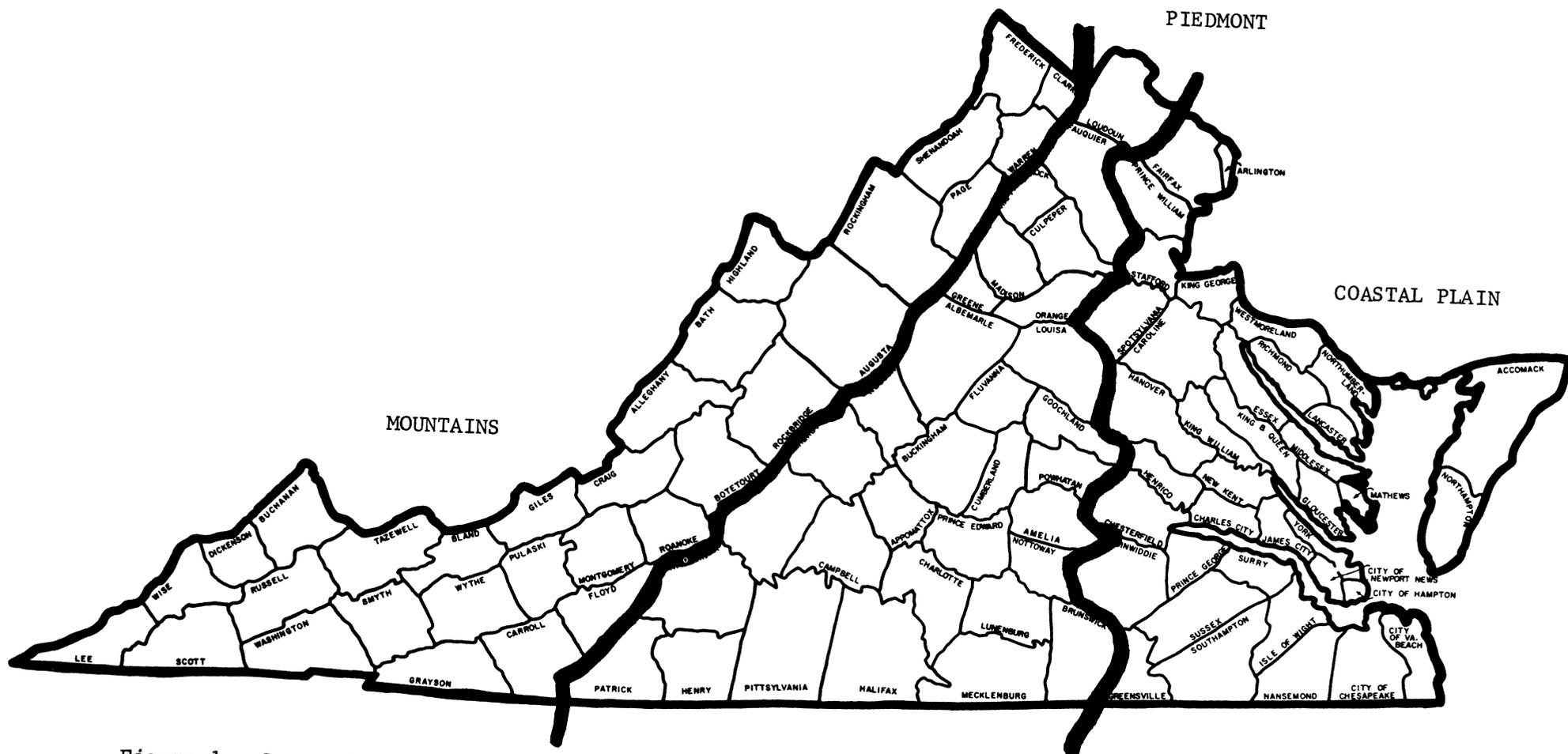


Figure 1. Geographic areas for Virginia hunting expenditure study, 1963 - 64

To obtain the observations, the State's license sales agencies were listed along with their accumulated sales for each license category. For example, if the first agency sold 1,000 state resident licenses and the second agency sold 2,000 state resident licenses, the former would be identified with numbers 1-1000 in the state resident category; the latter with numbers 1,001-3,000. A table of random numbers was used to allocate observations to sales agencies. Each observation corresponded to a license stub number in the sales record book. The hunter's name and address were taken from the stub and he was mailed a questionnaire. The names and addresses of the 2 hunters immediately following the observation in the record book were also recorded. If the first hunter did not respond within 2 weeks, a questionnaire was mailed to the second hunter. If the second hunter did not respond within 2 weeks, a questionnaire was mailed to the third hunter. If none of the 3 responded, the sample size was reduced by one.

According to Cochran (1953, p. 7), "A sampling procedure is said to be unbiased if the mean of the frequency distribution of the estimates which it produces is exactly equal to the population characteristic which is being estimated." It is not practically feasible to design a bias-free mail survey. However, some designs will contain more possible sources of bias than others. It is well to recognize these sources of bias before considering the results. This study contained 2 probable sources of bias.

First, the participants were asked to recall past expenditures. The recall problem introduces a source of bias in all surveys of this type. However, the problem may have been unnecessarily acute in this study because the license records were not made available immediately following the hunting season, but became available periodically in various size lots over a 6-month period. This situation created 2 problems: recall ability decreases with time; and some participants received questionnaires after the 1964-65 hunting season had begun.

Second, there were no follow-up mailings or assessments of non-response. That is, it cannot be stated that the persons who responded to questionnaires are members of the same expenditure category as persons who might have responded to a second or third mailing or not at all. Brown, *et al.* (1964) found that persons who responded to an initial mailing were in a higher expenditure category than those who responded to a second or third mailing.

RESULTS AND DISCUSSION

A total of 725 usable questionnaires were returned (Table 3). Analysis of the returned questionnaires produced estimates of average and total expenditures, along with their standard errors (Table 4). The estimate for the average expenditure per hunter was \$233; the estimate for total hunting expenditures was over \$87 million.

Table 3. Number of usable questionnaires returned by Virginia hunting license purchasers, 1963-64

Type of license	Geographic area			Total
	Coastal plain	Piedmont	Mountains	
State resident	176	58	122	356
County resident	103	37	104	244
Non-resident	65	24	36	125
Total	344	119	262	725

Table 4. Estimates and standard errors for average and total Virginia hunter expenditures, 1963-64

Category	Individual		Population	
	Estimate	Standard error	Estimate	Standard Error
	dollars		thousand dollars	
Geographic area				
Coastal plain	243	14	36,410	2,140
Piedmont	226	24	13,740	1,430
Mountains	227	19	37,880	3,090
Type of license				
State resident	283	17	62,240	3,650
County resident	146	12	20,270	1,600
Non-resident	293	36	4,520	570
Average ^{a/}	233	11		
Total			87,030	4,020

^{a/} Weighted by proportion of respondents in each category.

There were no significant differences between average expenditures for the geographic areas. Within the types of licenses, the average expenditures for purchasers of county resident licenses was significantly below expenditures for state resident and non-resident license purchasers.

Interpretation of results from a study of this type is difficult. Some investigators have stated or inferred that the amount spent by hunters is equivalent to the value of the game harvested. This interpretation is erroneous, because the entire expenditure can be allocated to travel, arms, clothing, etc., leaving a zero value for the game. The only interpretation which appears valid is that the expenditure is the amount the population of hunters is willing to spend under the current level of available game, hunting regulations, and license fees.

As indicated, the expenditure figures are useful to administrative agencies in planning their programs. However, a single expenditure estimate cannot tell an agency how much it should spend to improve hunting or what would happen if, for example, the agency doubled license fees.

REFERENCES

1. Brown, William G., Ajmer Singh, and Emery N. Castle. An economic evaluation of the Oregon salmon and steelhead sport fishery. Oregon State University, Corvallis, Agric. Exp. Sta. Tech. Bull. 78, 1964. 47 p.
2. Cochran, W. G. Sampling techniques. 2nd ed., John Wiley & Sons, Inc., New York, 1963. 413 p.
3. Gray, James M. Estimated annual consumer hunting expenditures for license purchasers in the coastal plain of Virginia, 1963-1964 hunting season. Unpublished master of science thesis. Virginia Polytechnic Institute, 1964. 65 p.
4. White, D. L. How New Hampshire attached the dollar sign to its fish and wildlife. New Hampshire Fish and Game Department, Concord, Tech. Circular 11, 1955. 13 p.

APPENDIX

**QUESTIONNAIRE USED IN VIRGINIA HUNTER
EXPENDITURE STUDY, 1963-1964**

VIRGINIA POLYTECHNIC INSTITUTE
DEPARTMENT OF FORESTRY AND WILDLIFE
BLACKSBURG, VIRGINIA

Dear Sportsman:

The V. P. I. Department of Forestry and Wildlife and the Virginia Commission of Game and Inland Fisheries need your help. A cooperative study is being conducted to estimate the amount of money spent annually for hunting in Virginia.

You have been randomly selected by your hunting license number to take part in the study. We would appreciate your filling out the enclosed questionnaire and returning it as soon as possible in the stamped, self-addressed envelope.

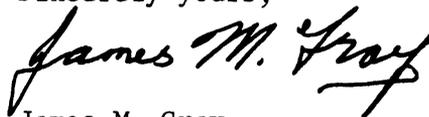
Questionnaires will not be identified with individuals. Since our objective is to estimate Virginia's total expenditure for hunting, it is very important that all questionnaires be returned, regardless of the amount of money spent.

In completing the enclosed questionnaire, check only those items you purchased for hunting. For example, if you bought a flashlight to carry in your car and happened to use it once or twice while hunting, the cost of the flashlight should not be included on the questionnaire. Items ordered by mail or purchased outside Virginia should not be included on the questionnaire, since the study is concerned only with expenditures made in Virginia.

Results of this study will illustrate the importance of hunting to the over-all economy of Virginia. This should lead to an increase in the quantity and quality of Virginia hunting, thus better hunting for you and your fellow sportsmen.

Thank you for your cooperation.

Sincerely yours,



James M. Gray
Research Assistant

Number _____

Color Code _____

HUNTER EXPENDITURE SURVEY FOR THE COMMONWEALTH OF VIRGINIA

Please indicate the amount of money you spent during the 1963-64 hunting season by checking each of the items listed in the following questionnaire. After you have completed the questionnaire, place it in the enclosed, stamped, self-addressed envelope and mail as soon as possible. NO POSTAGE IS NECESSARY. It is very important that the questionnaire be returned as soon as possible. Include only money spent in Virginia between July 1, 1963 and June 30, 1964.

Please indicate with a check those Virginia HUNTING LICENSES you bought between July 1, 1963, and June 30, 1964.

- 1. State Resident (yes___) (no___) 2. County Resident (yes___) (no___)
- 3. State Nonresident (yes___) (no___) 4. State Forest Stamp (yes___) (no___)
- 5. Nonresident to hunt on shooting preserve only (yes___) (no___)
- 6. National Forest Stamp (yes___) (no___)
- 7. Resident Big Game Tag; deer, bear, and turkey (yes___) (no___)
- 8. Nonresident Big Game Tag; deer, bear, and turkey (yes___) (no___)
- 9. County Damage Stamps (please indicate with a number how many were purchased; for example, 2 if two stamps were purchased) _____
- 10. Nonresident County Damage Stamps (please indicate number purchased) ___0 ___1 ___2 ___3
- 11. Duck Stamp (yes___) (no___) 12. Stationary Blind for Waterfowl (yes___) (no___)
- 13. Floating Blind for Waterfowl (yes___) (no___)

The questionnaire on the next page should be read completely before answering. The following example will illustrate how the questionnaire should be checked. Suppose for the first row 'Rifles and Shotguns' a hunter spent \$17.00 for a big game rifle and \$23.00 for a shotgun to be used primarily for rabbit hunting, the row would be checked in this manner:

Expenditure Categories	BIG GAME					SMALL GAME					WATERFOWL						
	Dollars Spent					Dollars Spent					Dollars Spent						
	0	.01-1.00	1.01-5.00	6 - 10	11-20	0	.01-1.00	10.1-5.00	6 - 10	11 - 20	31 - 40	0	.01-1.00	1.01-5.00	6 - 10	11 - 20	21 - 30
Rifles & Shotguns					x					x		x					

Note: Place three checks in each row.

