STATE OF COLORADO
NIL SINE NUMINE
DEPT. OF GAME & FISH
C. N. FEAST, DIRECTOR

The Personal Interview Method of obtaining Information on Game and Fish Resources

Game and Fish Management Division

F. A. Project 36 R

G.B. Kennedy, 1948

Current Report 24

THE PERSONAL INTERVIEW METHOD OF OBTAINING INFORMATION ON GAME AND FISH RESOURCES

By

Gilbert N. Hunter
Game Manager, Colorado Game and Fish Department
Denver, Colorado

Final Report, Federal Aid Project 36-R

COLORADO GAME AND FISH DEPARTMENT
Denver, Colorado

Current Report 24 August, 1949

In Colorado, forests, waters, altitude, and inaccessibility combine to produce thousands of square miles of game, fish, and fur animal habitat--resources, in the aggregate, worth $50,000,000 annually to the people of this State.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

FOREWORD

One of the significant findings in this report is that the money turnover accruing directly from fish and game resources in Colorado amounts to more than $50,000,000 annually. Much of this turnover is in the form of direct income to the thousands of guides, outfitters, merchandisers, trappers, and others, who depend, wholly or in part, on the industries associated with fish and game for their livelihood.

From the economic standpoint, therefore, intelligent and progressive husbandry of fish, game, and fur animals in Colorado is good business. Fish, game, and fur animals are self-perpetuating when properly managed. Their preservation and use on a sustained yield basis, therefore, insures in perpetuity an important source of business and prosperity in the State of Colorado.

The economic, however, is not the only value derived from fish and game. Recreational, esthetic, and spiritual values associated with hunting and fishing, and other experiences in the out-of-doors, are perhaps of greater value in the long run to the people of our state than their total business accrual. Certainly, the joint value of wildlife resources give them an importance in our economy, and a quality in our way of life, that we of Colorado can scarcely afford to be without.

It is the responsibility of the Colorado Game and Fish Commission,

effected through the Game and Fish Department, to administer, in accordance with legislation therefor, the fish and game resources of the State. In meeting this responsibility, it is the policy of the Game and Fish Department to base administration on factual and biologically sound information, gathered by technicians who are familiar both with sportsmen's problems and good management of fish and game. Such procedure is designed to achieve soundness in operation, and to insure fairness in regulations to those who utilize fish, game, and fur animals, or are affected by them.

This report is in accordance with the policy of the Game and Fish Department to obtain and present accurate information on those resources for which it is responsible. It is directed specifically to the thousands of hunters and fishermen who support the Department; but in a broader sense, it is an accounting to the people of the State, who, collectively, own its fish and game. Other reports of this informative nature will be forthcoming.

Cleland N. Feast,
Director

THE PERSONAL INTERVIEW METHOD OF OBTAINING INFORMATION ON GAME AND FISH RESOURCES

Gilbert N. Hunter
Game Manager, Colorado Game and Fish Department
Denver, Colorado

INTRODUCTION

Inventory, annually and seasonally corrected, is essential to modern game and fish management. Wildlife inventory deals not only with numbers of deer, quail, and muskrat, but also with kill, sex ratios, and the condition of both animals and range. Accurate statistics, to the modern game and fish administrator, provide more than rules-of-thumb in attaining management objectives; they represent the difference between facts and estimates in operation.

Several years before the present work was initiated, Gordon (1941) reported a sampling technique designed to obtain information on hunters' activities and the economics accruing therefrom. His method was based on personal interviews and included many of the objectives sought in the Colorado work, but was conducted only experimentally. He pointed out the possibility of statewide application of the interview technique, and suggested the use of International Business Machines in analyzing the data obtained. He also suggested that costs could be reduced, and refinements made, under conditions induced by a broader application of the method.

The Colorado survey, developed under the advisorship of the National Opinion Research Center, Denver, and independent of Gordon's experimental research, is the first instance of state-wide application of the interview technique in question. In common with most states and provinces, the imperative need of more information on wildlife resources, especially the stock and take of fish and small game, was apparent. Moreover, it was felt by responsible personnel in the Game and Fish Department that information obtained at big game check stations and from big game kill cards should be checked for reliability, thus crediting or discrediting the statistics so gathered and used as management tools. Accordingly, in April, 1946, this personal interview survey -- hereafter called Random Survey -- was initiated, which, with later refinements, proved extremely useful in evaluating previously gathered information, and in providing a wide variety of new statistics now being employed constantly by Colorado game and fish administrators.

ACKNOWLEDGMENTS

For assistance in executing the field aspects of this investigation, and in compiling it into report form, I am deeply indebted to the following of the Colorado Game and Fish Department: Director Cleland N. Feast for encouragement prior to and during the work; Assistant Director J. D. Hart, Theodor R. Swem (Federal Aid Coordinator resigned), E. Kliess Brown, Federal Aid Coordinator, A. E. Carlson, Project

Leader, and R. H. Hess, Chief Fish Biologist, for aid in general supervision; Wallace Perkins, Lloyd Harold, O. C. Fuqua, and Sidney Ray, interviewers; and Esther Lofft, Dixie Frew (resigned), and Velma Merkle, office staff, for faithful assistance during the difficult job of report compilation.

The National Opinion Research Center, Inc., Denver, gave much assistance with project organization. Dr. Lee E. Yeager, Leader of the Colorado Cooperative Wildlife Research Unit, Fort Collins, Colorado, assisted in the general preparation of the report for publication.

SCOPE AND REQUIREMENTS

The interview method used in Colorado was designed to do specific jobs. First, the Game and Fish Department needed information on big game, small game, waterfowl, and fish. Second, and very important, it was imperative to determine what groups constituted combination small game-fishing license buyers, who in Colorado number in excess of 225,000, annually. Of these license holders, the Department needed to know how many hunted only; how many fished only; how many did both or neither; and finally, how many combination license holders also purchased big game licenses and hunted deer, elk, and bear.

The Department needed many other kinds of information, such as the economics of hunting and fishing; number of trips per hunter or fisherman per season; wounding losses in game; time of day and under

what weather conditions kills were made; distance hunted from automobiles; the professions represented by hunters and fishermen; age of sportsmen; arms used; use of dogs and horses; attitude toward property; and predators killed by big game hunters. The interview procedure was designed to cover all of these topics and many others listed under Application of Results to Management.

METHODS AND COSTS

Great complexity in the kinds of information desired made it imperative that procedures be devised with the greatest possible forethought. Accordingly, the assistance of the National Opinion Research Center, Denver, was obtained in planning the method of interview. Three questionnaires, one for big game, one for small game, and one for fish, were devised for use in gathering information.

The variety of information obtained in 4,964 interviews was so great that it can best be explained through the use of figures and tables. Figure 1 is a sample of the interview form used. This form, for simplicity, was designed to conform with International Business Machine requirements. Field interviewers wrote in code the answers obtained, thus eliminating the double operation of coding and punching I.B.M. cards in the office preparatory to analysis. The coding method used was based on figures 0 to 9.

Originally, every 50th name in the case of big game, and every 137th name in the case of combination license holders, were chosen for

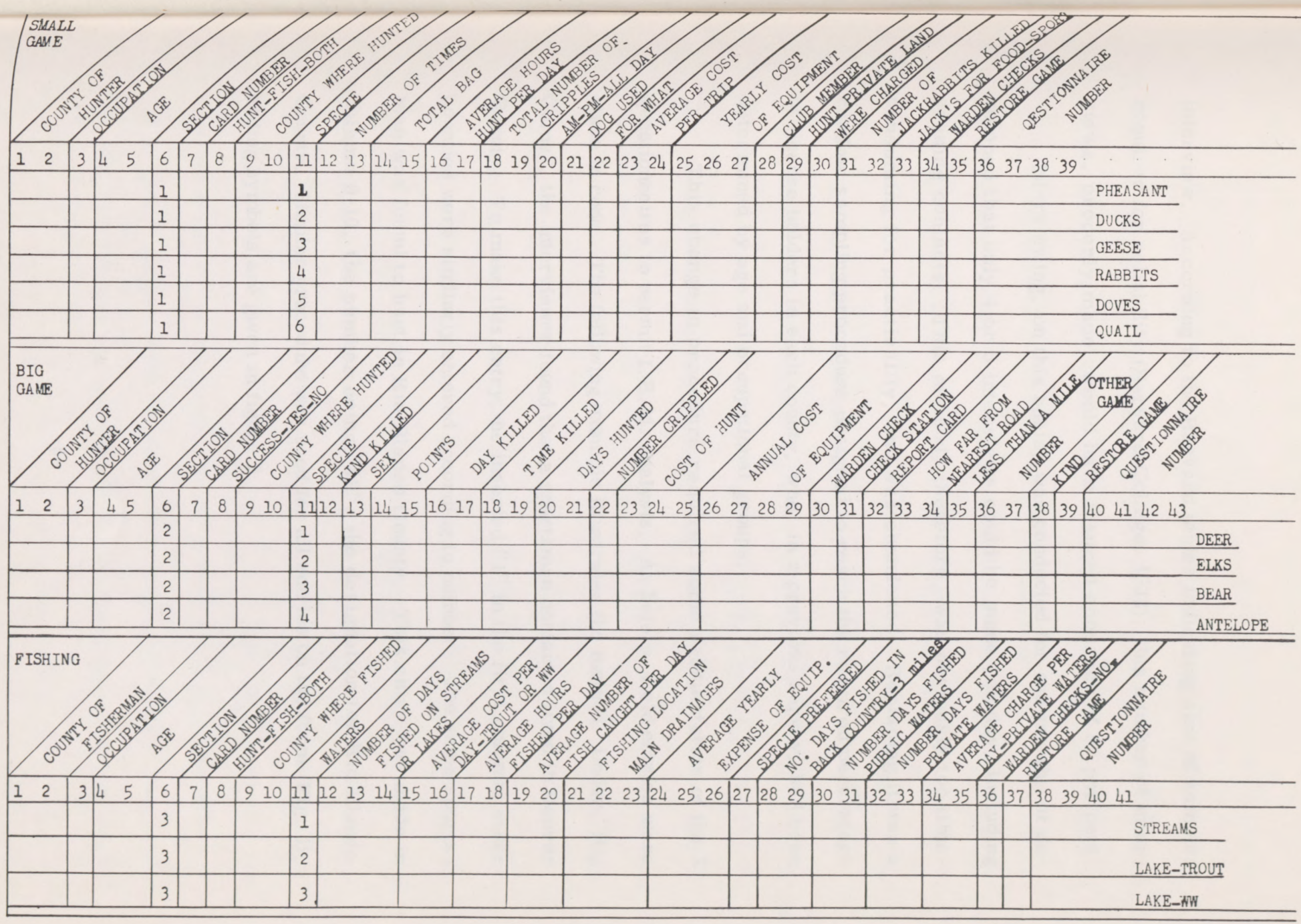

Figure 1--Interview Form Used in Random Survey

interview. According to the Harvard tables indicating size of samples required for reliability (Harvard College, 1932), this number of interviews, properly made, would have insured accuracy of 96 per cent.

Interviewing, on this basis, was conducted for one month. It developed that only 4 or 5 interviews could be made per day, including evening contacts. This method, therefore, was obviously too time-consuming for practicality, and was abandoned. Replacing it was a random sampling procedure designed to reach the required percentage of license holders in each county, who, in a previous survey, had been determined by age and occupational groups.

This change in procedure required some reorientation of the 3 questionnaires to permit I.B.M. analysis. As before, field entries were made in code. The following example illustrates the method: Under "Big Game", the interviewer found that a sportsman contacted lived in Denver County. To make this entry, he inserted "1" in the first column; other counties were similarly entered according to number. The same sportsman was found to hunt in Rio Blanco County. This entry was made in column 9-10, the number being "49", the designation for Rio Blanco County. Similar procedure was used for all entries on the form (Fig. 1); coding symbols are given in figure 2.

In cases where a sportsman hunted pheasants, ducks, deer, elk, and fished for trout, 5 cards would be punched; and where all species of game and both trout and warm-water fish were sought, the necessary entries would require 13 cards. Each card made was cross-referenced to refer to the master card or form. I.B.M. representatives were very cooperative in setting up this system and their services should be requested when such a survey is planned.

Under the revised procedure, it was found that 15 to 20 interviews could be made per day. Specific contacts required only about 15 minutes; the remaining time was spent in travel. In 1945, 3 men worked a total of 45 man-months; and in 1946, 5 men worked 30 man-months; the total of 75 man-months included all time required for interviews and much assistance in the analysis of data.

Final analysis involved transfer, in code, of field data to I.B.M. cards. Analysis subsequently was entirely mechanical, although the services of a skilled operator were required. Preferably, such an operator should have a good knowledge of statistics and some grounding in biology. The results obtained indicated accuracy permissable in practical application, and in nearly all cases the error, as near as could be determined, was less than 10 per cent.

The total cost of the Survey for the 2-year period, including salary, travel, and subsistence of interviewers for 75 man-months, salary of an I.B.M. operator, and rent of I.B.M. equipment, was $16,316.33. It

1-Professional and Semi-professional Workers
   1. Educational, Medical, Legal, Engineering, Religious, Charitable, Government Workers, etc.

2-Proprietors, Managers and Officials including Farm owners and Tenants

3-Clerical, Sales and Kindred Workers
   1. Salesmen, store clerks, etc.

4-Craftsmen, Foremen and Kindred Workers
   1. All Union men
   2. Foremen in charge of craftsmen

5-Operatives and Kindred Workers
   1. Trucking Services, Construction Machine Operators, Railroad Engineers, Firemen, Bus Drivers, etc.

6-Protective Services
   1. Defense services, Police, Firemen, etc.

7-Service Workers (Except protective)
   1. Personal services: Domestic, hotel, cleaning and dyeing, etc.

8-Laborers

9-Retired

10-Women

11-Students

12-Trappers (Professional)

Main Drainages:

1. Yampa River
2. North Platte River
3. Laramie River
4. White River
5. Colorado River
6. Gunnison River
7. Rio Grande River
8. Dolores River
9. San Juan River
10. South Platte River
11. Arkansas River
12. Republican River

Game Groups:

1-Small Game, 2-Big Game, 3-Fish

Sex:

1-Buck, 2-Doe, 3-Fawn
1-Bull, 2-Cow, 3-Calf
1-Male Bear, 2-Female Bear, 3-Cub
(Antelope same as Deer)

Other Game:

1-Lion, 2-Coyote, 3-Bobcat, 4-Lynx

Cold-water Fish:

1. Rainbow (Steelheads, Silver Salmon)
2. Lochleven (Brown, German, Von Behr)
3. Brook (Redspot)
4. Native Trout (Black-spotted cutthroat)
5. Mackinaw (Lake Trout)
6. Grayling
7. Whitefish

Warm-water Fish:

1. Bass
2. Perch
3. Crappie
4. Bluegill
5. Sunfish
6. Catfish (Mudcats)
7. Catfish (Channel and Blue Cats)

Distance from Road:

.1 - 200 yards
.2 - 400 yards
.3 - 600 yards
.4 - 800 yards
.5 -1000 yards
.6 -1200 yards
.7 -1400 yards
.8 -1600 yards
.9 -1800 yards

1-AM, 2-PM, 3-AM & PM

1-Yes, 2-No

Fig. 2.-- Symbols Used in Coding Random Survey Questionnaire

should be noted that this cost included all time and personnel used in preliminary work, a part of which was discarded as being inapplicable. It is believed that, on the basis of experience to date, a comparable survey could be made, even at present costs, for one-half of the above amount, or about $8,000.00.

It should be added that two-thirds of the total cost was borne by Federal Aid Section of the Department and one-third was carried on regular Department funds.

ACCURACY

Despite the reputed reliability of the sampling techniques employed, even after adaptation to time and cost limitations, the Department felt that information obtained from interviews should be evaluated by any means at hand. Accordingly, 6 tests, 5 with big game and one with waterfowl, were made, wherein information provided by big game kill cards and duck stamp sales was used as a basis for comparison, tables 1 and 2.

Inspection of table 1 shows that the difference in per cent between the two sets of data under Success Ratio ranges from 4.9 to 5.9; under Total Kill, from 4.5 to 9.2; Kill First Week of Season, 5.2 to 6.9; Kill in 1-1/3 - 2-1/3 Age Class, 5.4 to 9.3; and Per cent of Kill, .1 to 8.0. The overall range in difference for the 5 tests is .1 to 9.3 per cent. In no case is the difference great enough to be inimical to practical field operation.

A sixth reliability check dealt with waterfowl, and compared the ratio of migratory waterfowl hunting stamps to combination licenses with the ratio of waterfowl hunters contacted to the total number of random interviews, table 2. The difference in the two sets of data in table 2 is only .2 per cent, and shows clearly that waterfowl hunters were sampled in proportion to numbers.

In regard to checks on big game, table 1, it should be stated that added reliability is implied to these data by the fact that the kill card returns reflect experience and refinement over a 3-year period. The general conclusion is, therefore, that the Random Survey as used in Colorado yielded information of sufficient accuracy for administrative use.

APPLICATION OF RESULTS TO MANAGEMENT

Information obtained from the survey has been used in almost every operation of the Department. The various applications may be grouped conveniently under the headings of General, Big Game, Small Game, and Fish, and will be discussed in this order.

General

The wide variety of general information accruing from the survey is indicated in tables 3-7, and the various tabulations beyond. Brief discussion pertinent to each table or tabulation describes the management application made of the data.

Table 1--Comparison of accuracy in per cent, big game kill cards vs random interview data - 1946

I. SUCCESS RATIO AND TOTAL KILL						
Species	Success Ratio			Total Kill		
	Cards	Random Interview	Per Cent Difference	Cards	Random Interview	Per Cent Difference
Deer	64.2	69.3	5.1	53,265	55,801	4.5
Elk	29.0	33.9	4.9	8,428	9,279	9.2
Antelope	83.7	77.8	5.9	1,113	1,049	5.8

II. KILL FIRST WEEK AND BY ONE AGE CLASS						
Species	Kill First Week of Season			Kill in 1-1/3 - 2-1/3 Age Class		
	Cards	Random Interview	Per Cent Difference	Cards	Random Interview	Per Cent Difference
Deer	55.4	60.6	5.2	42.0	32.7	9.3
Elk	68.7	75.6	6.9	34.3	28.9	5.4

III. KILL BY SPECIES AND SEX			
Species	Per Cent of Kill		
	Cards	Random Interview	Per Cent Difference
Deer: Bucks	68.9	76.9	8.0
Does	27.1	21.3	5.8
Fawns	4.0	1.8	2.2
Elk: Bulls	48.8	52.2	3.4
Cows	37.8	37.7	0.1
Calves	13.4	10.1	3.3
Antelope:			
Bucks	69.0	71.4	2.4
Does	27.0	28.6	1.6
Fawns	4.0	0.0	4.0

Table 2--Comparison of accuracy, duck stamp sales vs waterfowl hunters contacted in random interviews - 1946

Number Sold in Colorado			Random Interview Contacts		
Combination License Small game - fish	Duck Stamps	Percent of Duck Stamps to Combination	Total number of Contacts	Waterfowl Hunters Contacted	Percent of Waterfowl Hunters to Total Contacts
227,753	37,249	16.4	3,477	562	16.2

All Game and Fish Licenses

Prior to the completion of the survey, the Department had no certain knowledge of the use made of combination licenses by the more than 225,000 purchasers. Information obtained on this subject is given in table 3.

Table 3--Use made of all game and fish licenses

License Use	Per Cent
Hunt small game only	6.7
Fish only	26.8
Fish and hunt small game	25.0
Did not use combination license	2.4
Hunt big game only	7.5
Hunt big game and small game	4.2
Hunt big game and fish	12.5
Hunt big game, fish, and small game	13.7
Did not use big game license	1.2
Total	100.0

Information given in table 3 has been of much value to the Department in overall administration. A further analysis added still further to its value since it was found that of all licenses purchased, 49.6 per cent hunted small game; 37.9 per cent hunted big game; 77.9 per cent fished; and 3.7 per cent of all licenses sold were not used.

Combination (Small-game and Fish) Licenses

To permit further effectiveness in administration, the same general breakdown made of all licenses was needed for combination licenses. This was necessary because combination licenses cover

both small game and fish, whereas big-game licenses are issued separately by species. Since some combination license buyers also hunt big game, it was desired to obtain this item in the analysis. The breakdown for all use of combination licenses is given in table 4.

Table 4--Use made of combination (small-game and fish) license, including big-game license buyers who also hunted small game

License Use	Per Cent	
	1945	1946
Hunt small game only	7.2	7.3
Fish only	26.7	29.4
Hunt small game and fish	15.6	27.3
Hunt small game and big game	8.6	4.6
Hunt big game and fish	16.8	13.7
Hunt big game, small game, and fish	24.2	15.0
Did not use combination license	.9	2.7
Total	100.0	100.0

Of the combination licenses sold in 1945, 83.3 per cent of the purchasers fished and 55.6 per cent hunted; in 1946, these figures were 85.3 per cent and 54.3 per cent, respectively. A total of 22.1 per cent of all big game hunters hunt such game only; conversely, 77.9 per cent of big game hunters also fish and/or hunt small game. A further breakdown revealed that in 1946, 54.3 per cent of the combination license holders hunted small game. Of these, 48.1 per cent hunted pheasants; 28.0 per cent, ducks; 3.3 per cent, geese; 17.0 per cent, cottontail rabbits; 2.3 per cent, doves; 1.4 per cent, Gambel quail; and 24.6 per cent, jack rabbits.

It is unnecessary to comment on the utility of information such as given in tables 3 and 4 from the standpoint of game and fish management.

Economic Value of Game and Fish

The value of game and fish resources, in terms of money or other exchange, is of the greatest importance to those charged with their administration. Such information affords the readiest means of comparison with other industries, and the soundest basis on which to justify operations. In table 5, the annual value of the hunting and fishing industry in Colorado is given for 1945 and 1946.

Table 5--Economic value of hunting and fishing, Colorado, 1945-1946

Type	1945		
	Travel and Equipment	License Cost	Total
Fishing	$16,917,519.20	$324,235.00	$17,241,754.20
Small game	3,488,242.50	31,890.00	3,520,132.50
Big game -- Resident	3,547,242.02	295,505.00	3,842,747.02
Big game -- Non-resident	528,503.25	102,225.00	630,728.25
Antelope	28,929.60	5,600.00	34,529.60
Total	$24,510,436.57	$759,455.00	$25,269,891.57

Type	1946		
	Travel and Equipment	License Cost	Total
Fishing	$16,696,628.54	$487,685.92	$17,184,314.46
Small game	3,955,192.20	38,352.00	3,993,544.20
Big game -- Resident	5,290,977.06	507,090.00	5,798,067.06
Big game -- Non-resident	1,558,986.00	272,550.00	1,831,536.00
Antelope	26,170.60	6,745.00	32,915.60
Total	$27,527,954.40	$1,312,422.92	$28,840,377.32

It is obvious from data given in table 5 that hunting and fishing are highly important industries in Colorado. How much of this turnover is true income is not known, but unquestionably the total volume ranks among the larger business operations in the state.

In addition to the costs shown in table 5, this survey revealed that the average fisherman was accompanied by 1.25 persons, giving an additional value of $21,480,390.40, which should be credited to fishing. In summary, fishing in Colorado had a calculated economic value of $38,664,704.86. Adding these expenditures to all other types of hunting and fishing, the total income (turnover) accruing in 1946 from Colorado game and fish resources was in excess of $50,000,000.00.

An evaluation of the Colorado fur resource, determined from a separate Random Survey conducted by Federal Aid personnel working in cooperation with the Colorado Cooperative Wildlife Research Unit, revealed an income of $536,513.00 for 1946. This figure, added to that for hunting and fishing, gave a total calculated value for the wildlife resource of Colorado, for 1946, of $50,857,240.72.

Table 6 illustrates the average annual expenditure per hunter or fisherman. The average cost per big-game hunter was verified from check station data, and the figure so determined for 1946, was $45.78. This shows a difference of $6.39 from that given for big game in table 6, and is probably accounted for by the fact that hunters interviewed at the stations were hurried and had not yet completed their

trip, thus neglecting to add the balance. A considerable variance between 1945 and 1946 costs is indicated, probably because the War, ending in 1945, found many civilian workers, who had not had a vacation in several years, very free in their expenditure. Figures for non-resident hunters and 3-day fishermen (also non-residents) were obtained from check station reports. Costs for all groups were as follows:

Table 6--Average annual expenditure per hunter or fisherman, 1945-1946

Hunter or Fisherman	1945	1946
Deer, Elk and Bear	$60.02	$52.17
Antelope	25.83	19.40
Non-resident Deer, Elk and Bear	129.25	114.30
Small-game	33.85	31.88
Fisherman, season	84.76	63.44
Fisherman, 3-day	16.17	18.03

Kill and Catch

With the possible exception of population figures, no information is more useful to game and fish managers than kill and catch data. This type of information becomes increasingly valuable as it accumulates. Thus, the Department constantly, and with increasing confidence, makes use of its kill and catch figures for the 8-year period of 1940-47, given in table 7.

The nature and utility of this information is too obvious for discussion, but it may be mentioned in passing that such items as the steady increase in the deer kill, the growing importance of the warm-water fish catch, and similar trends, suggest definite orientation in

Table 7--Game kill and trout and warm-water fish take, 1940-1947

Species	1940	1941	1942	1943	1944	1945	1946	1947
Deer	24,428	19,690	25,293	30,646	25,185	28,264	53,265	46,666
Elk	2,987	2,387	4,893	6,148	3,931	3,355	8,428	4,793
Antelope	----	----	----	----	----	834	1,113	----
Bear	123	176	185	289	242	268	105	463
Pheasant	178,732	189,771	189,254	198,309	206,159	251,139	256,550	262,448
Ducks	375,596	420,629	365,618	306,739	372,610	427,224	378,669	387,564
Geese	2,303	2,579	2,241	1,880	2,284	4,985	4,956	5,063
Rabbits	232,048	246,370	245,708	253,668	262,118	142,462	271,803	278,050
Quail	10,682	11,341	11,311	11,775	12,221	21,159	12,524	12,813
Dove	36,373	38,602	38,495	40,143	41,645	26,432	47,582	48,672
Bandtail pigeon	----	----	----	----	18,708	9,625	----	----
Sage grouse	----	----	----	----	1,800	8,098	----	----
Blue grouse	----	----	----	----	----	3,772	----	----
Sharptail grouse	----	----	----	----	----	206	----	----
Jack rabbits	----	----	----	----	----	----	492,771	----
Trout	9,008,410	9,683,469	9,159,543	10,023,272	9,904,621	12,617,171	11,331,690	11,324,440
Warm-water fish	877,605	943,692	892,328	993,928	1,538,424	1,109,044	1,670,583	1,986,921

administration and management. Conversely, the nearly static kill of quails and cottontail rabbits, despite great increase in hunting pressure, indicated that reduction in season or bag limits, or both, were in order. On the strength of trends so revealed, it should be added here that the Colorado Game Commission, since 1947, has reduced both season and limits on cottontail rabbits and quail. All other species are being handled in accordance with requirement indicated by kill figures.

Hunter and Hunting Information

It is regarded as important by the Colorado Game and Fish Department to know hunters' attitudes and their preferences in equipment and hunting conditions. Accordingly, a series of questions were asked during the Random Survey in the hope of gathering this information. Questions and the results obtained follow:

Duck Hunting Hours:

Question: Can you obtain your ducks under the present shooting hours?

Answer:		Yes	No
	1945 only	62.0%	38.0%

Question: Would any change in evening hours aid you?

Answer:		Yes	No
	1945 only	64.3%	35.7%

Hunting Dogs:

Question: Did you use a dog?

Answer:	Yes	No
1945	17.0%	83.0%
1946	9.9%	90.1%

Question: Was dog trained?

Answer:		Yes	No
	1945 only	72.5%	27.5%

Question: What breed of dog used?

Answer:					
	1945 only	Setter	22.5%	Chesapeake	5.0%
		Labrador	15.9%	Pointer	8.2%
		Springer	22.0%	Off breed	14.3%
		Cocker	12.1%		
		Total			100.0%

Guns--Type and Gauge:

Question: What make of gun did you use?

Answer:					
	1945 only	Winchester	45.6%	L. C. Smith	2.0%
		Remington	26.0%	Miscellaneous	1.6%
		Browning	6.5%	Foreign	1.2%
		Stevens	6.2%	Parker	.1%
		Western	3.4%	Springfield	.1%
		Ithaca	2.6%	Iver Johnson	.1%
		Marlin	2.4%	LeFever	.1%
		Savage	2.0%	Ranger	.1%
		Total			100.0%

Question: What type of gun did you use?

Answer:					
	1945 only	Pump	58.4%	Double	16.0%
		Automatic	18.9%	Over/Under	.1%
		Single	6.6%		
		Total			100.0%

Hunting Clubs:

Question: Do you belong to a hunting club?

Answer:	Yes	No
1945	12.0%	88.0%
1946	18.0%	82.0%

Private Lands:

Question: Do you hunt private land?

Answer:	Yes	No
1945	87.3%	12.7%
1946	84.1%	15.9%

Question: Were you charged?

Answer:	Yes	No
1945	3.9%	96.1%
1946	1.5%	98.5%

Fenced Property:

Question: Do you regard fenced property as private?

Answer:	Yes	No
1945 only	74.3%	25.7%

Jack Rabbits:

Question: 1946 only Do you hunt Jack rabbits?

Answer: 24.6% of all small game hunters hunted Jack rabbits.

Question: 1946 only Reason for hunting Jack rabbits?

Answer: 34% hunted for food; 63% hunted for sport; 1% hunted for both reasons; and 2% did not answer.

Warden Checks:

Question: Were you checked by a warden?

Answer: 1946 only

	Type of Hunter					
	Pheasant	Duck	Goose	Rabbit	Dove	Quail
Checked by warden	20%	12%	12%	7%	7%	4%

Total per cent of small-game hunters checked was 14.9%

Big Game

The random survey for big game was made primarily as a check against the big-game card return report, but also for the purpose of obtaining other information pertinent to big-game hunting. Kill figures, as obtained by report cards, were used as final figures. It is interesting to note, however, that Random Survey figures, with the exception of antelope, are consistently higher on the number killed, but within the allowed margin of error. See table 1 for comparisons.

Residence of Hunters

Table 8 shows the counties in which big-game hunters reside. Naturally, these figures are a good indication of the percentage of licenses sold in each particular county. In comparing these data with card returns for 1946 and 1947, as shown in the Big Game Kill Report, (Hunter, 1948), the difference is very small. This, again, is proof of the accuracy of the Random Survey.

Denver County, because of its population of about 500,000, (approximately one-half of the state's population), shows by far the largest percentage of big-game hunters. No other county indicates the same trend for all big-game species, although various counties rank high for individual species. This is due mainly to the proximity of such counties to hunting country, illustrated by Mesa and El Paso for deer; Delta and La Plata for elk; Chaffee, Delta, Kit Carson, and Las Animas

This winter concentration of bull elk in Middle Park, Colorado, is typical of the conditions found throughout the greater part of the State each winter, when large herds drift from the forest areas to the agricultural centers and sage brush flats in the mountain valleys.

for bear; and Larimer and El Paso for antelope. It will be noted that species with general distribution, such as deer and elk, show less concentration, by counties, in hunters' residence.

Success Ratio

It is difficult to obtain from hunting report cards the exact location of unsuccessful hunters' efforts. By the Random method, the counties in which both successful and unsuccessful hunters operated was easily obtained. Table 9 indicates the kill success ratio by counties for both deer and elk. In reviewing this table, it will be observed that Lake and Pitkin Counties show 100 per cent success on deer. However, it was found that few men contacted hunted there, a circumstance enhancing hunting success. The same applies to San Juan County in regard to elk. Disregarding these apparent biases, table 9 is fairly indicative of the success a hunter might expect in the various counties of the state.

Table 8--Residence of big-game hunters by county, 1946, expressed in per cent

County	Deer	Elk	Bear	Antelope
Adams	.3	.4	0	0
Alamosa	.9	.9	0	0
Arapahoe	1.6	1.5	0	7.4
Archuleta	.9	2.1	0	0
Baca	.4	1.4	0	3.8
Bent	.3	.4	0	3.7
Boulder	2.1	3.7	0	0
Chaffee	2.1	1.3	12.5	0
Clear Creek	.1	0	0	0
Conejos	.6	.2	0	0
Costilla	.2	0	0	0
Crowley	.3	0	0	0
Custer	.4	0	0	0
Delta	5.1	5.3	12.5	0
Denver	17.1	12.5	37.5	14.8
Douglas	.4	.4	0	0
Dolores	.4	.9	0	0
Eagle	2.2	3.0	0	0
Elbert	.2	.2	0	0
El Paso	5.5	3.4	0	11.1
Fremont	2.6	2.1	0	0
Garfield	3.5	4.1	0	0
Gilpin	.1	.2	0	0
Grand	1.8	3.6	0	0
Gunnison	3.1	3.2	0	0
Hinsdale	.1	.2	0	0
Huerfano	.9	0	0	0
Jackson	.9	.7	0	0
Jefferson	1.5	2.4	0	0
Kiowa	.3	0	0	0
Kit Carson	.4	.6	12.5	0
Lake	1.4	.6	0	0
La Plata	4.1	4.9	0	0
Larimer	3.8	2.4	0	14.8
Las Animas	1.1	1.7	12.5	0
Lincoln	.2	.4	0	3.7
Logan	.9	1.5	0	0
Mesa	6.0	3.0	0	0

Table 8--Residence of big-game hunters by county, 1946
(continued)

County	Deer	Elk	Bear	Antelope
Mineral	.6	2.1	0	0
Moffat	1.8	1.9	0	7.4
Morgan	.4	.4	0	0
Montezuma	2.1	1.9	0	0
Montrose	3.8	3.4	0	0
Otero	1.3	1.3	0	3.7
Ouray	.6	.6	0	0
Park	.4	.4	0	0
Pitkin	.5	.6	0	0
Phillips	.3	.6	0	0
Prowers	.4	.4	0	3.7
Pueblo	3.5	2.8	0	14.8
Rio Blanco	1.5	1.5	12.5	3.7
Rio Grande	1.6	3.9	0	3.7
Routt	2.2	4.1	0	0
Saguache	1.0	1.3	0	0
San Juan	.3	.2	0	0
San Miguel	.6	1.1	0	0
Sedgwick	.1	0	0	0
Summit	.3	0	0	0
Teller	.3	0	0	0
Washington	.1	.4	0	0
Weld	2.1	1.9	0	3.7
Yuma	.3	0	0	0
Unknown	.1	0	0	0
Total	100.0	100.0	100.0	100.0

Table 9--Success ratio by counties, Colorado deer and elk hunters, 1946, expressed in per cent

County Where Hunted	Success Ratio	
	Deer	Elk
Archuleta	53.3	50.0
Alamosa	50.0	0
Boulder	20.0	100.0
Chaffee	46.7	0
Clear Creek	42.9	42.9
Conejos	50.0	0
Costilla	85.7	0
Custer	75.0	0
Delta	65.2	50.0
Dolores	43.8	50.0
Douglas	50.0	0
Eagle	90.2	30.0
El Paso	33.3	0
Fremont	58.3	0
Garfield	75.0	29.4
Gilpin	12.5	0
Grand	58.9	26.5
Gunnison	90.6	49.1
Hinsdale	38.5	60.0
Huerfano	62.5	0
Jackson	64.0	12.5
Jefferson	75.0	0
Lake	100.0	0
La Plata	66.0	48.0
Larimer	40.0	25.0
Las Animas	20.0	0
Mesa	72.7	66.7
Mineral	42.9	18.8
Moffat	84.6	50.0
Montezuma	65.4	30.0
Montrose	77.6	30.0
Ouray	76.9	30.0
Park	40.0	0
Pitkin	100.0	16.7
Rio Blanco	83.5	22.2
Rio Grande	66.6	25.0
Routt	61.5	53.6
Saguache	65.4	31.3
San Juan	50.0	100.0
San Miguel	86.7	45.5
Summit	77.8	0
Teller	33.3	0

Distribution of Big-game Hunters and 1946 Kill

Table 10 shows the distribution of Colorado big-game hunters by counties. These figures, as obtained from the Random Survey, correspond to figures obtained from hunting report cards, as shown in 1946-1947 Big Game Kill Report (Hunter, 1948).

The reported kill for 1946, as determined from hunters' kill cards, was as follows: deer, 53,265; elk, 8,428; bear, 105; and antelope, 1,113.

Number of Hunters

The percent of big-game hunters seeking both deer and elk is valuable since it provides an index for calculating the approximate number of hunters in the field. In 1946, 20.3 per cent of all deer and elk license holders carried 2 licenses. Thus, there were 89,506 deer and elk hunters in the field. Total deer and elk license sales for 1946 was 112,320.

Wounding Loss

Table 11 depicts wounding loss by species for 1945 and 1946. Later surveys made at check stations reveal that a fair proportion of wounded animals were harvested by hunters (Hunter, 1948). It would appear that big game wounding losses in Colorado are not as heavy as commonly believed, although such mortality varies from about 14 per cent in elk to about 10 per cent in deer and less in antelope. It should

Table 10--Distribution of big-game hunters by counties, 1946, expressed in per cent

County	Deer	Elk	Bear	Antelope
Alamosa	.1	0	0	0
Arapahoe	0	0	0	14.8
Archuleta	1.1	1.3	0	0
Bent	.1	0	0	0
Boulder	.4	.4	0	0
Chaffee	1.1	0	0	0
Cheyenne	0	.2	0	0
Clear Creek	.4	1.5	0	0
Conejos	.3	0	0	0
Costilla	.5	0	0	0
Custer	.3	.2	0	0
Delta	3.3	2.1	0	0
Dolores	1.1	1.3	0	0
Douglas	.5	0	0	0
Eagle	10.9	6.4	0	0
Elbert	0	0	0	3.7
El Paso	.2	0	0	11.1
Fremont	2.6	0	0	0
Garfield	5.7	7.3	0	0
Gilpin	.5	0	0	0
Grand	6.8	10.5	37.5	0
Gunnison	12.2	12.2	12.5	0
Hinsdale	.9	3.2	0	0
Huerfano	1.1	0	0	7.4
Jackson	3.5	3.4	0	0
Jefferson	.3	0	0	0
Lake	.1	0	0	0
La Plata	3.8	5.3	0	0
Larimer	4.3	.9	0	11.1
Las Animas	.4	0	12.5	0
Lincoln	0	0	0	14.8
Mesa	4.7	2.6	0	0
Mineral	1.0	3.4	0	0
Moffat	2.7	.4	0	11.1
Montezuma	1.9	2.1	0	0
Montrose	4.8	2.1	12.5	0
Ouray	.9	2.1	0	0
Park	1.1	0	12.5	0
Pitkin	1.9	2.6	0	0
Pueblo	.1	0	0	11.1
Rio Blanco	8.6	7.7	12.5	0
Rio Grande	1.3	1.7	0	0
Routt	.9	6.0	0	0
Saguache	1.9	3.2	0	0
San Juan	.1	.2	0	0
San Miguel	1.1	2.4	0	0
Sedgwick	0	.2	0	0
Summit	.6	.9	0	0
Teller	.9	0	0	0
Weld	0	0	0	14.9
Unknown	3.0	6.2	0	0
Total	100.0	100.0	100.0	100.0

be recognized, however, that this is only the known loss; the actual loss, including animals wounded without knowledge of hunters and losses unreported, is almost certainly higher.

An unexpected finding was that the bulk of wounding in big game was by successful hunters. This is presumably due to the fact that successful hunters, more skillful and experienced than unsuccessful ones, obtain and take a far greater number of shots at game.

Table 11--Per cent of wounding loss by species, 1945-46

	Deer		Elk		Antelope	
	1945	1946	1945	1946	1945	1946
Per cent of hunters wounding game	4.7	5.2	5.1	3.7	9.0	
Per cent of game shot that are wounded	8.2	8.0	12.4	10.7	10.0	
Number lost for game obtained	1 to 11.3	1 to 8.6	1 to 7	1 to 7.3	1 to 11	
Per cent of hunters wounding game that injure two or more animals	44.0	22.5	54.5	19.0		
Per cent of deer and elk wounded by successful hunters	72.7	75.3	81.8	91.3		

All antelope hunters reporting wounding, wounded only 1 animal.

Big Game Hunters Checked

Differences in checks for 1945 and 1946 can be explained by the fact that, in 1945, there were proportionately more wardens per hunter

than in 1946. In 1946, license sales increased about 90 per cent over 1945, but warden force remained approximately the same. As for check stations, there were 6 for deer and elk in 1945; 10 in 1946. These differences are shown in table 12.

Table 12--Big game hunters checked, Colorado, 1945-46

By Whom Checked	Per cent Checked	
	1945	1946
Warden	21.3	11.5
Check Station	30.2	41.6

Hunting Report Card Return

In 1946, the Random Survey showed that 83.6 per cent of all big-game hunters returned their cards. However, the actual return was only 64.6 per cent. This bias can be explained by the fact that most hunters, realizing there was a law on hunting report card return, informed the interviewer that they had returned their card whether or not they had done so. In the case of antelope hunters, 96.2 per cent said they sent in cards, and actually 97 per cent did return them.

Use of Horses in Hunting

In 1945, 34.1 per cent of deer hunters and 68.3 per cent of elk hunters reported using horses. Of such elk hunters, 78.7 per cent were successful. The wider use of horses in elk hunting is due to

greater inaccessibility of range on which this species is hunted.

Distance Hunted from Car

Table 13 indicates the distance the average big-game hunter moved from his car. It is interesting to note that 62.7 per cent of all deer, 29.1 per cent of all elk, and 57.2 per cent of all antelope were shot within a mile of hunter's cars. Naturally, most hunters who traveled 5 miles or more from the road were on pack trips and hunting from hunters' camps.

Table 13--Distance of big game hunting from car, Colorado, 1946

Maximum Distance from Road	Per Cent of Hunters		
	Deer	Elk	Antelope
200 Yards	18.5	10.1	28.6
400 "	4.8	1.9	0
600 "	4.5	1.9	0
800 "	2.5	0	0
1,000 "	6.2	1.9	0
1,200 "	2.2	.6	4.8
1,400 "	1.1	0	0
1,600 "	2.7	1.3	0
1,760 " or 1 Mile	20.2	11.4	23.8
2 Miles	15.0	10.2	14.3
3 "	10.0	10.2	4.8
4 "	3.4	6.9	0
5 "	3.3	7.6	0
6 "	2.0	3.8	0
7 "	1.0	3.8	0
8 "	1.2	6.9	9.5
9 "	.3	1.3	0
10 "	0	5.7	14.2
11 "	0	.6	0
12 "	.3	5.0	0
13 "	.1	2.6	0
14 "	0	.6	0
15 "	.3	3.3	0
16 "	.2	.6	0
17 "	0	.6	0
20 "	0	.6	0
28 "	.2	.6	0
Total	100.0	100.0	100.0

Hour of Big-game Kill

The following table shows the time of big-game kills in 1945. Morning kills accounted for 65.2 per cent of all deer; 72.5 per cent of all elk; and 70 per cent of all antelope. Preponderance of morning kills is due to the natural attempts of hunters to get into the field early in order to get ahead of other sportsmen. Also, a great part of the total kill is made the first morning of the season, before the game becomes alarmed.

Table 14--Hour of big-game kill, Colorado, 1945

Per Cent of Kill	A. M.						
	6:00	7:00	8:00	9:00	10:00	11:00	12:00
Deer	4.5	8.4	12.5	12.6	13.3	6.0	7.9
Elk	5.0	10.0	13.1	20.0	11.9	4.4	8.1
Antelope	3.3	16.7	16.7	13.3	3.3	16.7	70.0
	P. M.						
	1:00	2:00	3:00	4:00	5:00	6:00	Total
Deer	2.7	4.9	7.4	10.3	5.5	4.0	100.0
Elk	3.1	8.1	3.5	6.6	1.2	5.0	100.0
Antelope	3.3	6.7	6.7	6.7	3.3	3.3	100.0

Other Game Killed

It was determined from Survey data that during the 1946 big-game season, one hunter out of 1,908 killed a mountain lion; that 8.3 per cent of all big-game hunters killed a coyote; and that .6 per cent of all big-game hunters killed bob-cats.

Occupation of Big Game Hunters

Colorado big-game hunters come from many walks of life, as would be expected. In table 15, this information is presented.

Table 15--Occupation of big-game hunters, Colorado, 1946, expressed in per cent

Occupation	Per Cent
Professional or Semi-Professional	3.1
Proprietors, Managers, Officials	32.0
Clerical, Sales, Kindred	12.7
Craftsmen, Foremen, Kindred	32.1
Operatives, Kindred	4.4
Protective Service	4.0
Service Workers	2.0
Laborers	3.9
Retired	1.3
Women	1.1
Students	2.8
Unknown	.6
Total	100.0

Age of Big Game Hunters

Big-game hunting, a strenuous sport, was naturally most common in younger age-class. Thus, the 21-45 class accounted for 74.4 per cent of the total number of hunters. This information is presented in table 16.

Table 16--Age-groups of big-game hunters, 1946

5-Year Age Groups	Per Cent	5-Year Age Groups	Per Cent
10-15	.3	46-50	8.7
16-20	3.8	51-55	5.9
21-25	12.4	56-60	4.2
26-30	16.7	61-65	1.8
31-35	16.2	66-70	.5
36-40	17.2	71-75	.3
41-45	11.9	76-80	.1
Total	78.5		21.5

Small Game

Hunters and Kill

Prior to completion of the Random Survey, the Colorado Game and Fish Department was unable to ascertain either the number of small-game hunters or the kill by species, whether by counties or game-management districts. In table 17, the average kill of pheasants, ducks, and rabbits per hunter is given by counties for 1946. It will be noted that the total number of hunters and the total kill for each group is also given. The breakdown extends that given in table 7, and supplies further information on hunting pressure and the success ratio for common species, and serves as an excellent medium for indicating distribution of kill.

A still further breakdown of the small-game kill results when the total number of hunters, total kill, and average kill per hunter, is known by species for each of the 10 small-game management districts. Such information is shown in table 18. These data likewise indicate hunting pressure, success ratio, and distribution for small game.

It is believed that the best indication of game density as indicated in table 18 is the average season kill per hunter. Thus, for pheasants, it is known that northeastern Colorado holds the largest population of birds, with the Fort Collins-Loveland-Greeley area ranking second. These localities are included as the North East and North Central game

Of all of the small game species, the common cottontail and varying hare affords Colorado hunters their greatest take by numbers of any small game.

management units, respectively, wherein the average pheasant kill per hunter, 1946, was 6.7 and 4.4 birds, table 18.

Population density in other species is indicated similarly. Ducks, in 1946, were most abundant in the East Central, South East, and North Central units, with several others ranking close. Geese showed only one major concentration area, the South East unit, where the Two Buttes Public Shooting Ground is located. Rabbits were rather uniformly distributed, as indicated by kill, with the South East and San Luis units ranking highest. Doves were most numerous in the South East and North Central units. Quails were legal only in the West Central area.

The two types of information just discussed, namely kill by counties and kill by game management units, is of interest to both sportsmen and game managers. Sportsmen and other local residents are always glad to know how one county compares with another, hence their interest in hunting statistics presented on a county basis. Game managers, on the other hand, knowing that each district is more or less uniform as regards geographical features and agricultural practices, and that game populations thereon may be handled as units, find the district breakdown of far greater utility.

Table 17--Pheasant, duck, and rabbit kill, number of hunters, and average take per man, by counties, Colorado, 1946

County Where Hunted	PHEASANTS			DUCKS			RABBITS		
	No. of Hunters	Kill	Average take per hunter	No. of Hunters	Kill	Average take per hunter	No. of Hunters	Kill	Average take per hunter
Adams	4,272	14,074	3.29	1,935	19,445	10.04	688	6,270	9.11
Alamosa	1,363	3,834	2.80	1,564	12,629	8.07	557	6,461	11.60
Arapahoe	428	1,998	4.66	619	5,979	9.65	434	2,846	6.56
Archuleta				121	1,494	12.34	184	608	3.30
Baca	309	986	3.19	376	2,100	5.58			
Bent	863	2,653	3.07	699	11,947	17.09	308	3,797	12.33
Boulder	4,463	16,356	3.66	1,997	31,297	15.67	184	930	5.05
Chaffee				183	3,728	20.37	434	11,027	25.41
Conejos	553	1,242	2.24	628	8,537	13.59	681	7,820	11.48
Costilla				59	1,607	27.23	61	172	2.82
Crowley	309	858	2.77	759	11,152	14.69			
Custer				183	358	1.95	124	544	4.39
Delta	3,779	10,786	2.85	817	4,258	5.21	1,059	9,179	8.67
Douglas	60	114	1.90	121	509	4.20	61	363	5.95
Dolores							61	4,966	81.41
Eagle				183	1,304	7.12	124	508	4.10
Elbert				59	2,177	36.89	124	508	4.10
El Paso	60	192	3.20	744	6,873	9.23	1,245	12,468	10.01
Fremont				246	131	.53	1,059	19,589	18.50
Garfield	194	252	1.29	214	1,683	7.86			
Gilpin							124	1,052	8.48
Grand				121	434	3.58	131	1,133	8.65
Gunnison				201	3,427	17.04	61	172	2.82
Hinsdale				59	434	7.35	61	2,492	40.85
Huerfano				370	3,349	9.05	805	13,147	16.33
Jackson				59	509	8.62	61	753	12.34
Jefferson	119	191	1.60	252	1,607	6.37	247	2,357	9.54
Kiowa	184	498	2.70	246	4,220	17.15	61	109	1.79
Kit Carson	619	3,090	4.99	121	850	7.02			
Lake				121	0	0	247	4,531	18.34
La Plata	1,238	2,423	1.95	744	6,644	8.93	501	5,020	10.02
Larimer	5,516	32,721	5.93	2,432	37,734	15.51	124	807	6.51
Las Animas				744	5,129	6.89	935	10,864	11.62
Lincoln							61	299	4.90
Logan	4,038	31,926	7.90	2,385	32,924	13.80	625	5,401	8.64
Mesa	1,307	3,911	2.99	802	5,801	7.23	1,059	8,799	8.31
Moffat				152	699	4.59	315	4,966	15.77
Morgan	3,354	15,866	4.73	1,331	9,559	7.18	189	4,966	26.28
Montezuma	369	319	.86	121	736	6.08	308	6,325	20.54
Montrose	3,285	11,225	3.41	927	4,826	5.20	434	4,042	9.31
Otero	2,485	6,143	2.47	649	6,644	10.23	371	2,302	6.20
Park				59	320	5.42	564	6,080	10.78
Phillips	1,053	8,605	8.17	121	812	6.71	61	245	4.02
Pitkin				59	509	8.62	61	943	15.46
Prowers	1,992	7,066	3.54	1,950	24,252	12.43	688	7,928	11.52
Pueblo				246	6,389	25.97	688	7,765	11.29
Rio Blanco	60	62	1.03	183	1,039	5.67	371	5,591	15.07
Rio Grande	2,541	9,119	3.58	1,549	15,807	10.20	991	13,283	13.40
Routt				432	3,652	8.45	184	2,927	15.91
Saguache	1,488	4,962	3.33	1,549	17,777	11.47	1,432	29,265	20.44
San Miguel				59	358	6.06			
Sedgwick	1,546	11,961	7.73	587	7,325	12.47	61	372	6.10
Summit				59	434	7.35			
Teller				59	434	7.35	618	13,446	21.76
Washington	744	3,218	4.32	59	1,191	20.18	184	1,677	9.11
Weld	9,737	41,961	4.31	3,964	40,989	10.34	625	8,798	14.08
Yuma	1,177	7,938	6.74	308	4,647	15.08	315	5,890	18.70
Total or Average	59,505	256,550	4.31	34,587	378,669	10.95	20,951	271,803	12.97

Table 18--Small-game kill, number of hunters, and average take per man, by game management units, 1946, Colorado

Game Management Unit	PHEASANTS			DUCKS			GEESE			RABBITS			DOVES			QUAIL		
	Hunters	Kill	Average take per man for Season	Hunters	Kill	Average take per man for Season	Hunters	Kill	Average take per man for Season	Hunters	Kill	Average take per man for Season	Hunters	Kill	Average take per man for Season	Hunters	Kill	Average take per man for Season
NORTH CENTRAL Adams, Arapahoe, Boulder, Gilpin, Jefferson, Larimer, Weld Counties	24,535	107,301	4.37	11,199	137,051	12.23	62	42	.68	2,426	23,060	9.50	248	5,701	22.98	NO OPEN SEASON		
NORTH EAST Logan, Morgan, Phillips, Sedgwick, Washington, Yuma Counties	11,912	79,514	6.67	4,791	56,458	11.78	490	374	.76	1,435	18,551	12.92	370	6,507	17.58	NO OPEN SEASON		
NORTH PARK Jackson County	NO OPEN SEASON			59	509	8.62	0	0	0	61	753	12.34	0	0	0	NO OPEN SEASON		
SOUTH CENTRAL Chaffee, Custer, Douglas, El Paso, Fremont, Park, Teller Counties	120	306	2.55	1,595	12,353	7.74	62	41	.64	4,105	63,517	15.47	620	8,859	14.28	NO OPEN SEASON		
SOUTH EAST Baca, Bent, Crowley, Huerfano, Kiowa, Las Animas, Otero, Prowers, Pueblo Counties	6,142	18,204	2.96	6,039	75,182	12.45	3,160	4,396	1.39	3,856	45,912	11.91	930	13,442	14.45	NO OPEN SEASON		
SAN LUIS Alamosa, Conejos, Costilla, Hinsdale, Rio Grande, Saguache Counties	5,945	19,157	3.22	5,408	56,791	10.50	124	41	.33	3,783	59,493	15.73	62	619	9.98	NO OPEN SEASON		
WEST CENTRAL Delta, Mesa, Montrose Counties	8,371	25,922	3.09	2,546	14,885	5.85	0	0	0	2,552	22,020	8.63	62	0	0	1,674	12,524	7.48
SOUTH WEST Archuleta, Dolores, LaPlata, Montezuma, San Miguel Counties	1,607	2,742	1.71	1,045	9,232	8.83	0	0	0	1,054	16,919	16.05	372	11,524	30.98	NO OPEN SEASON		
WEST Eagle, Garfield, Grand, Gunnison, Lake, Moffat, Pitkin, Rio Blanco, Routt, Summit Counties	254	314	1.24	1,725	13,181	7.64	191	62	.32	1,494	20,771	13.90	124	930	7.50	NO OPEN SEASON		
EAST CENTRAL Elbert, Kit Carson, Lincoln Counties	619	3,090	4.99	180	3,027	16.82	0	0	0	185	807	4.36	0	0	0	NO OPEN SEASON		
Total or Average	59,505	256,550	4.31	34,587	378,669	10.95	4,089	4,956	1.21	20,951	271,803	12.97	2,788	47,582	17.06	1,674	12,524	7.48

Kill Analysis

Table 19 supplies an analysis of small-game hunting in Colorado. To determine the accuracy of these data, a number of checks were made. In 1945, 2,601 pheasant hunters were contacted by wardens. The kill obtained by warden check was .311 per man hour. The Random Survey indicated a take per man hour of .310. In 1946, 1,607 checks were made by wardens, and they obtained a kill of .304 bird per man hour; the Survey indicated .39 bird per man hour. Both these checks are within the limits of desired accuracy.

A further analysis of the data indicates that whenever there is a liberal bag limit the average hunter makes a greater number of trips. This condition is reflected by comparing the number of trips for duck and goose hunters as well as the average amount expended. When bag and length of seasons are liberal, hunters make more trips and naturally run up their costs. The 1945 migratory bird season in Colorado was much more liberal than the 1946 season. During the course of the Survey, interviewers found that some hunters had difficulty in proportioning their costs correctly. This was logical, for Colorado has a number of seasons running concurrently, and it is quite common for one hunter to hunt ducks, geese, pheasants, rabbits, and quails on one trip. Therefore, the writer believes that the 2-year average of the amount expended is the most accurate figure to use, since it compensates for the inability of the hunter to proportion precisely his expenses to the various species that were hunted on one trip.

Table 19--Small-game analysis, Colorado, 1945 and 1946

INQUIRY	PHEASANTS		DUCKS		GEESE		COTTONTAILS		DOVES		SCALED QUAIL		GAMBEL QUAIL		BLUE GROUSE		SHARPTAIL GROUSE		SAGE CHICKENS		BAND-TAIL PIGEONS		JACK RABBITS**
	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1945	1946	1946
1. Average number trips per hunter per season	3.70	2.53	7.15	5.77	7.71	4.73	5.90	6.17	3.15	2.84	2.25		4.40	3.44	1.36		1.00		.95		3.75		
2. Average number small game taken per hunter for season	4.88	4.31	14.94	10.95	1.64	1.21	14.15	12.97	15.27	17.06	7.80		9.18	7.48	2.00		2.00		2.62		15.83		16.22
3. Average bag per man hour hunted	.31	.39	.57	.52	.05	.05	.64	.61	1.79	2.08	.68		.53	.88	.41		.31		.65		1.30		
4. Average hours spent each day hunting	4.23	4.37	3.65	3.66	4.54	5.01	3.76	3.46	2.70	2.89	5.06		3.92	2.57	3.59		6.50		4.23		3.24		
*5. Average amount expended per hunter for season	33.23	33.20	45.18	38.67	32.94	14.53	26.72	25.52	16.85	5.85	11.93		19.21	8.78	8.46		3.04		6.23		22.41		
6. Average amount expended per hunter - 1945-1946	33.21		41.62		22.38		25.91		10.06				13.55										
7. Cost per bird or animal	6.81	7.70	3.02	3.53	20.05	11.99	1.89	1.97	1.10	.34	1.40		2.71	1.17	4.48		.76		2.61		1.75		
8. Average cost per bird or animal - 1945-1946	7.23		3.24		16.63		1.93		.70				1.68										
9. Number of birds or animals obtained for each lost by wounding	4.96	6.19	8.71	8.77	7.30	6.15	5.16	20.40	10.72	18.70	21.25		6.53	20.20	72.00		0		8.16		31.60		
10. Percent lost of total shot	16.76	13.90	10.30	10.24	12.04	14.00	1.90	4.70	8.50	5.10	1.30		14.80	4.71	1.00		0		10.90		3.10		
11. Percent of hunters	49.94	48.14	27.75	27.98	2.95	3.31	9.77	16.95	1.68	2.26	1.02		1.37	1.35	1.83		.10		3.00		.59		24.57
12. Number of small game hunters in State	51,463	59,505	28,596	34,587	3,040	4,089	10,068	20,951	1,731	2,788	1,051		1,412	1,674	1,886		103		3,091		608		30,373
13. Total State take obtained	251,139	256,550	427,224	378,669	4,985	4,956	142,462	271,803	26,432	47,582	8,197		12,962	12,524	3,772		206		8,098		9,625		
14. Kill not obtained	50,632	41,445	49,050	43,203	682	805	8,904	13,324	2,465	2,540	385		1,984	620	52				992		305		
15. Total drain	301,771	297,995	476,274	421,872	5,667	5,761	151,366	285,127	28,897	50,122	8,582		14,946	13,144	3,824		206		9,090		9,930		492,771

NO OPEN SEASON

*34.1% of total expenditure is equipment cost.
**Jack rabbits not considered game. No information obtained in 1945.

It is also interesting to note that cost-per-bird or -mammal increases inversely to the bag limit. When the bag limit is high, naturally the cost per item bagged is lower, since each hunter obtains more pieces of game per hunting trip. Of the total expenditure by small game hunters, 34.1 per cent was for equipment costs. This included ammunition, guns, clothing, and other equipment.

Additional comments on items in table 19 that might appear questionable are as follows:

Rabbits, item 11--This increase was due to the fact that many G.I.'s were just returning from Service and desired to get into the field prior to the regular big-game season.

Doves, item 7--The difference in cost for the 2 years is attributed to the good season for doves during 1946, and a fair season in 1945. The 2-year average cost more nearly represents the amount that would be expended during a normal season.

Quail, item 7 and 8--Costs vary considerably in this item because hunters cannot accurately charge their expenses when hunting pheasants and quail on the same trip. The average cost for the 2-year period on Gambel quail compares very favorably with the 1945 cost on scaled quail, which inhabit a territory where little else can be hunted. Gambel quail, on the other hand, are hunted in conjunction with pheasants and ducks.

Quail, item 9--The number of birds obtained for each bird lost by wounding for the 3-year check period on all species of quail was about 16.

Grouse, item 6--Since all grouse are hunted together, it was difficult to figure the cost on one particular species. The average cost per bird for the 3 species was $2.99. The average grouse hunter spent $7.11. Wounding loss on blue grouse was negligible, doubtless because many hunters used .22 rifles. No wounding loss was reported on sharptail grouse because the number of hunters for this species was very small.

Residence of Small-game Hunters

All Colorado counties in which small-game hunting occurred are represented in the residence listing of such hunters, table 20. Denver County, because of population, ranks first; and rank in general is roughly proportional to number of residents per county. Naturally, counties holding or adjacent to concentrations of a given species showed a relatively high percentage of hunters; thus Prowers County ranked high for geese (Two Buttes Public Shooting Ground) and Mesa County for quails.

Table 20--Per cent of small game hunters, Colorado, by counties, 1946

County of Residence	Species Hunted					
	Pheasants	Ducks	Geese	Rabbits	Doves	Quails
Adams	.4	.5	0	0	0	0
Alamosa	1.6	3.2	1.5	3.3	2.2	0
Arapahoe	2.9	3.2	3.0	2.4	0	0
Archuleta	.1	.4	0	.9	0	0
Baca	.2	.5	4.5	0	0	0
Bent	.9	1.1	6.1	1.2	6.7	0
Boulder	4.3	3.9	1.5	.9	0	0
Chaffee	1.5	2.2	0	5.0	4.4	3.7
Conejos	.8	.9	0	2.1	0	0
Costilla	0	.2	0	.3	0	0
Crowley	0	.2	1.5	0	0	0
Custer	0	.4	0	.6	0	0
Delta	4.2	2.2	0	5.3	2.2	11.1
Denver	29.4	21.7	9.1	12.0	15.8	3.7
Douglas	.1	.2	0	.3	0	0
Dolores	0	0	0	.3	2.2	0
Eagle	.1	.4	0	.3	0	0
Elbert	.1	.2	0	0	0	0
El Paso	4.8	5.6	6.1	9.2	2.2	3.7
Fremont	.5	1.6	6.1	4.7	11.1	0
Garfield	.5	.5	0	.3	0	0
Gilpin	0	.2	0	.9	0	0
Grand	.2	.2	0	.9	0	0
Gunnison	.7	.9	0	0	0	0
Hinsdale	.1	.2	0	.3	0	0
Huerfano	.5	1.3	1.5	3.0	2.2	3.7
Jackson	0	.4	0	.3	0	0
Jefferson	1.5	.9	0	0	0	0
Kiowa	.3	.4	3.0	0	0	0
Kit Carson	.5	.2	0	0	0	0
Lake	.2	.7	1.5	1.8	0	3.7
La Plata	2.2	2.2	0	2.4	11.1	0
Larimer	6.9	6.3	0	0	0	0
Las Animas	1.8	2.3	0	4.4	2.2	0
Lincoln	0	.2	0	0	0	0
Logan	2.4	3.0	7.7	1.5	8.9	0
Mesa	4.9	3.2	0	5.0	0	63.0
Mineral	.1	.2	0	0	0	0
Moffat	.3	.4	3.0	.6	0	0
Morgan	1.5	1.6	0	0	0	0

Table 20--Per cent of small game hunters, Colorado, by counties, 1946 (Continued)

County of Residence	Species Hunted					
	Pheasants	Ducks	Geese	Rabbits	Doves	Quails
Montezuma	.6	.4	0	1.5	0	3.7
Montrose	3.2	1.8	0	1.8	0	3.7
Otero	3.1	3.2	9.1	2.1	13.4	0
Ouray	.3	0	0	0	0	0
Park	.1	0	0	1.2	0	0
Phillips	1.1	.5	0	0	0	0
Pitkin	0	.2	0	.3	0	0
Prowers	2.0	3.6	24.2	2.7	4.4	0
Pueblo	2.6	2.2	6.1	5.0	4.4	0
Rio Blanco	.1	.5	0	1.8	4.4	0
Rio Grande	3.2	4.5	1.5	5.6	0	0
Routt	.1	1.3	1.5	1.8	0	0
Saguache	1.1	2.5	0	1.5	0	0
San Juan	.2	0	0	0	0	0
San Miguel	.2	.4	0	.3	0	0
Sedgwick	.6	.7	1.5	.3	0	0
Summit	0	.2	0	0	0	0
Teller	0	0	0	1.8	0	0
Washington	.4	0	0	0	0	0
Weld	3.6	3.2	0	1.2	0	0
Yuma	1.0	.9	0	.9	2.2	0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Counties Hunted In

Since Colorado has 63 counties, space does not permit the listing of all of them. Therefore, analyses for 5 sample counties are given in table 21, illustrating the breakdown of Random Survey data relative to counties in which small-game hunting was done. These 5 counties are chosen as representative of the various sections of Colorado. Study of table 21 shows that hunters spend most of their time in their own or in adjacent counties, although heavy concentrations of game, such as geese at Two Buttes, Prowers County, drew hunters from a large part of the state. Denver hunters spent most of their time in adjacent counties, since 71.6 per cent of their pheasant kill was in a radius of 65 miles from this city.

Table 21--Residence of small-game hunters, and counties hunted in, Colorado, 1946, expressed in per cent

County	Species Hunted					
	Pheasants	Ducks	Geese	Rabbits	Doves	Quails
Denver County Residents						
Adams	20.2	21.5	0	26.2	28.6	0
Alamosa	0	.8	0	0	0	0
Arapahoe	.7	.8	0	9.5	28.5	0
Baca	0	0	50.0	0	0	0
Bent	.4	1.7	0	0	0	0
Boulder	12.1	8.3	0	2.4	14.3	0
Douglas	0	0	0	0	14.3	0
Fremont	0	0	0	2.4	0	0
Gunnison	0	0	0	2.4	0	0
Jefferson	.4	0	0	7.1	0	0
Kiowa	0	0	16.6	0	0	0
Larimer	6.0	2.5	0	4.8	0	0
Logan	11.3	15.7	0	11.9	14.3	0
Mesa	.4	.8	0	0	0	100.0
Morgan	7.8	9.9	16.7	2.4	0	0
Park	0	0	0	2.4	0	0
Phillips	2.4	.8	0	2.4	0	0
Prowers	0	.8	16.7	0	0	0
Rio Grande	.4	0	0	0	0	0
Saguache	.4	.8	0	4.8	0	0
Sedgwick	3.5	1.7	0	0	0	0
Washington	.4	0	0	7.0	0	0
Weld	32.2	32.2	0	11.9	0	0
Yuma	1.4	0	0	2.4	0	0
Did not use Duck Stamp	---	1.7	---	---	---	---
Total	100.0	100.0	100.0	100.0	100.0	100.0
Weld County Residents						
Larimer	2.9	0	0	0	0	0
Weld	97.1	100.0	0	100.0	0	0
Total	100.0	100.0	0	100.0	0	0

Table 21--Residence of small-game hunters, and counties hunted in, Colorado, 1946, (Continued)

County	Species Hunted					
	Pheasants	Ducks	Geese	Rabbits	Doves	Quails
Mesa County Residents						
Chaffee	2.1	0	0	0	0	0
Delta	34.0	11.0	0	0	0	5.9
Grande	0	5.6	0	0	0	0
Jefferson	2.2	0	0	0	0	0
Mesa	42.6	66.6	.0	100.0	0	70.6
Montrose	19.1	11.1	0	0	0	23.5
Pueblo	0	5.6	0	0	0	0
Total	100.0	100.0	0	100.0	0	100.0
Logan County Residents						
Logan	95.7	100.0	0	100.0	100.0	0
Morgan	4.3	0	0	0	0	0
Total	100.0	100.0	0	100.0	100.0	0
Rio Grande County Residents						
Alamosa	6.7	12.0	0	5.3	0	0
Baca	0	0	100.0	0	0	0
Rio Grande	86.6	80.0	0	84.2	0	0
Saguache	6.7	8.0	0	10.5	0	0
Total	100.0	100.0	100.0	100.0	0	0

Occupation of Small-game Hunters

As in the case of big-game, small-game hunters come from many professions and occupations. The two largest groups consisted of small business proprietors or managers and craftsmen of various kinds, the former group including farmers. Clerical, sales, and similar personnel made up the third largest group. Percentages for the 12 occupations in which sportsmen were listed are given in table 22.

Table 22--Occupation of small-game hunter, Colorado, 1946

Occupation	Per Cent
1. Professional and Semi-professional	3.2
2. Proprietors, Managers, Officials	31.3
3. Clerical, Sales and Kindred	14.9
4. Craftsmen, Foremen, Kindred	32.1
5. Operatives and Kindred Workers	2.6
6. Protective Service	3.9
7. Service Workers	2.3
8. Laborers	4.2
9. Retired	.7
10. Women	.6
11. Students	4.0
12. Unknown	.2
Total	100.0

Age of Small-game Hunters

The age of small-game hunters follows closely the trend found in big-game hunters, namely that the largest percentage fell into the 21-45 year age-group. Thus, hunters of this age constituted 76.2 per cent of the total. The comparable big-game figure was 74.4 per cent. Percentages for all 5-year age-groups are given in table 23.

Table 23--Age-groups of small-game hunters, Colorado, 1946

5-Year Age Groups	Per Cent	5-Year Age Groups	Per Cent
10-15	.3	46-50	7.8
16-20	5.6	51-55	4.7
21-25	12.9	56-60	3.0
26-30	16.6	61-65	1.2
31-35	17.8	66-70	.7
36-40	17.3	71-75	.3
41-45	11.6	Unknown	.2
Total	82.1		17.9

Fish

In Colorado, fishing is of very great importance from the standpoint of both the Department's operations as well as the overall economy of the state. For these reasons, it is necessary to know as much as possible about fishermen and the various species of fishes involved. Information given below, based on 2,399 field interviews of holders of combination small-game and fishing licenses for 1946, supplies these details.

Species and Catch

The various tabulations immediately following list the species most commonly taken by Colorado fishermen, together with data pertaining to catch.

1. His favorite fish, in order of preference, was:

		Per cent
Trout		
In streams------	Rainbow	74.6
	Native	12.9
	Brook	7.7
	Loch	4.8

		Per cent
Trout		
In lakes	Rainbow	74.0
	Native	14.7
	Brook	7.1
	Loch	3.5
	Mackinaw	.7
In warm-water lakes	Bass	40.0
	Crappie	29.2
	Catfish	21.5
	Perch	7.3
	Bluegill	2.0

2. Average catch per fishing hour, number:

On trout streams	1.24
On trout lakes	1.18
On warm-water lakes	1.96
Average	1.46

3. Average daily catch, number:

On trout streams	6.45
On trout lakes	6.72
On warm-water lakes	8.70
Average	7.29

4. Average total catch for season, number:

On trout streams	54.57
On trout lakes	13.79
On warm-water lakes	12.05
Total	80.42

Time Spent in Fishing

The average fisherman devoted time to his sport as indicated by the following tabulation:

1. Number of days spent:

On trout streams	8.44
On trout lakes	2.05
On warm-water lakes	1.38
Total days	11.87

Fishing in all of its forms represents a multi-million dollar industry in Colorado. Both cold- and warm-water species abound in the State.

2. Average hours spent per fishing day:

On trout streams	5.20
On trout lakes	5.68
On warm-water lakes	4.43
Average	5.10

3. Total fishing hours per season:

On trout streams	43.94	(71.2%)
On trout lakes	11.67	(18.9%)
On warm-water lakes	6.14	(9.9%)
Total hours	61.75	

4. Days spent on pack trips (3 miles or more on foot or horseback):

On trout streams	.53
On trout lakes	.30
Total	.83

5. Fishing days spent (expressed in percent):

On Public Waters		On Private Waters	
Trout streams	62.4	Trout streams	7.1
Trout lakes	16.3	Trout lakes	1.5
Warm-water lakes	9.6	Warm-water lakes	3.1
Totals	88.3		11.7

Fishing Costs

Colorado fishermen spent sums indicated in the following tabulations in taking trout and warm-water fish in the state:

1. Average daily cost of fishing trips:

On trout streams	$4.22
On trout lakes	4.94
On warm-water lakes	1.52
Average	$3.56

2. Season cost of fishing trips:

On trout streams	$35.64
On trout lakes	10.14
On warm-water lakes	2.10
Total	$47.88

3. Season cost of fishing equipment:

On trout streams	$13.70
On trout lakes	1.18
On warm-water lakes	.68
Total	$15.56

4. Total spent per fisherman for season $63.44

Warden Contacts

The average fisherman was contacted .56 times on his 1946 fishing trips by wardens of the Colorado Game and Fish Department, according to Random Survey data.

That portion of the questionnaire having to do with this subject was included for the specific purpose of testing the accuracy of returns from the Random Survey with a known answer. A total of 22,907 contacts were made by members of the warden force during 1946; since 286,603 licenses were sold that year, the average number of contacts per license holder was .08. Thus the answer obtained from the Survey was 7 times larger than the true answer.

The apparent explanations for this extreme bias are, persons interviewed misunderstood the question and included the times they had been contacted by a warden over a period of years, rather than just for 1946; or, persons interviewed fished more often in warden contact areas than did average license holders.

Fishing Time, Catch, and Costs--Statewide Basis

When the above statistics are applied to the total sale of combination small-game and fishing licenses in 1946, the following totals are apparent for Colorado as a whole:

1. Total number of licenses sold	286,603
Number of resident licenses sold	224,721
Number of season non-resident licenses sold	27,171
Number of 3-day non-resident licenses sold	34,711
Total number of season licenses sold	251,892
2. Trout stream fishing days	2,178,500
Trout lake fishing days	534,368
Total trout fishing days	2,712,868
Warm-water fishing days	348,701
Total fishing days	3,061,569
3. Trout stream fishing hours	11,339,310
Trout lake fishing hours	3,038,256
Total trout fishing hours	14,377,566
Warm-water fishing hours	1,546,837
Total fishing hours	15,924,403
4. Number fish caught in trout streams	14,084,217
Number fish caught in trout lakes	3,591,067
Total trout caught	17,675,284
Number fish caught in warm-water	3,035,389
Total fish caught	20,710,673

Since fishermen are notoriously able to over-estimate the number and size of fish caught, the catch per man-hour, derived from almost 23,000 warden contact reports throughout the season and state during 1946, is considered a more reliable figure. Based on this latter figure, the catch for the 1946 season in Colorado is as follows:

Number fish caught in trout streams	9,751,807
Number fish caught in trout lakes	1,579,893
Total number trout caught	11,331,700
Number fish caught in warm water	1,680,583
Total fish caught	13,012,283

Data on other questions, after adjustment to a statewide basis are as follows:

1. Days spent on pack trips (3 miles or more on foot or horseback):

On trout streams	151,842
On trout lakes	87,090
Total	238,932

The total is 7.8 per cent of all fishing days.

2. Season cost of fishing trips:

On trout streams	$10,214,530.92
On trout lakes	2,906,154.42
On warm-water lakes	601,866.30
Total	$13,722,551.64

3. Season cost of fishing equipment:

On trout streams	$ 3,926,461.10
On trout lakes	338,191.54
On warm-water lakes	194,890.04
Total	$ 4,459,542.68

4. Total amount spent for season: $18,182,094.32

5. Total charges for fishing:

On trout streams	$ 7,992.39
On trout lakes	776.54
Total	$ 8,768.93

6. Favorite fishing areas by drainage (An indication of fishing pressure):

		Per cent
Trout Streams -	South Platte River	28.5
	Colorado River	22.3
	Gunnison River	18.5
	Rio Grande River	12.2
	Arkansas River	6.2
	Yampa River	3.8
	North Platte River	3.1
	White River	2.7
	Dolores River	1.9
	Laramie River	.8
		100.0
Trout Lakes ---	Colorado River	36.3
	South Platte River	14.2
	Arkansas River	11.2
	San Juan River	10.0
	Rio Grande River	9.2
	Gunnison River	7.2
	White River	3.6
	Dolores River	3.3
	Yampa River	2.6
	North Platte River	1.5
	Laramie River	.9
		100.0
Warm Water ---	South Platte River	61.9
	Arkansas River	28.9
	Colorado River	4.0
	Republican River	1.8
	Laramie River	1.3
	White River	.9
	Dolores River	.4
	Gunnison River	.4
	San Juan River	.4
		100.0

Fishing Pressure by Counties

Regions of heaviest fishing pressure are usually known in a general way by administrators, but an accurate measurement of this factor on a state-wide basis and for all types of fishing is seldom at hand. Obviously such information is of great advantage in management operations. The Random Survey provided this type of data for trout streams, trout lakes, and leading warm waters in Colorado. Evaluation is on the basis of total fishing for each class carried by the most important fishing counties, table 24.

Age of Fishermen

The age of Colorado fishermen averaged only slightly more than that of hunters. The largest age group for both classes of sportsmen was between 31 and 40 years, but a somewhat larger percentage of fishermen were listed in the oldest age brackets. This information, by 10-year periods, is as follows:

Age, Years	Per cent
12-20	4.6
21-30	25.1
31-40	32.9
41-50	21.5
51-60	11.6
61-70	3.6
71-80	.7

Table 24--Fishing pressure by counties, Colorado

Trout Streams		Trout Lakes		Warm-water	
County	Per Cent	County	Per Cent	County	Per Cent
Gunnison	16.0	Mesa	10.3	Larimer	16.2
Larimer	11.2	La Plata	8.5	Logan	9.6
Grand	5.9	Delta	7.5	Denver	7.5
Park	4.9	Park	5.3	Otero	5.7
Eagle	3.9	Hinsdale	5.1	Prowers	5.7
La Plata	3.8	Lake	4.0	Bent	5.3
Routt	3.6	Mineral	4.0	Boulder	5.3
Rio Grande	3.6	Eagle	3.8	Jefferson	4.4
Mineral	3.6	Summit	3.8	Crowley	4.0
Jackson	3.2	Garfield	3.8	Morgan	4.0
Garfield	2.8	Gunnison	3.7	Weld	4.0
Boulder	2.6	Larimer	3.7	Baca	3.5
Pitkin	2.5	Custer	3.1	Mesa	3.5
Rio Blanco	2.5	Rio Blanco	3.1	Sedgwick	3.5
Mesa	2.4	Grand	3.0	Adams	3.1
Conejos	2.3	Teller	2.5	El Paso	3.1
Jefferson	2.1	Routt	2.2	Arapahoe	2.2
Delta	1.9	Pitkin	2.0	Kiowa	1.8
Summit	1.9	Las Animas	1.8	Gilpin	.9
Saguache	1.8	Boulder	1.6	Las Animas	.9
Hinsdale	1.8	Jackson	1.6	Pueblo	.9
Chaffee	1.6	Pueblo	1.6	Yuma	.9
Douglas	1.4	Conejos	1.4	Cheyenne	.4
Lake	1.1	San Miguel	1.4	Delta	.4
Las Animas	1.1	El Paso	1.2	Dolores	.4
Archuleta	1.0	Chaffee	1.1	Garfield	.4
Teller	1.0	Montezuma	1.1	Gunnison	.4
Montezuma	.9	San Juan	1.0	Kit Carson	.4
Yuma	.9	Dolores	.8	La Plata	.4
Fremont	.7	Fremont	.8	Lincoln	.4
Custer	.7	Montrose	.8	Phillips	.4
Dolores	.6	Clear Creek	.5	Rio Blanco	.4
Huerfano	.6	Gilpin	.4		
San Miguel	.6	Jefferson	.4		
Clear Creek	.5	Rio Grande	.4		
El Paso	.5	Saguache	.4		
Gilpin	.3	Archuleta	.3		
Ouray	.3	Denver	.3		
Costilla	.3	Huerfano	.3		
Montrose	.3	Moffat	.3		
Moffat	.2	Ouray	.3		
San Juan	.2	Weld	.3		
Pueblo	.2	Adams	.1		
Weld	.2	Alamosa	.1		
Adams	.1	Arapahoe	.1		
Alamosa	.1	Costilla	.1		
Kiowa	.1	Kit Carson	.1		
Cheyenne	.1				
Logan	.1				
Totals	100.0		100.0		100.0

CONCLUSIONS

This report as a whole is presented in the form of a summary, and for this reason no item-by-item resume is included.

The results presented here are based on a total of 4, 964 field interviews of persons holding combination small-game and fishing licenses for 1946 game and fish seasons in Colorado. Limitation to one year is regarded as a shortcoming, but after numerous checks against known information it is concluded that the results obtained are, in general, sufficiently accurate for administrative use. These results have been used constantly by the Game and Fish Department since completion of analysis in 1947, with definite improvement in both the effectiveness and scope of the Department's operations.

The comprehensiveness of the Survey, and the fact that it covered all game groups, resulted in information on a very large number of topics ranging from total kill to sportsmen's preferences as to dog and guns. The normal operations of the Game and Fish Department would never have yielded data of comparable detail or diversity.

A further and relatively comprehensive test of the Random Survey method was made in 1947-48 in gathering information on the Colorado fur resource. Procedure in this case was very similar to that employed for the original Survey in 1946, but I.B.M. forms and specific operations were

adapted to meet problems peculiar to fur animal investigation. Analysis of the data obtained has provided information on the fur resource (Yeager, Denney, and Hammit, 1949; Yeager and Brown, in press) comparable to that obtained on big game, small game, and fish.

LITERATURE CITED

Gordon, Seth Jr.

1941. A sampling technique for the determination of hunters' activities and the economics thereof. Jour. Wildl. Mgt. 5(3): 260-278, illus.

Harvard College

1932. Size of sample necessary to be practically sure of accuracy. 1 p. Cambridge, Mass.

Hunter, Gilbert N.

1948. Colorado big game kill report, 1946-1947. Colo. Game and Fish Dept., Current Rept. 23, 80 pp., illus.

Yeager, Lee E. and E. Kliess Brown

1949. Survey of the Colorado fur resource and its management applications. Western Assoc. State Game and Fish Comm. Proc. (In press)

Yeager, Lee., Richard N. Denney, and Harold C. Hammit

1949. Survey of the Colorado fur resource. Colo. Game and Fish Dept., Current Rept. 26 (In press)