AN ANALYSIS OF

CONTROLLED WATERFOWL HUNTING AND HUNTER CHARACTERISTICS

AT WISCONSIN'S SANDHILL WILDLIFE DEMONSTRATION AREA

(1963 THROUGH 1971)

by

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A Thesis

Submitted to

University of Wisconsin - Stevens Point

in partial fulfillment

of the requirements for

the degree of

MASTER of SCIENCE

December 1973

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Date thesis is presented December 13, 1973

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ABSTRACT

A study of controlled waterfowl hunting was conducted at Wisconsin's Sandhill Wildlife Demonstration Area from the fall of 1963 through that of 1971; a hunter characteristics survey was added in 1971.

Mallards and Canada geese were the birds most frequently killed at Sandhill during the 9-year study; 1967 was the most successful year. Units D and G were the most heavily hunted waterfowl hunting units, most of the birds crippled were crippled in units D and G, and successful hunters spent more time in units D and G than did the unsuccessful hunters. Successful hunters hunted an average of 5.8 hours per trip while the unsuccessful hunters hunted an average of 4.2 hours per trip. An average of 10.3 hours of hunting were required to harvest each bird. Dogs were used on only 14 percent of the hunting trips from 1963 through 1969. Successful hunters who used dogs averaged 1.7 birds per trip while those who did not averaged 1.6 birds. Dog users had a crippling rate of 20 percent and non-dog users had one of 21 percent. It was also found that as the years of a hunter's hunting experience increased, the amount of time he spent hunting and the amount of waterfowl he killed increased, while his crippling losses decreased. Hunters using decoys or a combination of hunting techniques were by far the most successful, but pass-shooters had the lowest crippling rate. Most of the hunter trips to Sandhill were made from distances of either less-than 50 miles or greater-than 100 miles, with a relatively small portion of trips made from the intermediate distance of 50 to 100 miles. The greatest percentage of trips (53 percent) were made from Wood County (the county in which Sandhill is located).

The majority of hunters questioned in the hunter characteristics survey approved of the regulated system of hunting at Sandhill, thought that the system gave everyone an equal hunting opportunity, and were in favor of the Sandhill system of regulated hunting being initiated on other public waterfowl hunting areas in Wisconsin. The majority of hunters also were primarily urban dwellers with an appreciation for wildlife and the esthetic values of nature. Most hunters had an annual income of $7,000 or more, did not belong to a sportsmans organization, read more than one outdoor magazine; but did not read the Wisconsin Conservation Bulletin, and have never read a book on wildlife management. Hunters also did not give strong support to the selective shooting policy for waterfowl.

ACKNOWLEDGEMENTS

The acknowledgement of the following individuals, who have contributed to my successful completion of this thesis, expresses, in only a small way, my sincere gratitude to them.

Raymond Anderson, my graduate professor, for his patience, advice, encouragement, and determined editorial prowess in the development of this thesis. Frederick Baumgartner and Lyle Nauman, members of my graduate committee, for reviewing the thesis and advising me on its proper development. Frederick Hilpert, Associate Director of Instructional Data Processing, for his tireless assistance in the analysis of the hunter data.

John Kubisiak (DNR), Forest Wildlife Project Leader - Sandhill, for conducting the early years of the controlled hunting project at Sandhill, orienting me to the project, aiding in the collection of data, and helping in the development of this thesis. Richard Hunt (DNR), Wetland Wildlife Research Group Leader - Horicon, for his review of the thesis, suggestions for improvement, research material, and patience. William Creed (DNR), Forest Wildlife Research Group Leader - Rhinelander and Clarence Smith (DNR), Superintendant - Meadow Valley Unit. for their reviews of the thesis. Kenneth Simonson (DNR), Manager - Sandhill Game Project, for his time and effort in the collection of the hunter information used in this study.

The Wisconsin Department of Natural Resources for partially funding the project.

My parents, Dr. and Mrs. Stanley Meier, for their moral and financial support.

My wife, Marlene, for her continuing love and encouragement.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

A growing population, growing interest in waterfowl hunting, and increased posting of private land have forced many of America's sportsmen to rely principally on our public hunting grounds for waterfowl hunting. Excessive use and overcrowding of these areas has compelled many state game management agencies to impose some method of controlling the number of hunters using them. Bednarik (1957) indicated that approximately 50 percent of the states operated controlled waterfowl hunting areas in 1957; their actual number is undoubtedly greater today.

Baumgartner (1942) studied controlled waterfowl hunting at Lake Carl Blackwell, Oklahoma in 1940. Scott (1948) reviewed the methods of controlled hunting used in the United States and Canada up to 1948. Miller (1950) studied controlled waterfowl hunting on a public marsh in Michigan from 1945 to 1950. Teer (1952) studied controlled waterfowl hunting on a public hunting ground in Iowa in 1950. Kozlik (1955) reviewed the development and operation of public waterfowl hunting areas in California from 1948 to 1953. Bednarik (1961) reviewed 10 years of controlled waterfowl hunting at Ohio's Magee Marsh Wildlife Area, 1951 through 1960. Hunt et al. (1962) reviewed development of the controlled goose hunting program at Horicon Marsh, Wisconsin from 1953 through 1962. Seih and Aspelmeier (1962) studied controlled waterfowl hunting at Lake Odessa, Iowa from 1960 through 1961. Dimmick and Klimstra (1964) studied the permit and marked-blind-site systems of

controlled duck hunting in Illinois from 1957 through 1959. Joanen (1966) reviewed the system of controlled waterfowl hunting used at Louisiana's Pass-A-Loutre Public Shooting Area from 1954 through 1966.

A deficiency of controlled waterfowl hunting information for Wisconsin, however, prompted the Wisconsin Department of Natural Resources (DNR) to initiate a study of controlled hunting at the Sandhill Wildlife Demonstration Area in 1963. The purpose of the study was to investigate several aspects of waterfowl hunting and hunter performance under a controlled hunting situation. A hunter characteristics survey, similar to that conducted by Peterle (1961), was added in 1971. It was designed to learn more about the hunter's reaction to controlled hunting as well as investigate his educational and economic background and survey his outdoor sporting interests.

Hunter characteristics surveys have received a great deal of attention since 1965. Peterle (1967) followed up his 1961 study with one on the characteristics of hunters in Ohio. VanLandingham (1968) studied the characteristics of hunters and fishermen in northeastern United States. McCurdy and Jenkins (1969) studied the characteristics and opinions of hunters hunting at the Oakwood Bottoms Greentree Reservoir, Shawnee National Forest, Illinois. Garret (1970) studied the characteristics of big game hunters in Nevada. Eisele (1970) surveyed the attitudes of Wisconsin waterfowl hunters on regulations and management policies. Green (1970) studied the characteristics of hunters using shooting preserves in Michigan. More (1970) studied the motivational attitudes of hunters in Massachusetts. Klessig and Hale (1972) studied the characteristics, activities, and attitudes of 1,500 Wisconsin hunters licensed in 1968.

Study Area

The Sandhill Wildlife Demonstration Area is located in central Wisconsin, in southwestern Wood County, 18 miles southwest of Wisconsin Rapids and 1 mile west of Babcock (Fig. 1). The 9,150 acre public Area is a testing ground for experimental game management techniques, and is completely enclosed by a deer-proof fence with only one access and one exit road open to the public. The topography is generally flat with a few low ridges and poor drainage. The predominant vegetation types on the area are; (1) the "northern xeric forest", (2) the "southern Shrub-carr", (3) the "northern sedge meadow", and (4) the "emergent aquatic community" (Curtis, 1959). Isolated red pine (Pinus resinosa), white pine (Pinus strobus), and jack pine (Pinus banksiana), with red oak (Quercus borealis), and hills oak (Quercus ellipsoidalis) cover the few low ridges. The area is made up of approximately 1,235 acres of water, 1,960 acres of marsh, 1,240 acres of lowland brush, and 4,715 acres of upland (forests, gravel pits, and fields). The northern portion of the area, approximately 4,690 acres, is a wildlife refuge with 740 acres of water and 1,005 acres of marsh. The southern portion, approximately 4,460 acres, is open to hunting and contains 11 waterfowl hunting units ranging from 17 to 300 acres in size. The hunting units comprise 1,482 acres of waterfowl hunting area containing 475 acres of water and a minimum of 640 acres of marsh. The remaining 2,978 acres in the southern part are open to ruffed grouse (Bonasa umbellus) and squirrel (Sciurus carolinensis) hunting, but not waterfowl hunting. Twenty-one water control devices, placed in the 5 miles of drainage

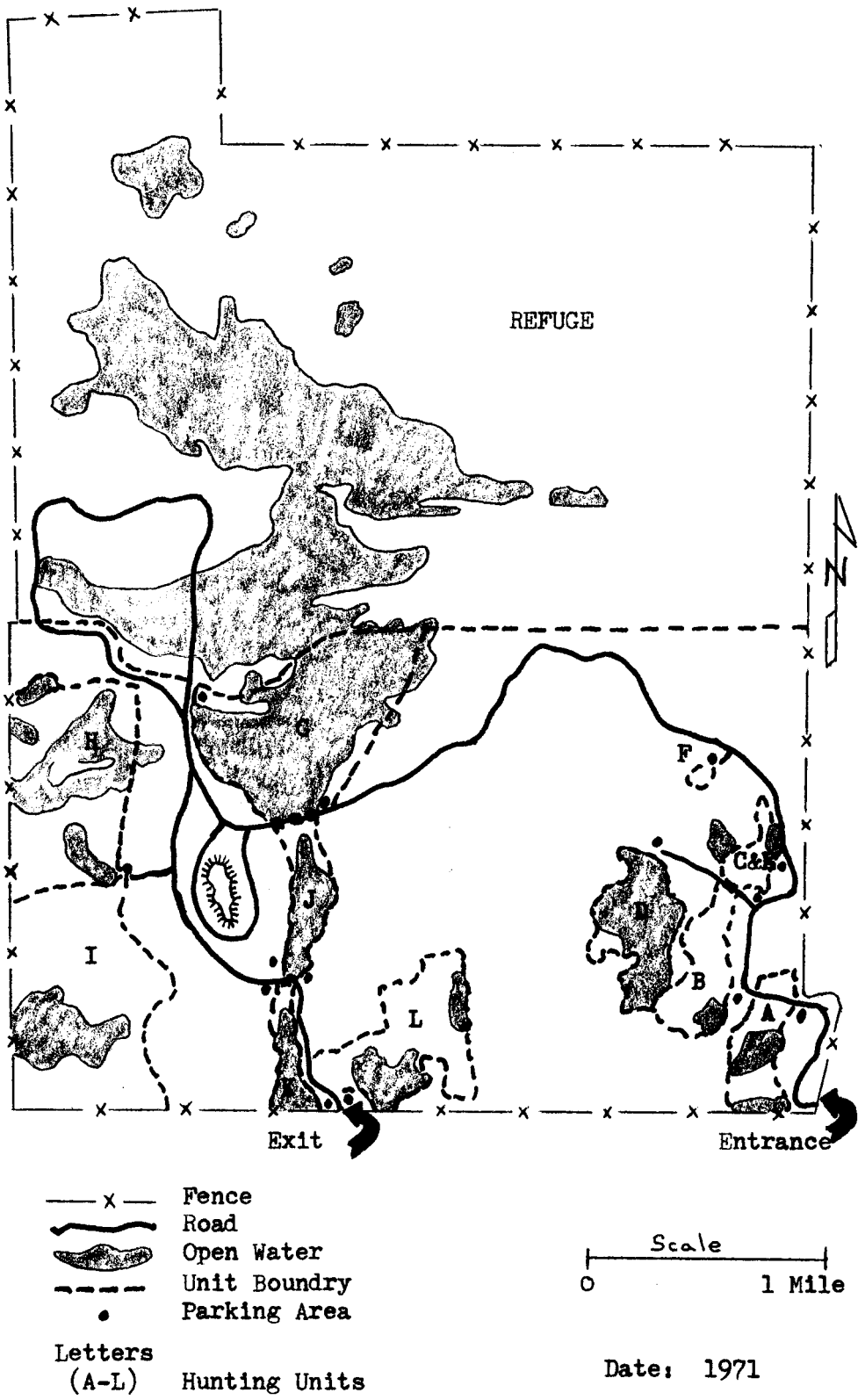


Fig. 1. Sandhill Wildlife Area, Wis.

ditches that crisscross the area, regulate the water levels of the flowages. Precipitation and a high ground water table provide the water supply for the area. Sandhill not only receives use from waterfowl hunters but also from ruffed grouse, squirrel, and whitetail deer (Odocoileus virginianus) hunters; and nonconsumptive use from bird watchers, hikers, and general tourists.

METHODS AND MATERIALS

Controlled Hunting Study

The waterfowl hunting program at Sandhill was designed to provide quality hunting with the least amount of regulation. There were no special bag restrictions, no boat or decoy rentals, and no special fees for hunting on the area. The general state waterfowl hunting regulations applied to Sandhill each year. Two aspects of the hunt, however, were regulated: (1) the number of hunters using the area at any one time, and (2) the hunters mobility on the area.

Each hunter was required to have a permit in order to hunt on the area. The permits were issued on a first-come-first-serve basis from a registration station at the main gate. Each hunter was personally interviewed at the registration station for his name, address, hunting license number, and choice of hunting unit. This information was recorded on a permit-information form. Hunters did not carry the permit-information form in the field until 1970 and 1971, when a carbon copy was retained in the registration station and the hunter carried the original permit with him. Prior to 1970, hunters carried an identifying button into the field. Each hunter was restricted to the hunting unit of his choice. A hunter could, however, change units by returning to the registration station to request a new permit. A map of the Sandhill Area (Fig. 1) and a map of each hunting unit (Appendix A) was available upon request. A parking area for automobiles was provided in each unit. All hunters were required to return to the registration station before leaving the area.

The registration station was open every day during the hunting season for the entire 9 year study. Hunters were allowed to enter the area only during the morning, from one hour before sunrise to 9 a.m. for the first three years. The procedure was changed in 1966 to allow hunters to enter from 1 to 3 p.m. in the afternoon, also. The identifying buttons were collected from the hunters and they were personally interviewed as to their daily hunting results from 1963 through 1969. Hunters voluntarily deposited their completed permit-information forms at the registration station in 1970 and 1971.

A maximum of 109 hunters were allowed on the area at any one time (Table 1). This allowed an average density of 1 hunter per 10.2 acres on a minimum of 1,115 acres of water and marsh available for waterfowl hunting. Hunter densities in each unit were determined by the minimum amount of water and marsh present in that unit. The maximum density of hunters allowed in each unit varied from 1 hunter per 7.5 acres of water and marsh in unit F to 1 hunter per 14.1 acres in unit G.

Two types of recording forms were used during the study: (1) card permits, and (2) IBM permits (Appendix B). The card permits were used in 1963 because it was the first year of operation at Sandhill and they were easily produced. The IBM permits were initiated in 1964 and used through 1969; they were far superior to the card permit for the gathering of information. The card permits were reinstituted in 1970 and 1971, because they were easy for the hunter to carry. All data were transferred to computer cards for analysis.

The alphabetical hunting unit designations used at Sandhill during the study have been retained in this paper to facilitate reference for

Table 1. The water acreage, minimum marsh acreage, and the allowable hunter densities for each waterfowl hunting unit from 1963 through 1971.

Hunting Unit	Water Acreage	Minimum Marsh Acreage	Number of Hunters Per Unit	Hunter Densities Per Acres of Marsh and Water for Each Unit
A	40A.	45A.	8	1 per 10.6A.
B	35A.	35A.	6	1 per 11.7A.
C&E	20A.	25A.	6	1 per 7.5A.
D	75A.	35A.	16	1 per 6.9A.
F	10A.	20A.	4	1 per 7.5A.
G	65A.	160A.	16	1 per 14.1A.
H	60A.	75A.	12	1 per 11.2A.
I	50A.	70A.	12	1 per 10.0A.
J	60A.	70A.	12	1 per 10.8A.
K	10A.	25A.	8	1 per 4.4A.
L	50A.	80A.	9	1 per 14.4A.
Total	475A.	640A.	109	1 per 10.2A.

those familiar with the area. There were 12 hunting units originally; however, shortly after the beginning of the study units C and E, because of their small size, were combined to form unit C&E.

The DNR conducted the Sandhill controlled waterfowl hunting study from 1963 through 1971. The study was turned over to me in 1971 for completion and analysis. I also designed and conducted the hunter characteristics survey in 1971. The waterfowl species killed during the study and listed in this paper were identified by the hunters and not by DNR personnel. No production or other waterfowl census surveys were conducted by the DNR during the study.

Hunter Characteristics Survey

The information obtained from this phase of the study was collected in the same manner as the information on controlled hunting. Three hunter Questionnaires (A, B, and C) were used. Each questionnaire consisted of three pages. The first page was common to all questionnaires; but, the second and third pages were unique to each. Page 1, questions 1-14 (Appendix C) was designed to collect basic information on the hunter and his attitude toward the controlled hunting program. Questionnaire A, questions 15-44 (Appendix C) was designed to collect information on the hunter's outdoor sporting interests. Questionnaire B, questions 45-63 (Appendix C) was designed to collect information on the hunter's economic background. Questionnaire C, questions 64-80 (Appendix C) was designed to collect information on the hunter's educational background.

The questionnaires were distributed with the hunting permits. They were handed out in the order (A, B, C), with questionnaire C being

handed to every third hunter. Each hunter completed only one of the questionnaires, irregardless of the number of times he visited the area during the hunting season. This prevented the hunters from answering the questions on the first page more than once. All hunters were instructed to complete and return their questionnaire with their permit when they left the area.

The information from the questionnaires was also recorded on computer cards. The data computations for both studies were made on the IBM 1130 computer at the University of Wisconsin - Stevens Point Computer Center. "No Response" answers to questions in both studies were considered as valid answers and were recorded as such in all computations. A "No Response" answer occurred when a hunter did not answer a q stion.

RESULTS AND DISCUSSION

Controlled Hunting Study

The Nine Year Waterfowl Kill

A total of 8,145 waterfowl hunting trips were made to the Sandhill Wildlife Demonstration Area from 1963 through 1971. Three-thousand-three-hundred-forty-four waterfowl were killed on 2,294 of these trips; 5,851 trips were unsuccessful. The average kill during the nine year period, for all hunting trips, was 0.4 birds per trip; 1.6 birds per successful trip.

Mallards (*Anas platyrhynchos*) and Canada geese (*Branta canadensis*) made up 41 and 17 percent of the 9-year waterfowl bag respectively (Table 2). One of the reasons mallards made up such a substantial portion of the annual kill (Table 3) may possibly be attributed to the fact that from 1963 through 1971 mallards had one of the highest continental breeding populations of any waterfowl species in North America (U.S. Bureau of Sport Fisheries and Wildlife, 1972a). The annual kill of mallards, Canada geese, and wood ducks (*Aix sponsa*) at Sandhill, however, did not reflect the yearly statewide changes in the daily bag limits for these species (Table 4). The mallard bag limit in 1969 was one mallard per day and in 1971 it was 4 per day; more mallards were killed in 1969 than in 1971. The daily bag limit for mallards in 1963, 1964, 1966, 1967, and 1970 was 2 per day; again, almost as many mallards were killed in 1967 alone as were killed in 1963, 1964, 1966 and 1970 combined. The daily bag limits for Canada geese in 1970 and 1971 were 1 and 2 respectively; yet, the annual kill for these two

Table 2. The Sandhill waterfowl kill - a summary by species, 1963 through 1971. (Percentages are in parentheses)

Species	Waterfowl Kill (1963 - 1971)
Mallard *Anas platyrhynchos*	1386 (41.4)
Canada Goose *Branta canadensis* Subsp.	561 (16.8)
Wood Duck *Aix sponsa*	213 (6.4)
Ring-Neck *Aythya collaris*	197 (5.9)
Greater and Lesser Scaup *Aythya marila* *Aythya affinis*	187 (5.6)
Green-Wing Teal *Anas carolinensis*	177 (5.3)
Blue-Wing Teal *Anas discors*	153 (4.6)
Baldpate *Mareca americana*	151 (4.5)
Black Duck *Anas rubripes*	66 (2.0)
Pintail *Anas acuta*	65 (1.9)
Gadwall *Anas strepera*	44 (1.3)
Shoveler *Spatula clypeata*	21 (0.6)
Coot *Fulica americana*	21 (0.6)

Table 2. (Cont.)

Species	Waterfowl Kill (1963 - 1971)
Merganser *Lophodytes cucullatus* *Mergus merganser* *Mergus serrator*	18 (0.5)
Golden-Eye *Bucephala clangula*	11 (0.3)
Ruddy Duck *Oxyura jamaicensis*	9 (0.3)
Bufflehead *Bucephala albeola*	9 (0.3)
Other Ducks	33 (1.0)
Other Geese	22 (0.7)
Total waterfowl kill - all species (1963 - 1971)	3,344 (100.0)

Table 3. The Sandhill waterfowl kill from 1963 through 1971. (Percentages are in parentheses)

Species	Year									Total
	1963	1964	1965	1966	1967	1968	1969	1970	1971	
Mallard	118 (44.5)	121 (44.1)	105 (30.9)	134 (43.9)	447 (62.9)	84 (26.0)	160 (34.2)	79 (35.9)	138 (31.5)	1,386
Canada Goose	35 (13.2)	50 (18.2)	80 (23.6)	61 (20.0)	100 (14.1)	68 (21.0)	121 (25.9)	17 (7.7)	29 (6.6)	561
Wood Duck	28 (10.6)	1 (0.4)	9 (2.6)	9 (3.0)	24 (3.4)	34 (10.5)	53 (11.3)	13 (5.9)	42 (9.6)	213
Ring-Neck	3 (1.1)	6 (2.2)	52 (15.3)	30 (9.8)	18 (2.5)	30 (9.3)	22 (4.7)	9 (4.1)	27 (6.2)	197
Scaup	2 (0.7)	3 (1.1)	16 (4.7)	2 (0.7)	10 (1.4)	28 (8.6)	12 (2.6)	38 (17.3)	76 (17.3)	187
GW Teal	23 (8.7)	18 (6.6)	8 (2.4)	15 (4.9)	26 (3.7)	34 (10.5)	29 (6.2)	17 (7.7)	7 (1.6)	177
BW Teal	10 (3.8)	7 (2.5)	8 (2.4)	17 (5.6)	18 (2.5)	9 (2.8)	34 (7.3)	5 (2.3)	45 (10.3)	153
Bal pate	11 (4.1)	22 (8.0)	17 (5.0)	11 (3.6)	12 (1.7)	11 (3.4)	19 (4.1)	16 (7.3)	32 (7.3)	151
Black Duck	5 (1.9)	15 (5.5)	13 (3.8)	6 (2.0)	12 (1.7)	4 (1.2)	6 (1.3)	1 (0.4)	4 (0.9)	66

Table 3. (Cont.)

Species	Year 1963	1964	1965	1966	1967	1968	1969	1970	1971	Total
Pintail	13 (4.9)	14 (5.1)	6 (1.8)	3 (1.0)	15 (2.1)	3 (0.9)	4 (0.8)	3 (1.4)	4 (0.9)	65
Gadwall	5 (1.9)	7 (2.5)	1 (0.3)	3 (1.0)	7 (1.0)	9 (2.8)	4 (0.8)	0 (0.0)	8 (1.8)	44
Shoveler	1 (0.4)	1 (0.4)	1 (0.3)	3 (1.0)	6 (0.8)	3 (0.9)	0 (0.0)	3 (1.4)	3 (0.7)	21
Coot	1 (0.4)	4 (1.5)	4 (1.2)	6 (2.0)	0 (0.0)	2 (0.6)	0 (0.0)	0 (0.0)	4 (0.9)	21
Merganser	0 (0.0)	0 (0.0)	2 (0.6)	1 (0.3)	4 (0.6)	3 (0.9)	1 (0.2)	7 (3.2)	0 (0.0)	18
Golden-Eye	1 (0.4)	0 (0.0)	3 (0.9)	1 (0.3)	2 (0.3)	0 (0.0)	1 (0.2)	1 (0.4)	2 (0.5)	11
Ruddy Duck	1 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)	3 (1.4)	4 (0.9)	9
Buf flehead	0 (0.0)	1 (0.4)	4 (1.2)	1 (0.3)	3 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	9
Other Ducks	0 (0.0)	4 (1.5)	8 (2.4)	1 (0.3)	6 (0.8)	1 (0.3)	0 (0.0)	6 (2.7)	7 (1.6)	33

Table 3. (Cont.)

Species	Year 1963	1964	1965	1966	1967	1968	1969	1970	1971	Total
Other Geese	8 (3.0)	0 (0.0)	2 (0.6)	1 (0.3)	1 (0.1)	0 (0.0)	2 (0.4)	2 (0.9)	6 (1.4)	22
Total Waterfowl Kill	265 (100.0)	274 (100.0)	339 (100.0)	305 (100.0)	711 (100.0)	324 (100.0)	468 (100.0)	220 (100.0)	438 (100.0)	3,344
Percent Yearly Kill Is Of Nine Year Kill	(7.9)	(8.2)	(10.1)	(9.1)	(21.3)	(9.7)	(14.0)	(6.6)	(13.1)	(100.0)
Total Number of Hunter Trips	850	763	617	930	1,025	1,001	1,069	865	1,025	8,145
Average Number of Waterfowl Killed Per Hunter Trip	0.3	0.4	0.5	0.3	0.7	0.3	0.4	0.2	0.4	0.4

Table 4. Summary of the Wisconsin waterfowl hunting regulations from 1963 through 1971.[1]

Hunting Season	Type	Length in Days	Daily Bag Limits	
1963	Duck	Oct. 5-Nov. 8 35 days	4	Including not more than: 1 hooded merganser; 2 wood ducks; 2 mallard or black ducks. No open season on canvasback and redhead ducks.
	Geese	Oct. 5-Dec. 13 70 days	5	Including not more than: 2 Canada geese, or 2 white-fronted geese, or 1 of each.
	Coot	Oct. 5-Nov. 8 35 days	8	
1964	Duck	Oct. 10-Nov. 18 40 days	4	Including not more than: 2 canvasback or redhead ducks, 1 of each; 1 hooded merganser; 2 wood ducks; 2 mallard ducks.
	Geese	Oct. 10-Dec. 18 70 days	5	Including not more than: 2 Canada geese, or 2 white-fronted geese, or 1 of each.
	Coot	Oct. 10-Nov. 18 40 days	10	
1965	Duck	Oct. 9-Nov. 17 40 days	4	Including not more than: 2 canvasback ducks; 1 hooded merganser; 2 wood ducks; 1 mallard duck; 1 pintail duck.
		Special Scaup Season Nov. 1-Nov. 17 17 days		In addition to the regular daily bag limit, 2 additional scaup ducks are allowed.
	Geese	Oct. 9-Dec. 17 70 days	5	Including not more than: 2 Canada geese, or 2 white-fronted geese, or 1 of each.
	Coot	Oct. 9-Nov. 17 40 days	10	

Table 4. (Cont.)

Hunting Season	Type	Length in Days	Daily Bag Limits	
1966	Duck	Oct. 8-Nov. 21 45 days	4	Including not more than: 2 canvasback ducks; 2 wood ducks, 2 mallard ducks.
		Special Scaup Season Nov. 1-Nov. 21 21 days		In addition to the regular daily bag limit 2 scaup or ringneck ducks or 1 of each are allowed.
	Geese	Oct. 8-Dec. 16 70 days	5	Including not more than: 1 Canada goose and 1 white-fronted goose or 2 white-fronted geese.
	Coot	Oct. 8-Nov. 21 45 days	10	
1967	Duck	Oct. 7-Nov. 15 40 days	4	Including not more than: 1 canvasback; 1 wood duck; 2 mallards; 1 hooded merganser.
		Special Scaup Season Nov. 1-Nov. 15 15 days		In addition to the regular daily bag limit 2 additional scaup ducks are allowed.
	Geese	Oct. 7-Dec. 15 70 days	5	Including not more than: 1 Canada goose, 1 white-fronted goose, or 2 white-fronted geese. Note: A federal goose hunting permit and tag are needed to hunt and possess Canada geese. Limit: 2 Canada geese per season.
	Coot	Oct. 7-Nov. 15 40 days	10	

Table 4. (Cont.)

Hunting Season	Type	Length in Days	Daily Bag Limits	
1968	Duck	Oct. 12-Nov. 10 30 days	3	Including not more than: 1 canvasback or 1 redhead; 1 mallard; 2 wood ducks; 2 black ducks; and 1 hooded merganser.
		Special Scaup Season Nov. 11-Nov. 26 16 days	5	
	Geese	Oct. 5-Dec. 13 70 days	5	Including not more than: 1 Canada goose and 1 white-fronted goose, or 2 white-fronted geese. Note: A federal goose hunting permit, report card, and tag is needed to hunt and possess Canada geese. Limit: 4 Canada Geese per season
	Coot	Oct. 12-Nov. 10 30 days	10	
1969	Duck	Oct. 4-Nov. 12 40 days	4	Including not more than: 1 canvasback or 1 redhead; 1 mallard; 2 wood ducks; and 1 hooded merganser.
		B.W. Teal Special Season Oct. 4-Oct. 12		2 in addition to the regular daily bag limit.
		Special Scaup Season Nov. 1-Nov. 12 12 days		In addition to the regular daily bag limit 2 additional scaup ducks are allowed.
	Geese	Oct. 4-Dec. 12 70 days	5	Includes not more than: 1 Canada goose and 1 white-fronted goose, or 2 white-fronted geese. Note: A federal goose hunting permit and report card is needed to hunt and possess Canada Geese.

Table 4. (Cont.)

Hunting Season	Type	Length in Days	Daily Bag Limits	
	Coot	Oct. 4-Nov. 12 40 days	10	
1970	Duck	Oct. 3-Nov. 26 55 days	6	Includes not more than: 1 canvasback or 1 redhead; 2 mallards; 2 wood ducks; and 1 hooded merganser.
		B.W. Teal Special Season Oct. 3-Oct. 11 8 days		2 in addition to the regular daily bag limit.
		Special Scaup Season Oct. 24-Nov. 26 34 days		In addition to the regular daily bag limit 2 additional scaup ducks are allowed.
	Geese	Oct. 3-Dec. 11 70 days	5	Including not more than: 1 Canada goose and 1 white-fronted goose, or 2 white-fronted geese. Note: A federal goose hunting permit and report card is needed to hunt and possess Canada geese.
	Coot	Oct. 3-Nov. 26 55 days	15	
1971	Duck	Oct. 2-Nov. 20 50 days	4	Including not more than: 1 canvasback or 1 redhead; 2 wood ducks; and 1 hooded merganser.
		B. W. Teal Special Season Oct. 2-Oct. 10 9 days		2 in addition to the regular daily bag limit
		Special Scaup Season Nov. 1-Nov. 20 20 days		In addition to the regular daily bag limit 2 additional scaup ducks are allowed.

Table 4. (Cont.)

Hunting Season	Type	Length in Days	Daily Bag Limits	
	Geese	Oct. 2-Dec. 10 70 days	5	Including not more than 2 Canada geese and 1 white-fronted goose, or 2 white-fronted geese.
	Coot	Oct. 2-Nov. 20 50 days	15	

[1]Based on the Wisconsin Waterfowl Hunting Regulations 1963 - 1971.

years was very low compared to that for the more restrictive years of 1967 and 1968 when hunters were allowed only 2 and 4 Canada geese per season respectively. The daily bag limit for wood ducks in 1964, 1965, and 1966 was 2 per day; the combined kill of wood ducks for these three years was lower than that of 1967 when the daily bag limit was 1 wood duck per hunter. The annual kill of mallards, Canada geese, and wood ducks at Sandhill appears to be partially dependent upon the variable concentration of these species on the study Area each fall.

The kill of greater scaup (Aythya marila) and lesser scaup (Aythya affinis) made up a substantial part of the annual kill in both 1970 and 1971; 17 percent for each year. More scaup were killed in these two waterfowl seasons (114 scaup) than were killed in the other seven seasons combined (73 scaup). This is probably a product of the long, state-wide special scaup seasons in 1970 and 1971. The special scaup seasons allowed a hunter to kill two additional scaup in addition to the regular daily bag limit. The special season ran for 34 days in 1970 and 20 days in 1971. The average length of the state-wide special scaup seasons from 1965 through 1969 was 16 days. The special scaup season held in 1966 also ran for 21 days; but, because of a lack of water at Sandhill, hunting conditions were very poor and the scaup kill that year was exceptionally low. Scaup breeding populations in North America during 1970 and 1971 were at their highest point since 1959 (U.S. Bureau of Sport Fisheries and Wildlife, 1972a); this may have been another factor contributing to the high scaup kill. There is a good possibility, however, that confusion by hunters in identifying ringneck ducks (Aythya collaris) from scaup was the major

factor contributing to the large scaup kill in 1970 and 1971. Hunters identified and reported all waterfowl killed, not DNR personnel. Ringneck production in the Sandhill area was high during these years (Personal communication with C. F. Smith, Project Superintendent Sandhill-Meadow Valley Unit, Babcock, Wis.).

The average annual waterfowl kill for Sandhill was 371.6 birds per season. The total kill, however, was not evenly distributed over each of the 9 years. The annual kill for 6 of the 9 years fell below this average, while that for three exceeded it. The lowest waterfowl kill occurred in 1970. The reason for this, even though 1970 was a year of high waterfowl production (U.S. Bureau of Sport Fisheries and Wildlife, 1972b), is unknown but possibly was caused by a decrease in the number of major waterfowl species (mallards, Canada geese, wood ducks, etc.) that used Sandhill as a rest area that fall. The waterfowl kill exceeded the average in 1967, 1969, and 1971. The highest annual kill (711 birds) occurred in 1967; mallards constituted 63 percent of the kill that year. A high waterfowl kill such as this, when compared to the other eight years of the study, is unusual for Sandhill; especially since the waterfowl kill for the Mississippi flyway was 6 percent less (Martinson et al., 1968) and the season was 5 days shorter in 1967 than in 1966. Continental waterfowl production in general was lower in 1967 than in 1966, with the exception of mallard production which was up by an estimated 300,000 birds (U.S. Bureau of Sport Fisheries and Wildlife, 1972b). The increase in the number of hunting trips in 1967 (95 more than in 1966) also does not alone explain the high waterfowl kill that year. Excellent hunting conditions in 1967 (an abundance of water,

cold daily temperatures - average 36°F, and over 50 percent of the days overcast) may have contributed to hunter success that year. A combination of: 1. annual variations in waterfowl concentrations, 2. fall weather conditions, and 3. hunter numbers at Sandhill probably account for much of the variation in the annual waterfowl kill.

An average kill of 0.7 birds per hunting trip also occurred in 1967. This exceeded the 9-year Sandhill average of 0.4 birds per hunting trip. The average kill per hunting trip for the other eight years ranged from 0.2 birds in 1970 to 0.5 in 1965. Other studies of controlled hunting have shown greater hunting success. Baumgartner (1942) reported an average waterfowl kill of 1.67 birds per hunting trip at Lake Carl Blackwell, Oklahoma in 1940. Van Den Akker et al. (1951) reported an average kill of 3.5 birds per hunting trip at the Bear River Migratory Bird Refuge from 1932 through 1948. Teer (1952) reported an average kill of 0.83 birds per hunting trip at Forney Lake, Iowa in 1950. Seih and Aspelmeier (1962) reported waterfowl kills for Lake Odessa, Iowa of 1.1 birds per hunting trip in 1960 and 1.0 per hunting trip in 1961. Dimmick and Klimstra (1964) reported an average kill on controlled hunting areas in Illinois of 1.0 birds per hunting trip in 1957, 0.8 in 1958, and 1.0 in 1959. The average waterfowl kill for Sandhill from 1963 through 1971 (0.4 birds per hunting trip), even though low in comparison to the above studies, was not too low when one considers that the above-mentioned studies were conducted at earlier periods when the primary target species of waterfowl (mallards, green-wing teal (Anas carolinensis), blue-wing teal (Anas discors), Pintail (Anas acuta), and scaup) were more abundant (U.S. Bureau of Sport Fisheries and Wildlife, 1972a) and hunting

regulations were generally more liberal. Sandhill also does not lie in the major Mississippi flyway migratory routine; this may have been a factor affecting fall waterfowl population levels on the area and ultimately hunting success during the study.

Hunter Distribution And Hunting Success Among The Hunting Units

Hunter efforts during the 9 years were concentrated in units G and D (Table 5). These two units received 68 percent of the hunting pressure. Seventy-one percent of 1,749 successful duck hunting trips (Table D1, Appendix D) and 91 percent of 545 successful goose hunting trips (Table D2, Appendix D) were made to units G and D. Seventy-six percent of the Sandhill waterfowl kill also occurred in units G and D (Table 5). The popularity of, and success in, units G and D are related to the fact that they are both large hunting units with over 25 percent of their area occupied by shallow open water. This is very attractive to hunters and waterfowl. Unit G is the only unit which is directly adjacent to the refuge area; a factor which also influenced its popularity and hunter success. Hunters using units G and D, however, were not always successful; 67 percent of 6,396 unsuccessful duck hunting trips (Table D1, Appendix D) and 66 percent of 7,600 unsuccessful goose hunting trips (Table D2, Appendix D) occurred in these two units. Eighty-five percent of the hunters directed their hunting efforts to units A, B, D, G, and J, which are primarily used by decoy and pass-shooting hunters. The remaining units (C&E, F, H, I, K, and L), which are primarily used by jump-shooting hunters, received only 14 percent of the activity.

Table 5. The number of waterfowl hunting trips made to each hunting unit, the number of waterfowl killed in each hunting unit, and the number of waterfowl crippled in each hunting unit from 1963 through 1971. (Percentages are in parentheses)

Hunting Units	Number of Waterfowl Hunting Trips	Number of Waterfowl Killed	Number of Waterfowl Crippled	Rate of Crippling
A	233 (2.9)	75 (2.2)	28 (3.0)	27.2%
B	256 (3.1)	116 (3.5)	32 (3.5)	21.6%
C&E	45 (0.6)	16 (0.5)	6 (0.6)	27.3%
D	1,674 (20.5)	779 (23.3)	170 (18.4)	17.9%
F	99 (1.2)	20 (0.6)	4 (0.4)	16.6%
G	3,837 (47.1)	1,770 (52.9)	486 (52.7)	21.5%
H	487 (6.0)	128 (3.8)	51 (5.5)	28.5%
I	271 (3.3)	73 (2.2)	29 (3.2)	28.4%
J	921 (11.3)	253 (7.6)	75 (8.2)	22.9%
K	119 (1.5)	33 (1.0)	8 (0.9)	19.5%
L	111 (1.4)	34 (1.0)	7 (0.8)	17.1%
No Response[1]	92 (1.1)	47 (1.4)	26 (2.8)	35.6%
Total	8,145 (100.0)	3,344 (100.0)	922 (100.0)	21.6%

[1]Indicates the number of trips made, the number of waterfowl killed, and the number of waterfowl crippled by hunters who failed to record their hunting unit.

A total of 922 waterfowl were reported to have been crippled from 1963 through 1971 (Table 5). A bird knocked down and lost was considered as a crippled bird. Most of the waterfowl crippled (71 percent) were crippled in units G and D, 14 percent were crippled in units H and J, and 15 percent were crippled in the remaining 7 units. The number of birds crippled in units G and D is definitely a reflection of the hunter pressure in these two units. Unit D, however, had one of the lowest waterfowl crippling rates recorded for each of the eleven units during the 9-year study (18 percent). The waterfowl crippling rate is equal to the number of birds killed and possessed by hunters plus the number lost, divided into the number lost (Jahn and Hunt, 1964). The average crippling rate for Sandhill (22 percent) was comparable to that reported in other studies. Miller (1950) reported a crippling rate of 24 percent for Michigan's Pte. Mouillee Marsh. Teer (1952) reported a crippling rate of 21 percent at Forney Lake, Iowa. Bellrose (1953) reported an average crippling rate for the United States of 23 percent, but found that among Illinois River Valley duck clubs crippling losses were 15 percent. Bell (1959) found the average crippling rate for Wisconsin to be 20 percent. Jahn and Hunt (1964) found the waterfowl crippling rate on Wisconsin public hunting areas to be 21 percent and expressed the belief that crippling losses in an area are directly related to the hunting pressure that area receives. These figures probably represent a minimum of lost waterfowl, because some hunters fail to see all of their birds fall and some are hesitant to report crippled birds on the mistaken belief that they might lose their hunting privileges if they reported having crippled any birds. They are,

however, valid comparisons because they rely solely on the hunters judgment in reporting losses. The waterfowl crippling losses reported for Sandhill, Pte. Mouillee, and Forney Lake, etc., therefore, do not indicate any reduction of crippling under a controlled hunting program. A reduction in waterfowl crippling losses approaching the 15 percent level reported by Bellrose (1953) should be a primary objective in any controlled hunting program. Perhaps one of the best ways to lower the crippling loss at Sandhill would be to reduce hunter densities on some of the hunting units. ~~The losses and rates reported in Table 5 do not support this.~~ Hunter densities of 1 hunter per 500 acres and 1 blind per 90 acres with 2 hunters per blind are used at Pass a loutre, Louisiana and Crane Creek, Ohio respectively (Hawkins et al., 1961). Low hunter densities of this caliber, however, are not recommended for the Sandhill Area.

The Amount Of Time Spent Hunting

Hunters spent a minimum of 33,557 hours hunting at Sandhill from 1963 through 1971 (Table 6). They spent 73 percent of this time in units G and D, 11 percent in unit J, and 2 percent in each of the other eight units.

Successful hunters averaged more time per hunting trip than did unsuccessful hunters (Table 7). Successful hunters spent a minimum of 10,824.5 hours hunting (Table 8), an average of 5.8 hours per hunting trip. Unsuccessful hunters spent a minimum of 22,732.5 hours, an average of 4.2 hours per hunting trip. Thirty-six percent of the successful hunting trips were for 4 hours or less and 64 percent were for 5 hours or longer; while 65 percent of the unsuccessful hunting trips were for 4 hours or less and 35 percent were for 5 hours or longer. The successful hunters also

Table 6. The number of hours spent hunting in each hunting unit, from 1963 through 1971, by all waterfowl hunters. (Percentages are in parentheses)

Hunting Units	Total Number of Hours Spent Hunting	
A	797	(2.4)
B	767	(2.3)
C & E	163	(0.5)
D	7,440	(22.2)
F	307.5	(0.9)
G	16,943.5	(50.5)
H	1,696	(5.0)
I	829.5	(2.5)
J	3,589.5	(10.7)
K	350.5	(1.0)
L	282.5	(0.8)
No Response[1]	391	(1.2)
Total	33,557	(100.0)

[1]Indicates the number of hours spent waterfowl hunting by hunters who did not have a hunting unit recorded.

Table 7. The amount of time spent hunting by successful and unsuccessful hunters from 1963 through 1971. (Percentages are in parentheses)

Number of Hours Spent Hunting	Number of Successful Hunter Trips	Number of Unsuccessful Hunter Trips
½	3 (0.2)	23 (0.4)
1	30 (1.6)	350 (6.4)
2	123 (6.6)	979 (18.0)
3	222 (11.9)	1,252 (23.0)
4	294 (15.8)	929 (17.1)
5	208 (11.2)	620 (11.4)
6	287 (15.4)	441 (8.1)
7	124 (6.6)	163 (3.0)
8	73 (3.9)	111 (2.0)
9+	499 (26.8)	574 (10.6)
Total	1,863 (100.0)	5,442 (100.0)

Table 8. The number of hours spent hunting in each hunting unit by successful and unsuccessful hunters from 1963 through 1971. (Percentages are in parentheses)

Hunting Units	Hours Spent Hunting In Each Unit By Successful Hunters		Hours Spent Hunting In Each Unit By Unsuccessful Hunters	
A	219	(2.0)	578	(2.5)
B	253	(2.4)	514	(2.3)
C & E	67	(0.6)	96	(0.4)
D	2,559	(23.6)	4,881	(21.5)
F	66	(0.6)	241.5	(1.1)
G	5,996.5	(55.4)	10,947	(48.2)
H	366	(3.4)	1,330	(5.8)
I	207	(1.9)	622.5	(2.7)
J	783	(7.2)	2,806.5	(12.4)
K	81	(0.8)	269.5	(1.2)
L	98	(0.9)	184.5	(0.8)
No Response[1]	129	(1.2)	262	(1.1)
Total	10,824.5	(100.0)	22,732.5	(100.0)

[1]Indicates the number of hours spent waterfowl hunting by hunters who did not have a hunting unit recorded.

spent 79 percent of their 10,824.5 hunting hours in units G and D, while the unsuccessful hunters spent 70 percent of their 22,732.5 hunting hours in these two units. Hunting in unit G or D for 5 hours or longer was a successful combination for waterfowl hunting at Sandhill.

Considerable time was required to harvest each bird at Sandhill (10.3 hours per bird), when compared to the amount of time needed at other controlled hunting areas. Miller (1950) reported an average harvest time of 6.3 hours per bird at Michigan's Pte. Mouillee public hunting area from 1945 through 1949. Van den Akker et al., (1951) reported an average harvest time of 3.16 hours per bird at the Bear River Migratory Bird Refuge in 1948. Teer (1952) reported an average harvest time of 7.66 hours per bird at Iowa's Forney Lake Public Shooting Ground in 1950. Seih and Aspelmeier (1962) reported that it took 5.2 hours to harvest each bird at Lake Odessa, Iowa in 1960 and 1961. The great amount of time required to harvest each bird at Sandhill is an indication that the Area does not have a very large concentration of waterfowl during the fall. Data on the fall waterfowl population, however, are unavailable. Hunter densities on Sandhill's hunting units do not appear to have affected the amount of time required to kill each bird.

Dog-Use And Waterfowl Hunting

Hunters made 6,255 trips to Sandhill from 1963 through 1969, the years for which information on the use of hunting dogs was collected. Hunting dogs were used on only 14 percent of these trips (Table 9). An average waterfowl kill of 0.6 birds per hunter was attained for the 884 trips on which dogs were used; an average of 0.4 birds per trip was attained for the 5,116 trips on which dogs were not used.

Dogs were used on 18 percent of the 1,639 successful hunting trips and 13 percent of the 4,616 unsuccessful trips (Table 9). The successful hunters killed and brought to possession 2,686 waterfowl; 19 percent of this kill was by those hunters who used hunting dogs (Table 10). The successful hunters who used dogs averaged 1.7 birds per hunting trip and those who did not averaged 1.6 birds. Successful hunters using dogs brought to possession an average of 10 more waterfowl per 100 hunting trips than did ~~un~~successful hunters not using dogs over the same number of trips.

Six-hundred-four waterfowl were crippled and lost at Sandhill from 1964 through 1968 (Table 11). Sixteen percent of the birds were crippled by hunters who used dogs and 80 percent by hunters who did not. The crippling rate for hunters who used dogs, however, was 20 percent, and that for hunters who did not was 21 percent. Both groups of hunters crippled an average of 0.1 birds per hunting trip.

The information on dog-use indicates that hunters using dogs were potentially more successful over each 100 hunting trips than were hunters who did not use dogs over the same number of trips. There is no evidence of a reduction in waterfowl crippling when dogs were used. Bell (1959), however, found that, among 500 Wisconsin hunters in 1953, duck crippling losses were reduced by the use of a dog, from 17.5 to 11.3 percent. Bell also reported that his retriever recovered more wounded birds over an eight year period than (he, Bell) lost. The high and equal crippling loss experienced by both dog and non-dog using hunters at Sandhill suggests that hunters were "chance-shooting" at birds on the fringe of the effective range of their guns. The reason for this is possibly a lack of shooting

Table 9. The number of hunting trips on which dogs were and were not used from 1963 through 1969.[1] (Percentages are in parentheses)

	Dog Use			
	Yes	No	No Response[2]	Total
Number of successful hunting trips	298 (18.2)	1,281 (78.2)	60 (3.6)	1,639 (100.0)
Number of unsuccessful hunting trips	586 (12.7)	3,835 (83.1)	195 (4.2)	4,616 (100.0)
Total number of hunting trips	884 (14.1)	5,116 (81.8)	255 (4.1)	6,255 (100.0)

[1] No information collected from 1970 through 1971.
[2] Indicates the number of hunting trips on which hunters did not record their use or non-use of a hunting dog.

Table 10. The number of waterfowl killed in relation to dog and non-dog use by hunters from 1963 through 1969.[1] (Percentages are in parentheses)

Year	Number of Waterfowl Killed			
	Dog Use			
	Yes	No	No Response[2]	Total
1963	103 (38.9)	162 (61.1)	0 (0.0)	265 (100.0)
1964	46 (16.8)	181 (66.1)	47 (17.1)	274 (100.0)
1965	55 (16.2)	277 (81.7)	7 (2.1)	339 (100.0)
1966	47 (15.4)	258 (84.6	0 (0.0)	305 (100.0)
1967	122 (17.2)	533 (74.9)	56 (7.9)	711 (100.0)
1968	48 (14.8)	265 (81.8)	11 (3.4)	324 (100.0)
1969	86 (18.4)	380 (81.2)	2 (0.4)	468 (100.0)
Total	507 (18.9)	2,056 (76.5)	123 (4.6)	2,686 (100.0)
Number of successful hunting trips	298	1,281	60	1,639
Average number of waterfowl killed per successful hunting trip	1.7	1.6	2.0	1.6

[1] No information collected from 1970 through 1971.
[2] Indicates the number of waterfowl killed, the number of successful hunting trips, and the average number of waterfowl killed for hunters who did not record their use or non-use of a dog.

Table 11. The number of waterfowl crippled and lost by hunters using and not using dogs from 1964 through 1969.[1] (Percentages are in parentheses)

	Dog Use			
	Yes	No	No Response[2]	Total
Number of waterfowl crippled	67 (16.1)	481 (79.6)	26 (4.3)	604 (100.0)
Number of hunting trips on which waterfowl were crippled	77	394	20	495
Average number of cripples per hunter trip on which waterfowl were crippled	1.3	1.2	1.3	1.2
Total number of hunter trips from 1964 through 1969	667	4,491	247	5,405
Average number of cripples per hunter trip (1964-1969)	0.1	0.1	0.1	0.1
Total waterfowl kill[3]	481	2,305	144	2,950
Crippling rate	20.2%	20.9%	18.0%	20.6%

[1] No information collected in 1963, 1970, or 1971.
[2] Indicates the number of waterfowl crippled, the number of hunter trips on which waterfowl were crippled, the total number of hunter trips, the total waterfowl kill and the waterfowl crippling rate for hunters who did not record their use or non-use of a dog.
[3] Total waterfowl kill = waterfowl killed and possessed by hunters + birds knocked down and lost.

opportunity, which could have been brought about by a relatively low fall waterfowl population or a flight pattern over the marsh that generally avoided the hunting units and thus provided fewer targets. An average waterfowl kill of 0.4 birds per hunting trip with an average of 10.3 hours required to kill one bird suggests at least one of these possibilities.

Waterfowl Hunting Experience And Waterfowl Hunting

A total of 2,298 waterfowl hunting trips were made to Sandhill from 1964 through 1966; 520 were successful (Table 12). Twenty-three percent of the successful hunting trips (122) were made by hunters with from 0 to 5 years of experience, 45 percent (232) were made by those with from 6 to 15 years, and 29 percent (152) were made by those with 16+ years. The unsuccessful hunters were equally represented among the three experience groups, each group averaged 29 percent (311) of the trips. Unsuccessful hunters also failed to indicate their waterfowl hunting experience on 14 percent (244) of their trips.

A minimum of 3,195 hours were spent hunting by successful hunters (Table 13). Twenty-two percent of this time (699 hours) was spent by hunters with from 0 to 5 years of hunting experience, hunters with 6 to 15 years of experience accounted for 46 percent (1,468 hours), and hunters with 16+ years accounted for 29 percent (940 hours). The unsuccessful hunters spent a minimum of 7,739.5 hours hunting and hunters in each experience group spent equal amounts of time; each group averaged 28.7 percent of the time (approximately 2,223.5 hours). Unsuccessful hunters who failed to indicate their hunting experience accounted for 14 percent of the time (1,069.5 hours). When all 2,298 hunters were considered,

Table 12. The number of waterfowl hunter trips made by hunters in each hunter experience group from 1964 through 1966.[1] (Percentages are in parentheses)

	Waterfowl Hunting Experience Groups				
	0-5 yrs.	6-15 yrs.	16+ yrs.	No Response[2]	Total
Total number of successful hunter trips	122 (23.5)	232 (44.6)	152 (29.2)	14 (2.7)	520 (100.0)
Total number of unsuccessful hunter trips	524 (29.5)	523 (29.4)	487 (27.4)	244 (13.7)	1,778 (100.0)

[1]No information collected in 1963, or 1967 through 1971.
[2]Indicates the number of hunter trips on which hunters did not indicate their waterfowl hunting experience.

Table 13. The amount of time spent hunting by waterfowl hunters in each hunter experience group from 1964 through 1966.[1] (Percentages are in parentheses)

	Waterfowl Hunting Experience Groups				
	0-5 yrs.	6-15 yrs.	16+ yrs.	No Response[2]	Total
The number of hours spent hunting by successful hunters	699 (21.9)	1,468 (45.9)	940 (29.4)	88 (2.8)	3,195 (100.0)
The number of hours spent hunting by unsuccessful hunters	2,134.5 (27.6)	2,232 (28.8)	2,303.5 (29.8)	1,069.5 (13.8)	7,739.5 (100.0)
Total number of hours spent hunting	2,833.5	3,700	3,243.5	1,157.5	10,934.5
Total number of hunter trips (1966¾-1966)	646	755	639	258	2,298
Average number of hours spent hunting on each hunter trip	4.4	4.9	5.1	4.4	4.8

[1]No information collected in 1963, or 1967 through 1971.
[2]Indicates the number of hours spent, the number of trips taken, and the average number of waterfowl killed by hunters who did not indicate their waterfowl hunting experience.

however, the data indicated that the more hunting experience a hunter had, the greater the amount of time he spent afield per hunting trip (Table 13). The hunters in the 0 to 5, 6 to 15, and 16+ year-groups averaged 4.4, 4.9, and 5.1 hours per hunting trip respectively.

Nine-hundred-eighteen waterfowl were killed from 1964 through 1966 (Table 14). Hunters in the 6 to 15 year-group were the most successful when all 2,298 hunter trips were considered. The 0 to 5, 6 to 15, and 16+ year-groups averaged 0.3, 0.5, and 0.4 birds per hunting trip respectively. Among the 520 successful hunting trips, however, hunters in the 16+ year-group were the most successful and averaged 1.9 birds per hunting trip (Table 14). Hunters in the 6 to 15 year-group and the 0 to 5 year-group averaged 1.7 birds per trip.

Two-hundred-four waterfowl were crippled from 1964 through 1966 (Table 15). Hunters in the 0 to 5 year-group crippled 25 percent, those in the 6 to 15 year-group crippled 47 percent, and those in the 16+ year-group crippled 21 percent. Hunters in the 16+ year-group also had the lowest crippling rate of the three groups (13 percent) (Table 15). Hunters in the 0 to 5 and 6 to 15 year-groups had crippling rates of 21 percent and 19 percent respectively.

Waterfowl hunting experience not only benefits the hunter, but it also reduces waterfowl crippling losses. There is a definite relationship between waterfowl hunting experience and (1) time spent hunting, (2) waterfowl kill, and (3) waterfowl crippling losses. Hunters in the 16+ year-group spent more time in the field per hunter trip than did the other two groups, they had the second highest waterfowl kill per hunter trip, and they had the lowest waterfowl crippling rate of the three groups. Hunters

Table 14. The average number of waterfowl killed per hunter for each hunter experience group from 1964 through 1966.[1] (Percentages are in parentheses)

	Waterfowl Hunting Experience Groups				
	0-5 yrs.	6-15 yrs.	16+ yrs.	No Response[2]	Total
Number of successful hunter trips	122 (23.5)	232 (44.6)	152 (29.2)	14 (2.7)	520 (100.0)
Total waterfowl kill (1964-1966)	201	402	287	28	918
Average number of waterfowl killed per successful hunter trip	1.7	1.7	1.9	2.0	1.8
Total number of hunter trips (1964-1966)	646	755	639	258	2,298
Average number of waterfowl killed per hunter trip	0.3	0.5	0.4	0.1	0.4

[1] No information collected in 1963, or 1967 through 1971.
[2] Indicates the number of hunter trips on which hunters did not indicate their waterfowl hunting experience and the average number of waterfowl they killed on those trips.

Table 15. The number of waterfowl crippled in relation to waterfowl hunting experience from 1964 through 1966.[1] (Percentages are in parentheses)

	Waterfowl Hunting Experience Groups				
	0-5 yrs.	6-15 yrs.	16+ yrs.	No Response[2]	Total
Number of waterfowl crippled	52 (25.5)	97 (47.5)	43 (21.1)	12 (5.9)	204 (100.0)
Number of hunter trips on which waterfowl were crippled	40	78	38	8	164
Average number of cripples per hunter trip on which waterfowl were crippled	1.3	1.2	1.1	1.5	1.2
Total number of hunter trips (1964-1966)	646	755	639	258	2,298
Average number of cripples per hunter trip (1964-1966)	0.08	0.13	0.07	0.05	0.09
Total waterfowl kill[3]	253	499	330	40	1,122
Crippling rate	20.6%	19.4%	13.3%	30.0%	18.2%

[1]No information collected in 1963, or 1967 through 1971.
[2]Indicates the number of waterfowl crippled, the number of hunter trips on which waterfowl were crippled, the total number of hunter trips, the total waterfowl kill, and the waterfowl crippling rate for hunters who did not indicate their waterfowl hunting experience.
[3]Total waterfowl kill = birds killed and possessed by hunters + birds shot down and lost.

in the 0 to 5 year-group, on the other hand, spent the least amount of time afield per hunter trip, had the lowest waterfowl kill per trip, and had the highest waterfowl crippling rate.

Waterfowl Hunting Techniques And Waterfowl Hunting

Waterfowl hunting techniques greatly influenced hunting success. A total of 2,686 waterfowl were killed on 6,255 hunting trips from 1963 through 1969 (Table 16). Hunters who used decoys were the most successful and accounted for 69 percent of the kill, pass-shooters accounted for 23 percent, jump-shooters accounted for 7 percent, and hunters using a combination of hunting techniques accounted for 0.3 percent. Those using either decoys or a combination of techniques were the most successful; both averaged 0.6 birds per hunting trip (Table 16). Jump-shooters and pass-shooters averaged 0.3 and 0.2 birds per trip respectively.

Pass-shooters had the lowest crippling rate (16 percent) (Table 17), even though they had the lowest average kill per hunting trip. Decoy-hunters, combination-hunters, and jump-shooters had crippling rates of 20 percent, 27 percent, and 30 percent respectively. One would assume that decoy-hunters would have a lower crippling rate than pass-shooters, because they use a boat or waders to put out and retrieve their decoys and also shoot at waterfowl at a closer range; both factors making retrieval of birds relatively easy. This evidently was not the case at Sandhill. The reason for this is not apparent at the present time and should be investigated more thoroughly in the future.

The Origin Of Hunters And The Number Of Hunting Trips They Made To The Area

A total of 8,145 hunter trips were made to Sandhill from 1963 through 1971. The origin of the hunters is presented in Fig. 2. These data are

Table 16. The number of waterfowl killed in relation to the type of hunting used by the hunter from 1963 through 1969.[1] (Percentages are in parentheses)

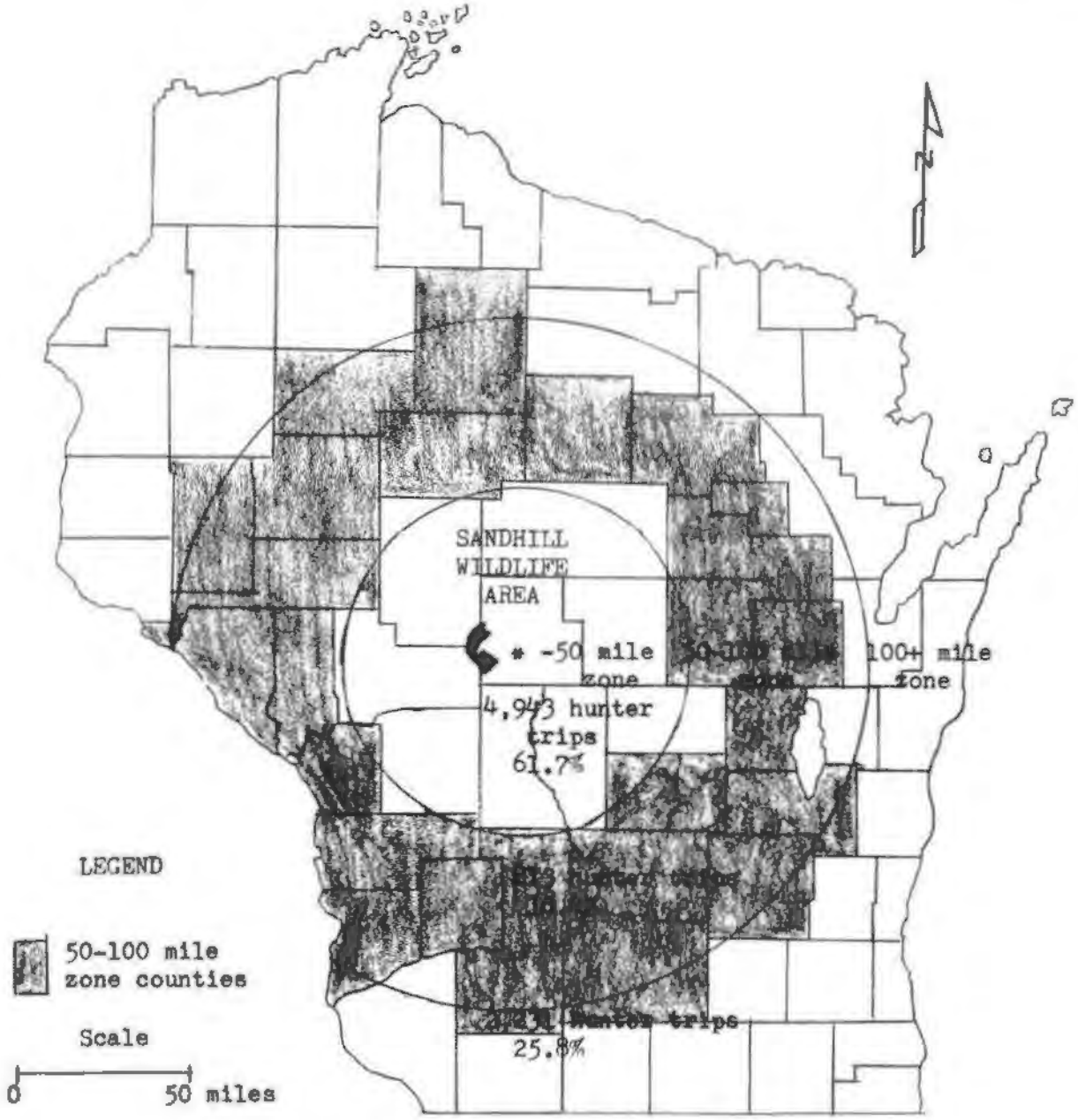
	Waterfowl Hunting Techniques					
	Decoy	Jump	Pass	Comb.[2]	No Response[3]	Total
Waterfowl Kill	1,845 (68.7)	193 (7.2)	618 (23.0)	8 (0.3)	22 (0.8)	2,686 (100.0)
Number of hunter trips	2,925 (46.8)	693 (11.1)	2,482 (39.7)	14 (0.2)	141 (2.2)	6,255 (100.0)
Average number of waterfowl killed per hunter trip	0.6	0.3	0.2	0.6	0.2	0.4

[1]No information collected from 1970 through 1971.
[2](Combination); indicates the use of more than one hunting technique per hunter trip.
[3]Indicates the number of waterfowl killed, the number of hunter trips, and the average number of waterfowl killed per hunter trip, by hunters who did not indicate the waterfowl hunting technique they used.

Table 17. The number of waterfowl crippled in relation to the type of hunting used by the hunter, from 1964 through 1969.[1] (Percentages are in parentheses)

	Waterfowl Hunting Techniques					
	Decoy	Jump	Pass	Comb.[2]	No Response[3]	Total
Number of waterfowl crippled	417 (69.0)	65 (10.8)	108 (17.9)	3 (0.5)	11 (1.8)	604 (100.0)
Number of waterfowl killed	1,648 (69.6)	153 (6.3)	554 (22.9)	8 (0.3)	22 (0.9)	2,421 (100.0)
Total waterfowl kill[4]	2,101 (69.4)	218 (7.2)	662 (21.9)	11 (0.4)	33 (1.1)	3,025 (100.0)
Crippling rate	19.8%	29.8%	16.3%	27.3%	33.3%	20.0%

[1]No information collected for 1963, 1970, or 1971.
[2](Combination); indicates the use of more than one hunting technique per hunter trip.
[3]Indicates the number of waterfowl crippled, the number of waterfowl killed, and the waterfowl crippling rate, for hunters who did not indicate the waterfowl hunting technique they used.
[4]Total waterfowl kill = birds killed and possessed by hunters + birds shot down and lost.



Out-of-State
171 hunter trips
2.1%

Fig. 2. The distance traveled by Sandhill waterfowl hunters

based on 8,005 completed forms; 140 of the 8,145 permit-information forms were improperly completed. Sixty-two percent of the trips to Sandhill were made from a distance of 50 miles or less, 10 percent were made from a distance of 50 to 100 miles, 26 percent were made from a distance of 100 or more miles, and 2 percent were made from out-of-state (most from Illinois).

Very few hunters came from northern Wisconsin counties in the greater-than-100-mile-zone (Table D3, Appendix D). Most of the trips in this zone originated from the southeastern counties. Fifty-three percent of the hunting trips were from Wood County (the county in which Sandhill is located), 6 percent were from Dane County in the 50 to 100-mile-zone, and 24 percent were made from Jefferson, Kenosha, Milwaukee, Ozaukee, Racine, Rock, Walworth, Washington, and Waukesha Counties in the greater-than-100-mile-zone.

The origin of hunter trips among the counties is not only a good indication of the State's population densities but also of the availability of open hunting land in relation to these population concentrations. Dane, Winnebago, Jefferson, Kenosha, Milwaukee, Ozaukee, Racine, Rock, Walworth, Washington, and Waukesha are Wisconsin's most populous counties. They either lie in close proximity to or contain the State's population centers. Long distance hunting trips from these counties are not uncommon because of the over-crowding of the public hunting grounds and lack of available hunting on private land in these areas. The small percentage of trips from the other Wisconsin counties represents smaller population densities and a greater availability for hunting on both public and private land. Northern Wisconsin exemplifies the latter situation. Counties in this

area have low resident populations and a large amount of available hunting area on both public and private land. The large number of hunter trips originating from Wood County is purely a product of Sandhill's availability to the Wood County hunters. The small number of hunters coming to Sandhill from Portage, Marathon, and Clark Counties is probably due to the popularity of the Mead Wildlife Area located in northeastern Wood, northwestern Portage, and south-central Marathon Counties.

Four-thousand-five-hundred-thirty-nine hunters made the 8,145 hunting trips to Sandhill from 1963 through 1972 (Table D4, Appendix D). Sixty-seven percent of them made only one trip to the area each year, 17 percent made three trips, and 4 percent made four trips. The largest number of return trips recorded consistantly on an annual basis was eight. The number of return trips made on an annual basis became very irregular beyond this point. Three hunters made an exceptional number of trips to the area during one single year; one hunter made 38 trips in 1970, another made 26 trips in 1971, and a third made 22 trips in 1969.

Gun Gauge And Shot Size In Relation To Waterfowl Hunting

Data on the gun gauges and shot sizes used by hunters at Sandhill was collected from 1963 through 1969. No significant correlations, however, were obtained from the information. Tables pertaining to gun gauge and shot size may be found in Appendix D (Tables D5 and D6, respectively).

Hunter Characteristics Survey

Questionnaires were distributed to 400 of 515 hunters, making the sample 78 percent of the total Sandhill hunter population in 1971. The

hunter characteristics information presented here represents the responses of 74 percent of the 400 hunters or 57 percent of all 515 hunters.

Forty-seven percent of the 294 Sandhill hunters answering questions 1-14 (Page 1 of Questionnaires A, B, and C) lived in Wood County, 13 percent lived in a county bordering on Wood County, 38 percent traveled 25 miles or less to hunt at Sandhill, another 38 percent traveled 100 or more miles to hunt, and 95 percent were residents of Wisconsin (Table ~~D6~~ D7, Appendix D). Seventy-eight percent approved of the regulated system of waterfowl hunting used at Sandhill, 80 percent thought that the system gave everyone an equal hunting opportunity, and 64 percent were in favor of the Sandhill system being initiated on other public waterfowl hunting areas in Wisconsin. When asked why they hunted at Sandhill, the hunters responded in the following categories: not-crowded (19 percent), good hunting (19 percent), convenient (3 percent), thought would try it (17 percent), and no opinion (41 percent).

A total of 102 hunters returned Questionnaire A (questions 15-44) (Table ~~D9~~ D8, Appendix D). Thirty-six percent of the hunters were born in a rural area (in a village or on a farm), 38 percent spent their childhood in a rural area, and 32 percent live in a rural area today. Klessig and Hale (1972) found that out of 1500 Wisconsin hunters 25 percent (375) were waterfowl hunters and that 53 percent of them were born in a rural area, 50 percent spent their childhood in a rural area, and 44 percent still live in a rural area today. Lobdell et al. (1969) found that 78 percent of Maine's hunters spent their childhood in a rural area. VanLandingham (1968) also found that 72 percent of all hunters in northeastern United States spent their childhood in a rural area. The large number of

urbanites, 65 percent (66 hunters), hunting at Sandhill indicates that urban dwellers rely more heavily upon public hunting areas for their hunting experiences than do people who live in a rural area. Thirty-four percent of the hunters at Sandhill indicated that they did the majority of their hunting on public land.

Most hunters indicated that they possessed appreciation for both wildlife and the esthetic values of nature. Eighty-eight percent of them did not feel it necessary to fill their legal bag limit in order to have a successful hunt, 75 percent did not shoot non-game animals, 94 percent considered wildlife equally as important as themselves in the scheme of nature, and 87 percent felt that part of the pleasure of hunting is to see beautiful sunsets, wildlife, and other wonders of nature. Klessig and Hale (1972) also found that Wisconsin hunters indicated that enjoying nature, and not bagging a limit or a trophy was their main motivation for hunting. This is a good indication that game management does not always have to be oriented to providing the hunter with the maximum number of game animals to shoot at. An enjoyable hunting experience appears to be just as important to the hunter.

Questionnaire B (questions 45-63) was returned by 92 hunters (Table ~~D10~~ D9, Appendix D). Fifty-one percent of the hunters had an annual income of from $7,000 to $15,000 or more, while 28 percent had an income of less than $7,000. Klessig and Hale (1972) reported similar findings with 66 percent of Wisconsin's waterfowl hunters having an annual income of $8,000 or more. VanLandingham (1968) also found that 60 percent of the hunters in northeastern United States had an annual income of $7,000 or more. Such a large percentage of hunters (average 41 percent) in the three studies

with incomes of less than $7,000 a year suggests that game management agencies must continue to provide hunting opportunities for all economic groups.

More than 75 percent of Sandhill's hunters did not belong to any sportsman's group. Klessig and Hale (1972) reported that 68 percent of Wisconsin's waterfowl hunters did not belong to a sportsman's group. Lobdell et al. (1969) also found that 82 percent of Maine's hunters did not belong to any sportsman's group. This indicates that most hunters do not support their sport with any more than the purchase of a hunting license.

A total of 100 hunters returned Questionnaire C (questions 64-80) (Table D10, Appendix D). More than 50 percent of them read one or more outdoor magazines. Relatively few hunters read the Wisconsin Conservation Bulletin or have read a book on wildlife management, 36 percent and 44 percent respectively. This indicates that most hunters are not well informed about the principles of wildlife management or the State programs that affect their hunting. Sixty-three percent of the hunters did, however, feel that scientific studies should form the basis for all game management programs.

The U.S. Fish and Wildlife Service policy of selective shooting for waterfowl was supported by 63 percent of the hunters, however, 42 percent of the hunters also supported the more liberal 3-bird-any-duck-bag (questions 76 and 80, respectively). This indicates that Sandhill hunters had some doubt as to their full support for the waterfowl hunting regulations used through 1971. Klessig and Hale (1972) found that 63 percent of

Wisconsin's waterfowl hunters felt that the waterfowl hunting regulations were too complicated to be understood. This probably reflects the increasing elaboration of waterfowl hunting rules that has taken place each year as game managers have attempted to implement species management concepts (Klessig and Hale, 1972).

MANAGEMENT RECOMMENDATIONS

The following management recommendations are based on the controlled waterfowl hunting information collected at Sandhill from 1963 through 1971, and are designed to supply needed information as well as improve the quality of hunting at Sandhill.

I. Waterfowl Management Recommendations

A. Waterfowl census surveys

1. Conduct, on an annual basis, a spring and late summer aerial or ground census of the waterfowl within Sandhill and on adjacent wetlands.

2. Conduct a temporal ground census of the Sandhill waterfowl flock, at least 3 times each week (i.e., Monday, Wednesday, and Friday), for the week prior to and each week during the waterfowl hunting season. Since most of the waterfowl congregate in the refuge at Sandhill, a fairly accurate census could be made by observing morning or evening waterfowl feeding flights to and from or within the refuge. When such flights fail to occur, the birds could be induced to flush after the shooting hours close in the evening. A census of this type, when compared with the late summer waterfowl census, will help determine if Sandhill's fall waterfowl population is made up primarily of local or migratory birds, and at what time during the fall the waterfowl population changes from predominantly local to predominantly migratory birds - if in fact it does. It will also make it possible to monitor influxes of migratory birds, and, when used in conjunction with the annual waterfowl kill records, will help determine what percentage of Sandhill's fall waterfowl flock is harvested at Sandhill each year.

3. Establish a permanent cannon netting site for a waterfowl trapping and marking program. The cannon net site could be located near the 30 acre agricultural field in the northeast section of the refuge (a current feeding site). The trapping and banding program should be conducted during the late summer, using U.S. Fish and Wildlife Service leg bands, and banding as many waterfowl as possible.

The banding program, when used in conjunction with band returns will help determine what percentage of the local puddle duck population is harvested at Sandhill each year.

B. Vegetation surveys and habitat improvements

1. Cover-type the Sandhill Area as to the suitability of its nesting, resting, feeding, and escape vegetation for ducks and geese. Make habitat improvements as found necessary. Encourage waterfowl nesting by improving local nesting habitat at Sandhill and on adjacent wet lands owned by the State. A margin of grassy vegetation should radiate out at least 100 to 220 yards from the shoreline around each body of water.

2. Employ seasonal manipulation of water levels in all flowages to encourage maximum production of moist soil plants: i.e., smartweeds (Polygonum spp.), millets (Echinochloa spp.), beggar-ticks (Bidens spp.), and wildrice (Zizania aquatica) etc. An annual system of rotational draw downs would probably work to the best advantage; not leaving nesting waterfowl without water during the critical brood rearing period.

3. Agricultural crops such as corn (Zea Mays), buckwheat (Polygonum spp.), and other small grains should be planted in the present 30 acre agricultural field in the northeast section of the refuge to attract stubble feeding ducks. Additional crops, such as alfalfa (Medicago spp.) and winter wheat (Triticum spp.) may also be planted to help attract geese. The present planting site should be enlarged or a second one created within the refuge to bring the agricultural acreage up to at least 60 acres. Future evaluation may indicate that 60 acres of planted crops is sufficient or that more agricultural acreage is necessary to meet Sandhill's waterfowl needs.

II. Hunter Management Recommendations

A. Reduce the waterfowl hunter densities within Sandhill to an average maximum level of 1 hunter per 21 acres of marsh and water, as presented in Table 18. Annually evaluate the effect of reduced hunter densities on the quality of hunting in each hunting unit. Use waterfowl crippling rates as the evaluation criteria (a crippling rate below

Table 18. Water and minimum marsh acreages and proposed allowable hunter densities for each waterfowl hunting unit at Sandhill.

Hunting Unit	Water And Minimum Marsh Acreages	Number Of Hunters Per Unit	Hunter Densities Per Acres Of Marsh And Water For Each Unit
A	85A.	4	1 per 21.2A.
B	70A.	4	1 per 17.5A.
C&E	45A.	4	1 per 11.2A.
D	110A.	6	1 per 18.3A.
F	30A.	2	1 per 15.0A.
G	225A.	8	1 per 28.1A.
H	135A.	6	1 per 22.5A.
I	120A.	6	1 per 20.0A.
J	130A.	6	1 per 21.7A.
K	35A.	2	1 per 17.5A.
L	130A.	6	1 per 21.7A.
Total	1,115A.	54	1 per 20.6A.

15 percent should be the objective for each unit). Reduce hunter densities for each unit as necessary, but do not increase them above the proposed levels.

B. Set up spy blinds on several hunting units to check the reliability of hunter reported crippling losses. Conduct observations, on an annual basis, at least 3 times weekly during the waterfowl season.

C. Have hunters identify killed waterfowl in the presence of experienced DNR personnel when leaving the area. This should increase the accuracy of the waterfowl kill and could also serve as a waterfowl identification proficiency test for hunters.

D. Consider limiting hunting as follows: 1. units D, G, and J to hunters using decoys in combination with a boat or a dog; 2. units A, B, H, I, and L to jump-shooters and pass-shooters with a dog and decoy-hunters with a boat or dog; and 3. units C&E, F, and K to all hunters without a dog or boat.

E. Consider requiring all waterfowl hunters, who hunt at Sandhill, to pass an annual waterfowl identification test of the waterfowl most frequently shot at Sandhill. A score of 90 percent correct should be considered as passing. The test should be conducted by experienced DNR personnel allowing the hunter to have the bird in hand, while the current point system for harvest is in effect.

F. Continue to monitor the effects of the controlled hunting program annually.

III. Future Controlled Hunting Research

A. Conduct the Sandhill study on a presently uncontrolled and over-crowded public waterfowl hunting area. Collect the same information but make no attempt to regulate hunting on the area. Evaluate the effectiveness of the controlled hunting program at Sandhill by comparing the results of the two studies.

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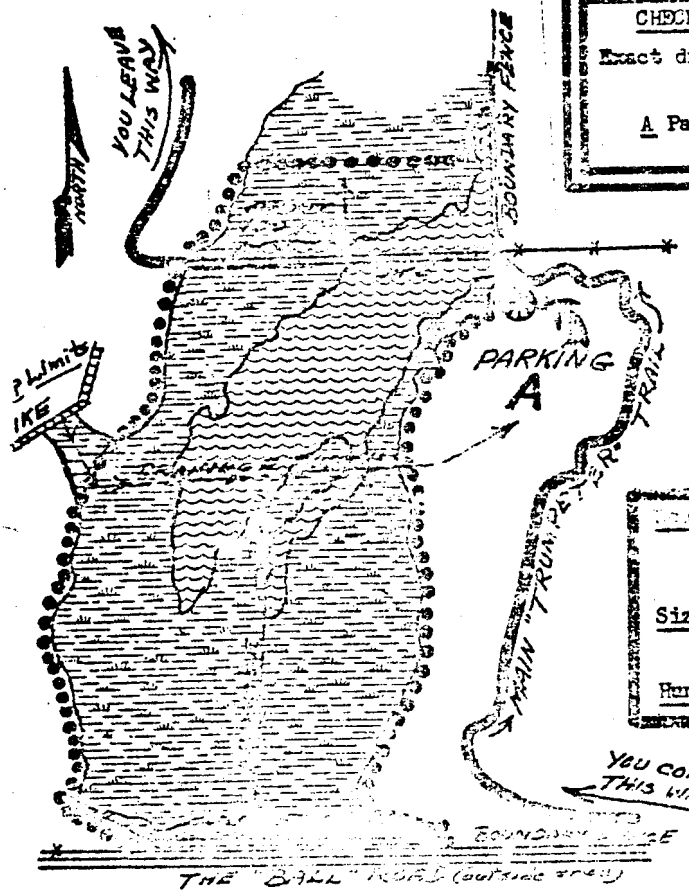
APPENDIX A

Hunting Unit Maps

MARSH UNIT A

—Hunt only on marsh and water area shown inside this heavy dotted line.
—Wooded, higher ground is "off limits".

CHECK YOUR SPEEDOMETER!
Exact distance from Entrance to:
A Parking - - 0.7 miles



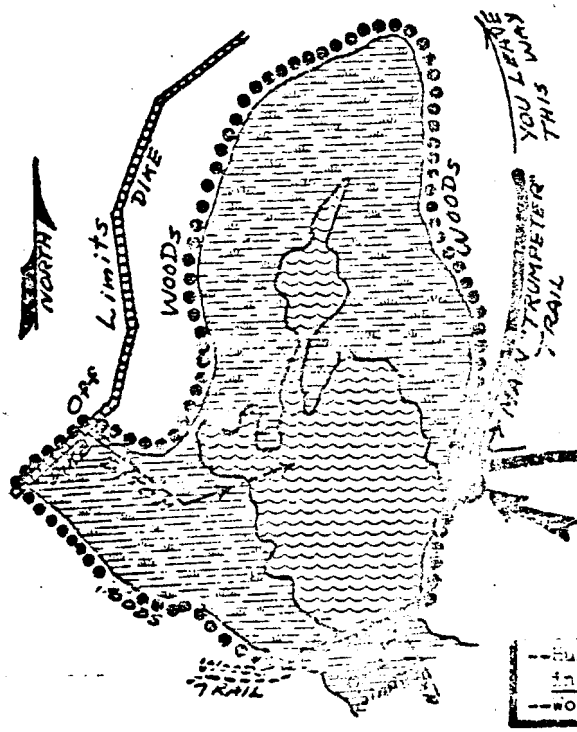
Boundary — dikes on E. & W.
Dike on S. end
100 yds. N. of dike at N. end
Size ——— 1000 yds. W. & S.
450 yds. E. & W.
About 100 acres
Hunter Limits -- 5 to 8 hunters

A BAG LIMIT IS NOT GUARANTEED ON SANDHILL!
This is not a stocked or artificial area.
It is a natural area where "elbow room" is provided by limiting hunters on the area.
There will be good days.
There will also be bad days.
A real hunter wouldn't want it any other way

Fig. A1. Marsh Unit A

MARSH UNIT B

CHECK YOUR SPEEDOMETER!
Exact distance from Entrance to:
B Parking - - - 1.0 miles



Boundary -- Wooded highlands plus 2 dikes around unit.
Size ------ 900 yds. N. and S.
370 yds. E. and W.
About 65 acres
Hunter limits - - 4 to 5 hunters

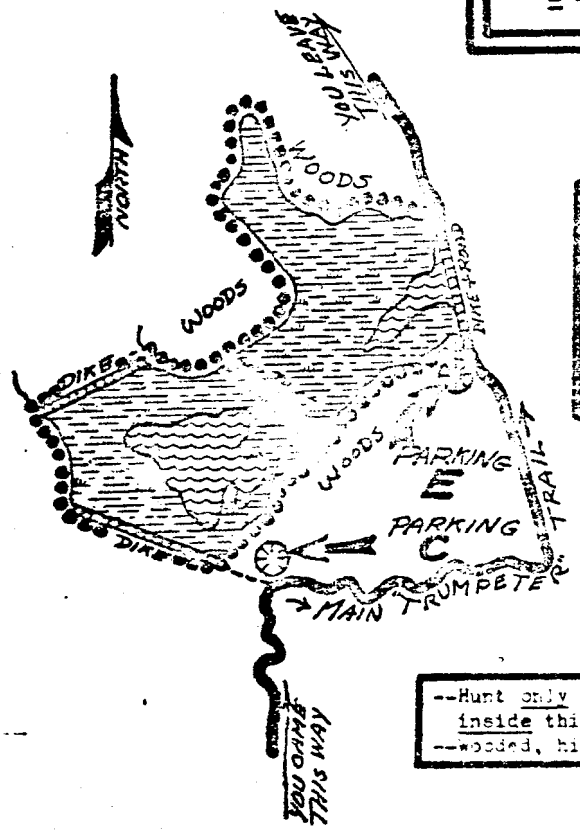
--Hunt only on marsh and water area shown inside this heavy dotted line.
--Wooded, higher ground is "off limits".

A BAG LIMIT IS NOT GUARANTEED ON SANDHILL!
This is not a stocked or artificial area.
It is a natural area where "elbow room" is provided by limiting hunters on the area.
There will be good days.
There will also be bad days.
A real hunter wouldn't want it any other way.

Fig. A2. Marsh Unit B

MARSH UNIT C&E

CHECK YOUR SPEEDOMETER!
Exact distance from Entrance to:
C Parking - - - 1.4 miles
E Parking - - - 1.9 miles



Boundaries -- As shown on map.

Size -- Unit C - 250 X 280 yds.
About 13 acres
Unit E - 300 X 350 yds.
About 15 acres

Hunter limits -- 2 per Unit

--Hunt only on marsh and water area shown inside this heavy dotted line.
--wooded, higher ground is "off limits".

A BAG LIMIT IS NOT GUARANTEED ON ANY HUNT!
This is not a stocked or artificial area.
It is a natural area where "elbow room" is provided by limiting hunters on the area.
There will be good days.
There will also be bad days.
A real hunter wouldn't want it any other way.

Fig. A3. Marsh Unit C & E

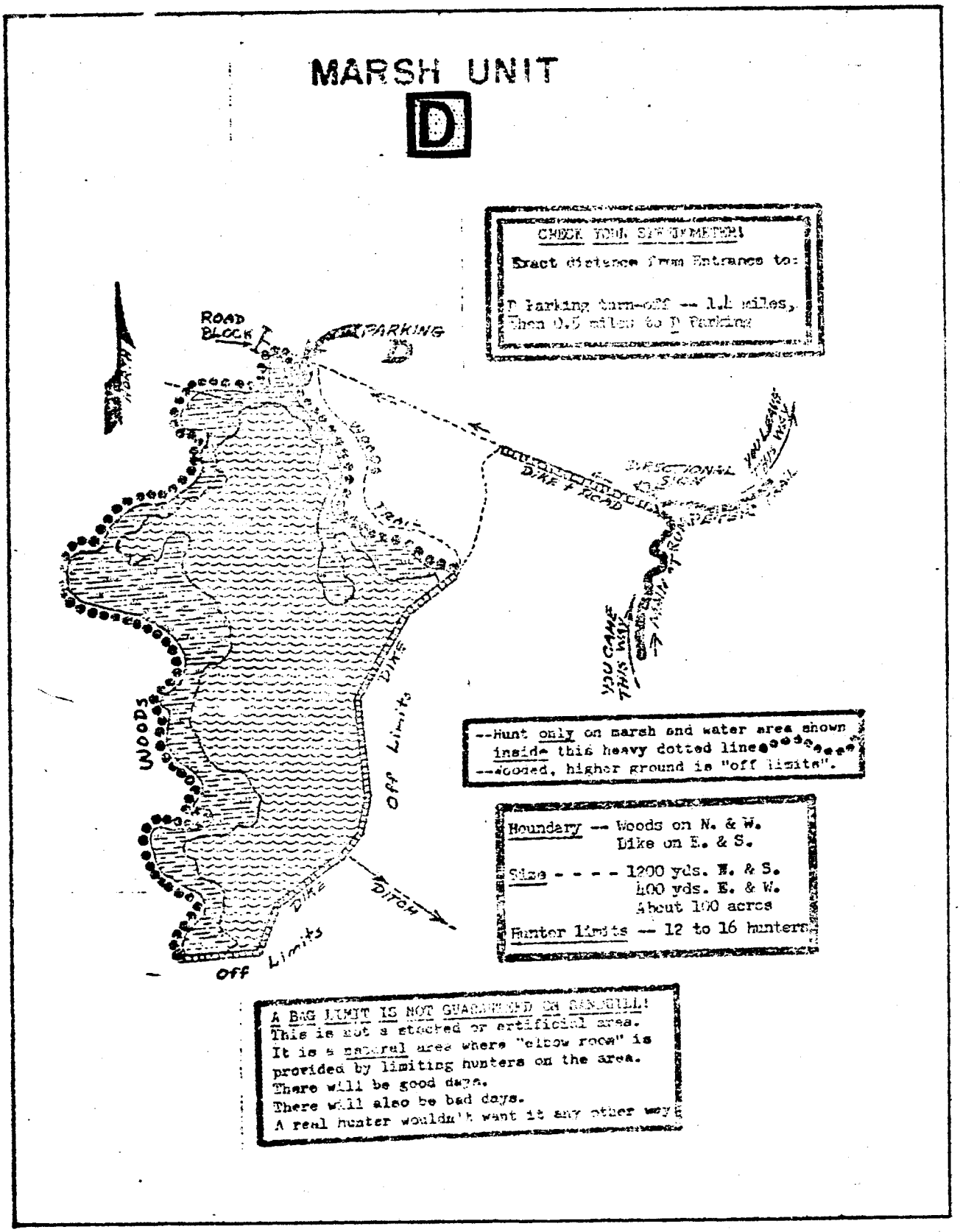


Fig. A4. Marsh Unit D

MARSH UNIT

Boundary - - Woods N. & S.; Dike E.; marsh narrows to W.

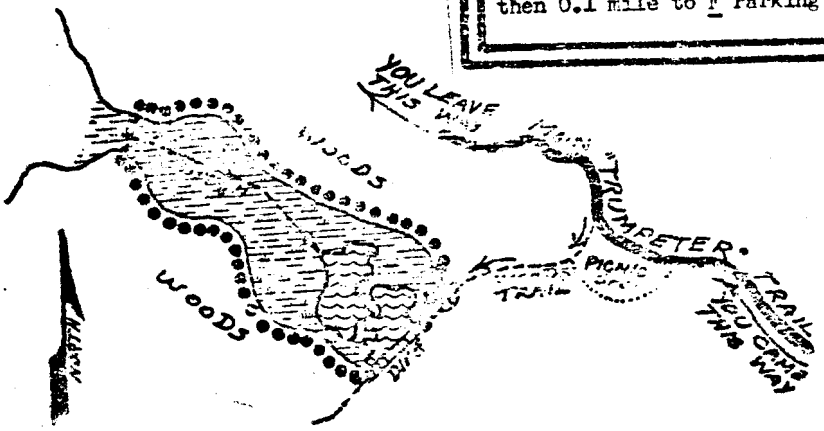
Size - - - - 450 yds.E. & W.
150 yds.N. & S.
About 17 acres

Hunter limits — 2 hunters

CHECK YOUR SPEEDOMETER!

Exact distance from Entrance to:

F Parking turn-off — 2.6 miles,
Then 0.1 mile to F Parking



—Hunt only on marsh and water areas shown inside this heavy dotted line.
—Wooded, higher ground is "off limits".

A BAG LIMIT IS NOT GUARANTEED ON SANDHILL!
This is not a stocked or artificial area.
It is a natural area where "elbow room" is provided by limiting hunters on the area.
There will be good days.
There will also be bad days.
A real hunter wouldn't want it any other way.

Fig. A5. Marsh Unit F

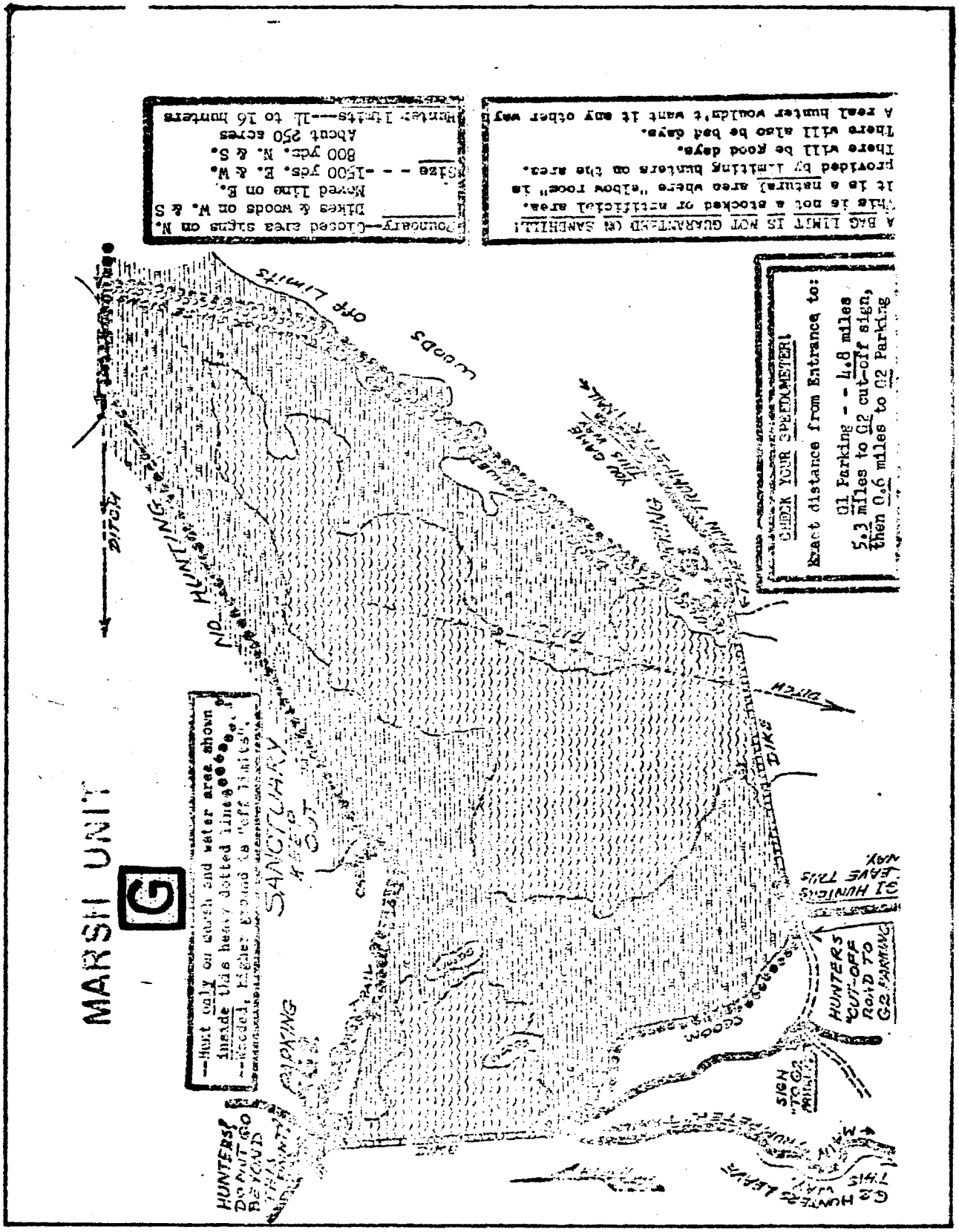


Fig. A6. Marsh Unit G

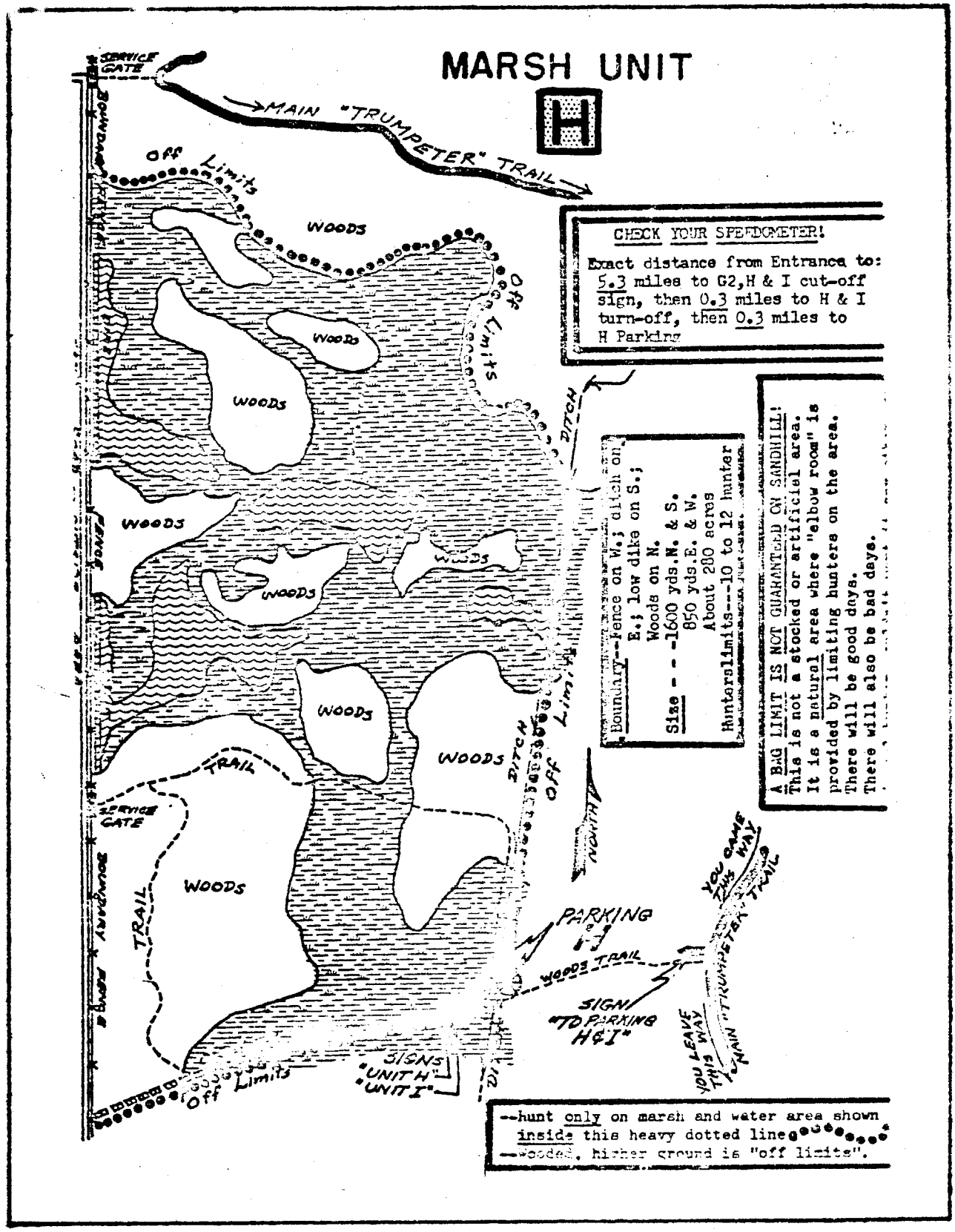


Fig. A7. Marsh Unit H

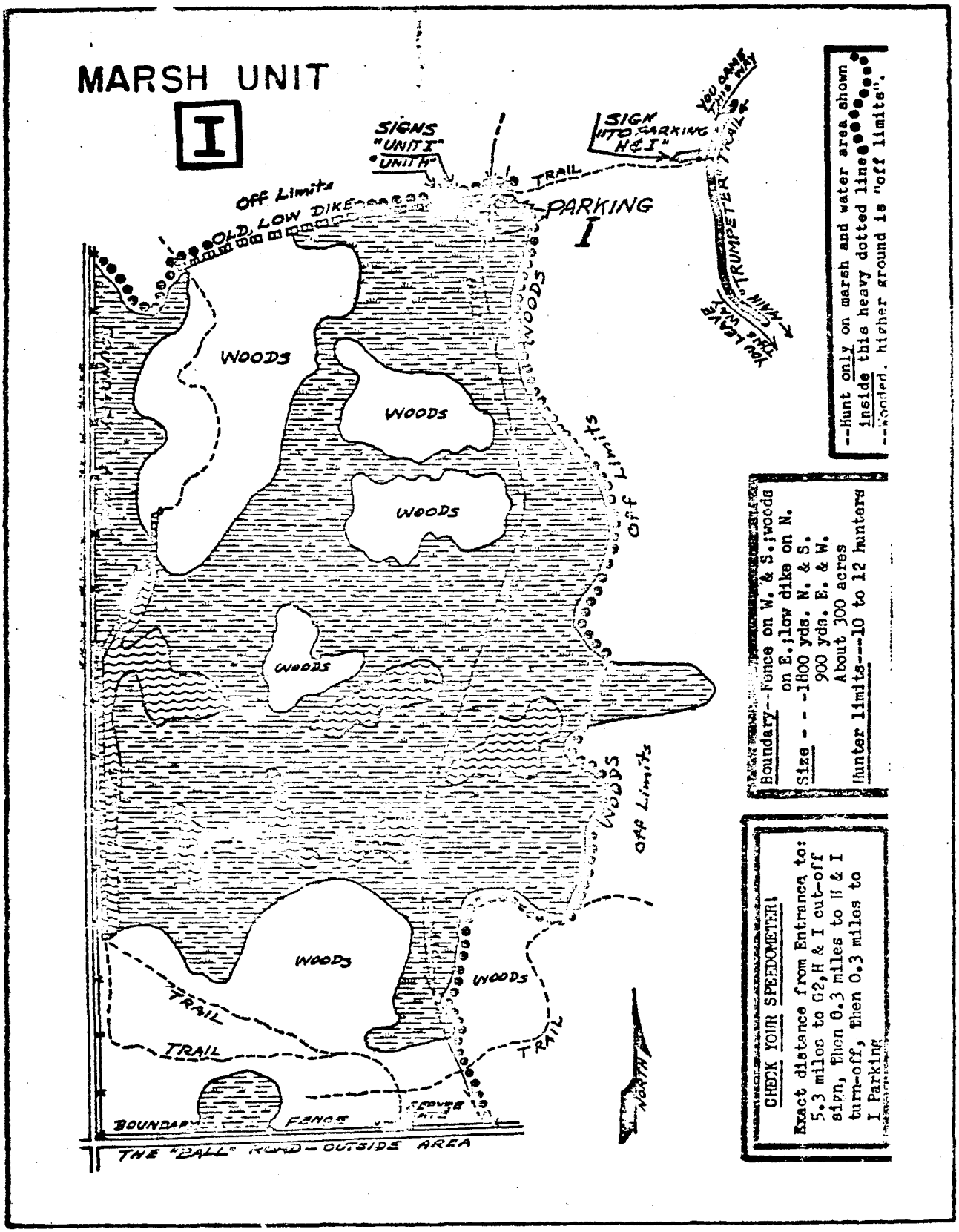


Fig. A8. Marsh Unit I

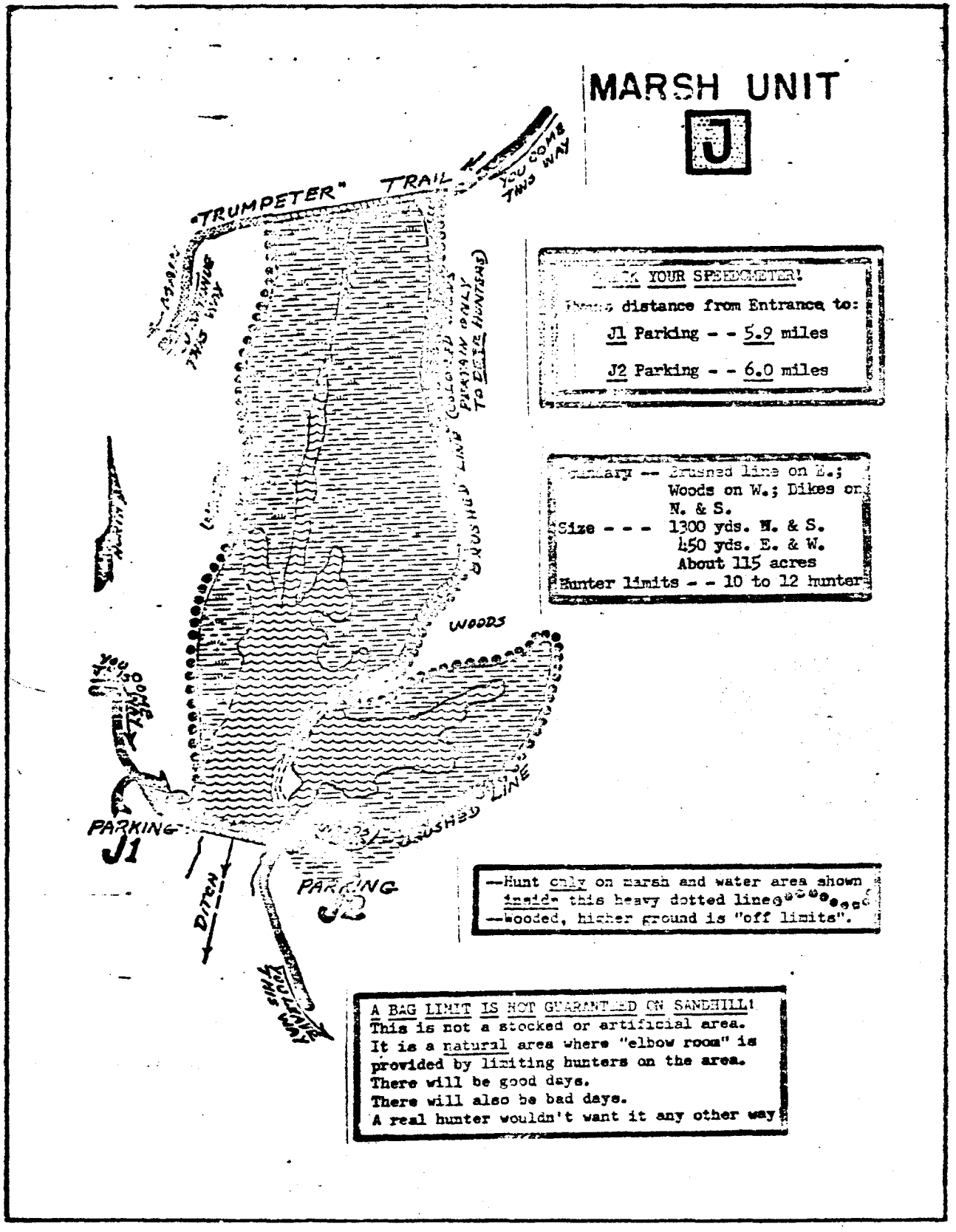
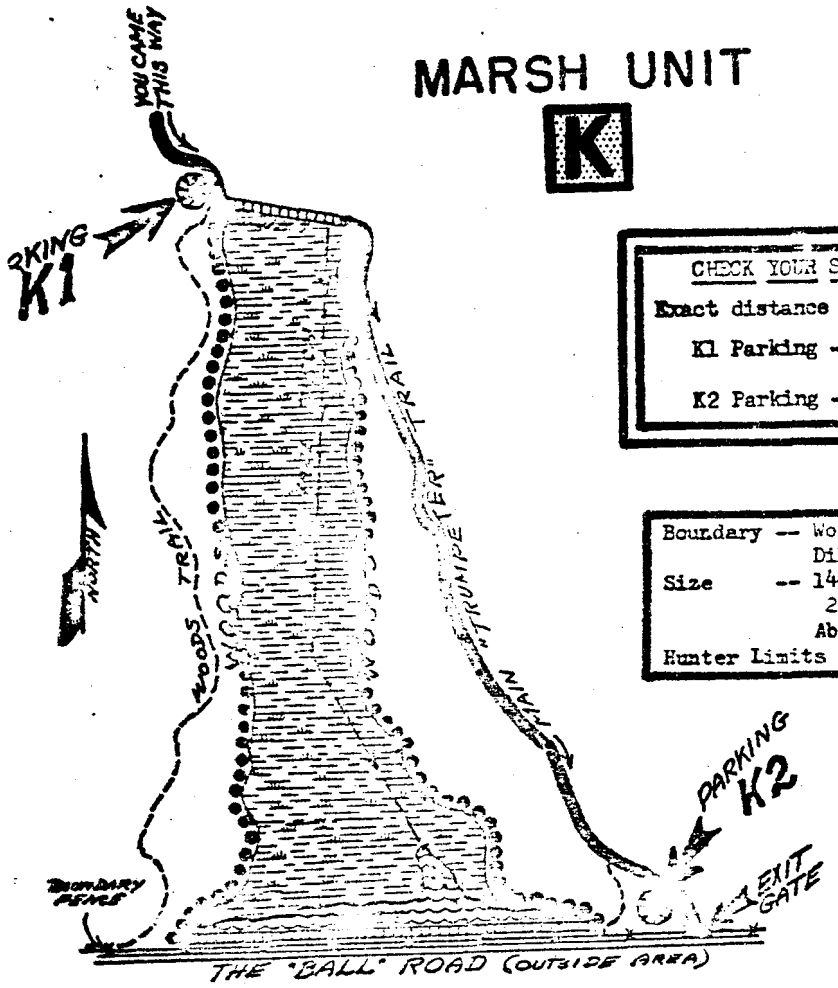


Fig. A9. Marsh Unit J

MARSH UNIT K



CHECK YOUR SPEEDOMETER!
Exact distance from Entrance to:
K1 Parking - - 5.9 miles
K2 Parking - - 6.7 miles

Boundary -- Woods on E. & W.
Dikes on N. & S.
Size -- 1400 yds. N. & S.
250 yds. E. & W.
About 80 acres
Hunter Limits -- 6 to 8 hunters

—Hunt only on marsh and water area shown inside this heavy dotted line.
—Wooded, higher ground is "off limits".

A BAG LIMIT IS NOT GUARANTEED ON SANDHILL!
This is not a stocked or artificial area.
It is a natural area where "elbow room" is provided by limiting hunters on the area.
There will be good days.
There will also be bad days.
A real hunter wouldn't want it any other way

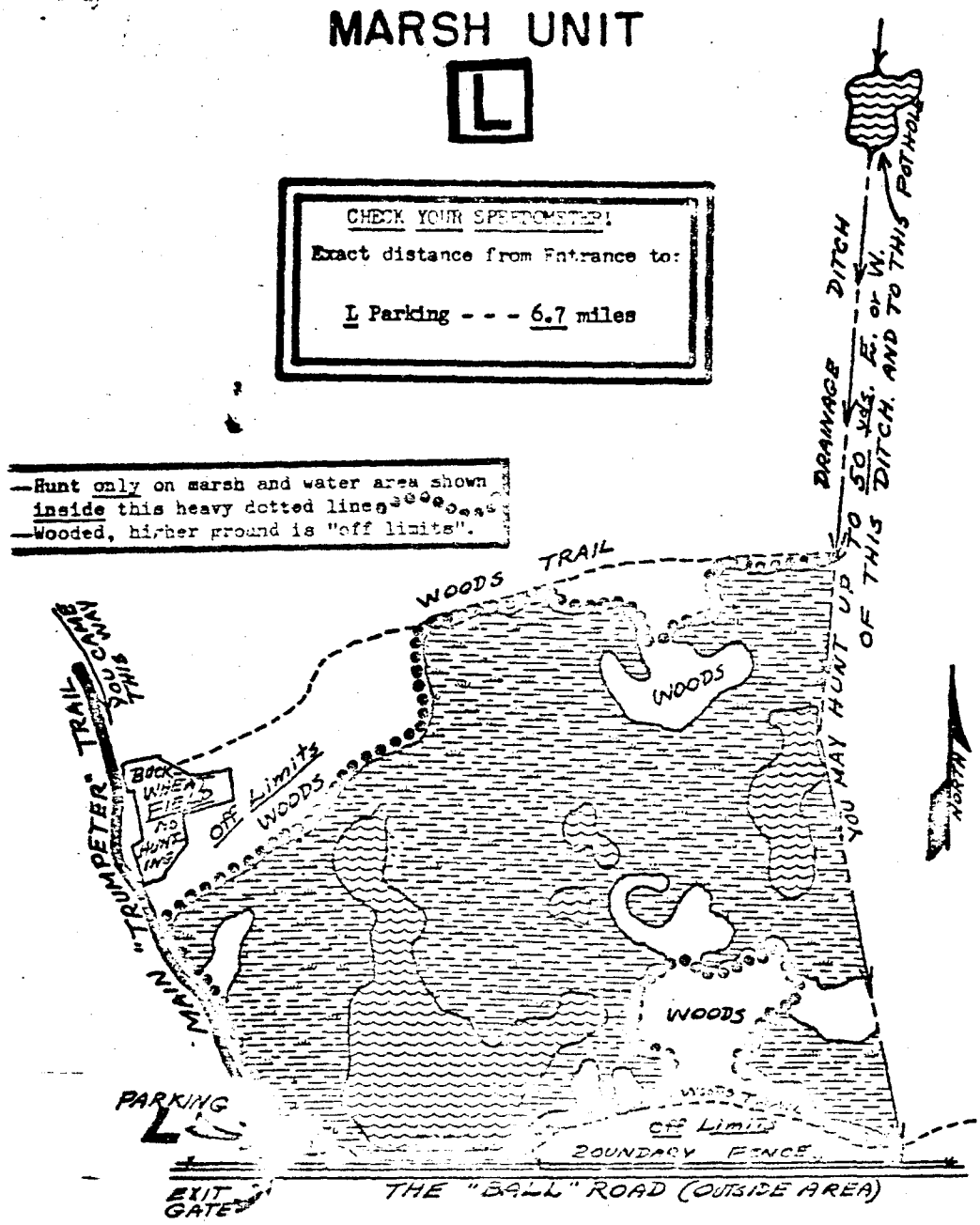
Fig. A10. Marsh Unit K

MARSH UNIT

L

CHECK YOUR SPEEDOMETER!
Exact distance from Entrance to:
L Parking - - - 6.7 miles

—Hunt only on marsh and water area shown inside this heavy dotted line.
—Wooded, higher ground is "off limits".



Boundary -- Woods on N.; ditch on E.; road on W.; dike and woods on S.
Size - - - 1000 yds. E. & W.
800 yds. N. & S.
About 160 acres
Hunter limits - - 7 to 9 hunters

A BAG LIMIT IS NOT GUARANTEED ON SANDHILL!
This is not a stocked or artificial area.
It is a natural area where "elbow room" is provided by limiting hunters on the area.
There will be good days.
There will also be bad days.
A real hunter wouldn't want it any other way!

Fig. All. Marsh Unit L

APPENDIX B

Permit-Information Forms

Hunting Unit:_____

Date:_____

Name:_____

Street or Rural Route:_____

City:_____ State:_____

License No._____

BAG CHECK

_____

_____

_____

_____

_____

_____

_____

_____

_____

From: _____ } _____
Hunted:
To: _____ }

Waterfowl Observed: Geese _____ Ducks _____ Other _____

Major type of hunting:_____

Gun used:_____

Shells used:_____

Used: Dogs?_____ Decoys?_____

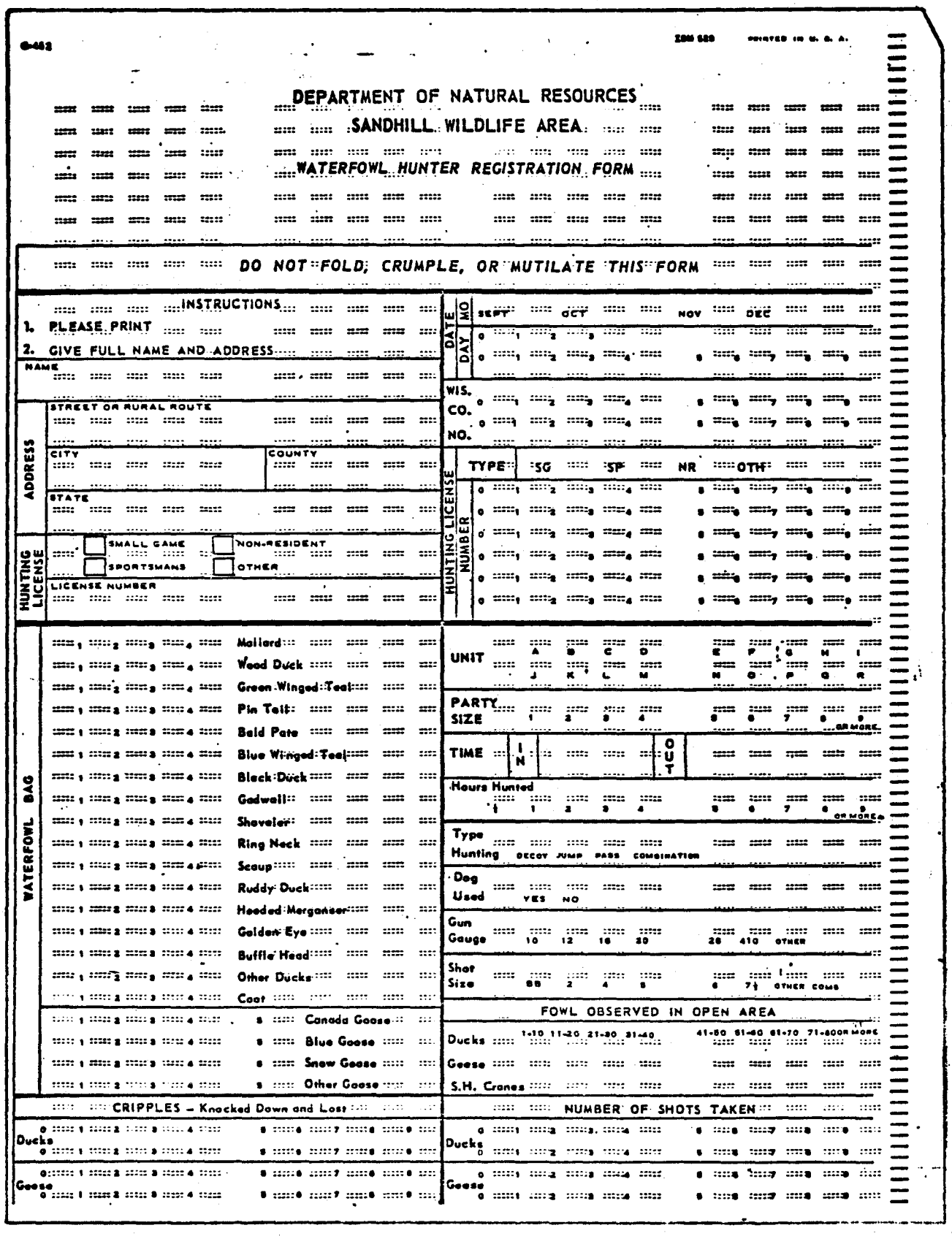
Number of shots taken:_____

Hit birds not retrieved:_____

REMARKS:

Checker:_____

Fig. B1. Card Permit-Information Form for 1963. (4 x 6 in.)



DEPARTMENT OF NATURAL RESOURCES

SANDHILL WILDLIFE AREA

WATERFOWL HUNTER REGISTRATION FORM

DO NOT FOLD, CRUMPLE, OR MUTILATE THIS FORM

INSTRUCTIONS

1. PLEASE PRINT
2. GIVE FULL NAME AND ADDRESS

NAME

ADDRESS: STREET OR RURAL ROUTE; CITY; COUNTY; STATE

HUNTING LICENSE: SMALL GAME; NON-RESIDENT; SPORTSMANS; OTHER; LICENSE NUMBER

WATERFOWL BAG: Mallard; Wood Duck; Green Winged Teal; Pin Tail; Bald Pate; Blue Winged Teal; Black Duck; Gadwall; Shoveler; Ring Neck; Scaup; Ruddy Duck; Hooded Merganser; Golden Eye; Buffle Head; Other Ducks; Coot; Canada Goose; Blue Goose; Snow Goose; Other Goose

CRIPPLES – Knocked Down and Lost: Ducks; Geese

DATE: MO (SEPT, OCT, NOV, DEC); DAY

WIS. CO. NO.

HUNTING LICENSE NUMBER: TYPE (SG, SP, NR, OTH)

UNIT: A B C D E F G H I J K L M N O P Q R

PARTY SIZE: 1 2 3 4 5 6 7 8 9 OR MORE

TIME: IN; OUT

Hours Hunted: ½ 1 2 3 4 5 6 7 8 9 OR MORE

Type Hunting: DECOY, JUMP, PASS, COMBINATION

Dog Used: YES, NO

Gun Gauge: 10, 12, 16, 20, 28, 410, OTHER

Shot Size: BB, 2, 4, 6, 6, 7½, OTHER COMB

FOWL OBSERVED IN OPEN AREA

	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	OR MORE
Ducks									
Geese									
S.H. Cranes									

NUMBER OF SHOTS TAKEN: Ducks; Geese

Fig. B2. IBM Permit-Information Form for 1964 through 1969. ($8\frac{1}{2}$ x 11 in.)

DEPARTMENT OF NATURAL RESOURCES

SANDHILL AREA HEADQUARTERS

Waterfowl Hunter Registration Form

Name: _____

Street or Rural Route: _____

City: _____ State: _____

License No. _____ Lic. Type SG S N-R OTHER

Date: _____ Flowage Unit: _____

TIME IN: _____

HUNTER: PLEASE FILL IN THIS PORTION OF CARD

TIME OUT:

NUMBER OF SHOTS TAKEN

At Ducks: _____

At Geese: _____

NUMBER OF CRIPPLES KNOCKED DOWN AND LOST

Number of ducks: _____

Number of geese: _____

NUMBER OF DUCKS BAGGED: _____ NUMBER OF GEESE BAGGED: _____

Please indicate number of each species if known

MALLARD _____ SCAUP (Bluebill) _____ CANADA GOOSE _____

BLUE-WGD-TEAL _____ BALDPATE (Widgeon) _____ OTHER GOOSE _____

GN-WGD-TEAL _____ OTHER (Indicate species if known) _____

WOOD DUCK _____ _____

RING NECK _____

THANK YOU FOR YOUR COOPERATION
SANDHILL WILDLIFE AREA STAFF

Fig. B3. Card Permit-Information Form for 1970 and 1971. (~ x 6 in.)

APPENDIX C

Hunter Characteristics Questionnaires

HUNTER SURVEY Code A

The following hunter questionnaire is designed to collect general information about the hunters using the Sandhill Wildlife Demonstration Area for waterfowl hunting. Please answer every question to the best of your knowledge. Return this questionnaire to the check out station along with your hunting permit when leaving. This questionnaire is annonymous; so, please do not sign your name.

1) How old are you?
0-15___ 16-30___ 31-54___ 46-60___ 61-75___

2) Sex?
Male___ Female___

3) Race?
White___ Black___ Amer. Indian___ Other (specify)_____

4) Marital status?
Single___ Married___ Widowed___ Divorced___

How many children do you have?
5) Boys 0___ 1___ 2___ 3___ more than 3___
6) Girls 0___ 1___ 2___ 3___ more than 3___

7) Do you live in Wood County?
Yes___ No___

8) Do you live in a county bordering on Wood County?
Yes___ No___

9) How far did you travel from home to hunt at Sandhill?
25 miles or less___ 26-50___ 50-100___ 100+___

10) Are you a resident of Wisconsin?
Yes___ No___

11) Do you approve of the regulated system of waterfowl hunting used at Sandhill?
Disagree___ No opinion___ Agree___

12) Do you feel that the system of assigning hunting units at Sandhill gives everyone an equal opportunity?
Disagree___ No opinion___ Agree___

13) Are you in favor of the Sandhill system of hunting being initiated on other public waterfowl hunting areas in Wisconsin?
Disagree___ No opinion___ Agree___

14) Why do you hunt at Sandhill?

_____

_____

_____

15) When you were born, did your parents live:
In a large city___ In a Village___
In a small town___ On a farm ___

16) In your childhood years, from 7 to 20, did you live most of the time:
In a large city___ In a village___
In a small city___ On a farm ___

17) At the present time do you live:
In a large city___ In a village___
In a small city___ On a farm ___

18) Were you born in Wisconsin?
Yes___ No___

From the following list select the outdoor activities that you frequently participate in.

19) Skiing___
20) Skating___
21) Snowshoeing___
22) Snowmobiling___
23) Tennis___
24) Skeet or trap shooting___
25) Golfing___
26) Boating or canoeing___
27) Swimming___
28) Fishing___
29) Hunting___
30) Camping___
31) Nature study___
32) Bird watching___
33) Hiking___

34) When you go hunting, do you usually go:
Alone___
With one other person___
With two other persons___
With several persons___

35) Do you take your son(s) hunting?
Yes___ No___ Have no son(s)___

36) Do you do the majority of your hunting on:
Private land___
Your own property___
State, federal, or county forest land___
State public hunting areas___
Private shooting preserves___

37) Do you feel that to have a successful hunt it is necessary to fill your legal bag limit?
Yes___ No___

38) If you hunt in a group, do you usually hunt with:
Immediate family___
Relatives___
Intimate friends___
Other friends___
Do not hunt in groups___

39) Do you hunt with the same companions from year to year?
Yes___ No___

40) When game-hunting do you ever shoot at non-game animals just for something to shoot at?
Yes___ No___ Sometimes___

41) Do you want your son(s) to grow up to enjoy hunting?
Yes___ No___ Have no son(s)___

42) Do you believe that a hunter should;
Have a respect for the wildlife that he hunts, considering them equally as important as himself in the scheme of nature____
Consider himself superior to and therefore master of the wildlife he hunts____

43) Part of the pleasure of hunting is to see beautiful sunsets, wildlife, and other wonders of nature.
Disagree___ No opinion___ Agree___

44) I like to continue the hunt until I kill at least one piece of game.
Disagree___ No opinion___ Agree___

Comments;

HUNTER SURVEY Code B

The following hunter questionnaire is designed to collect general information about the hunters using the Sandhill Wildlife Demonstration Area for waterfowl hunting. Please answer every question to the best of your knowledge. Return this questionnaire to the check out station along with your hunting permit when leaving. This questionnaire is annonymous; so, please do not sign your name.

1) How old are you?
0-15___ 16-30___ 31-54___ 46-60___ 61-75___

2) Sex?
Male___ Female___

3) Race?
White___ Black___ Amer. Indian___ Other (specify)_____

4) Marital status?
Single___ Married___ Widowed___ Divorced___

How many children do you have?
5) Boys 0___ 1___ 2___ 3___ more than 3___
6) Girls 0___ 1___ 2___ 3___ more than 3___

7) Do you live in Wood County?
Yes___ No___

8) Do you live in a county bordering on Wood County?
Yes___ No___

9) How far did you travel from home to hunt at Sandhill?
25 miles or less___ 26-50___ 50-100___ 100+___

10) Are you a resident of Wisconsin?
Yes___ No___

11) Do you approve of the regulated system of waterfowl hunting used at Sandhill?
Disagree___ No opinion___ Agree___

12) Do you feel that the system of assigning hunting units at Sandhill gives everyone an equal opportunity?
Disagree___ No opinion___ Agree___

13) Are you in favor of the Sandhill system of hunting being initiated on other public waterfowl hunting areas in Wisconsin?
Disagree___ No opinion___ Agree___

14) Why do you hunt at Sandhill?

_____

_____

_____

45) What was (or is) your father's main or major occupation?

_____

46) What is your main or major occupation?

_____

47) Are you unemployed?
Yes___ No___

48) What is your approximate total yearly income?
Less than $3000___
$3000-$6999___
$7000-$10999___
$11000-$14999___
$15000 or over___

49) Do you own a 1970 or newer model car?
Yes___ No___

50) Does your family own more than one car?
Yes___ No___

51) Is your home:
Rented___
Owned by you; but, mortgaged___
Fully owned by you___

52) Do you own a vacation cabin?
Yes___ No___

Have you been or are you a member of any of the following Conservation organizations: (check all that apply)
53) Ducks Unlimited___
54) Izaak Walton League___
55) Local Sportsmans Club___
56) Other (specify)_____

57) How many shotguns do you own?
0___ 1___ 2___ 3___ more than 3___

58) Do you load your own shotgun shells?
Some___ All___ None___

59) Do you make your own decoys?
Some___ All___ None___

60) Do you own a hunting dog?
Yes___ No___

61) Are you retired?
Yes___ No___

62) Do you train your own dog(s) to hunt?
Yes___ No___ Have no dog(s)___

63) When you bring game home, do you and your family eat the game?
Sometimes___ Never___ Always___

Comments

HUNTER SURVEY Code C

The following hunter questionnaire is designed to collect general information about the hunters using the Sandhill Wildlife Demonstration Area for waterfowl hunting. Please answer every question to the best of your knowledge. Return this questionnaire to the check out station along with your hunting permit when leaving. This questionnaire is annonymous; so, please do not sign your name.

1) How old are you?
0-15___ 16-30___ 31-54___ 46-60___ 61-75___

2) Sex?
Male___ Female___

3) Race?
White___ Black___ Amer. Indian___ Other (specify)_____

4) Marital status?
Single___ Married___ Widowed___ Divorced___

How many children do you have?
5) Boys 0___ 1___ 2___ 3___ more than 3___
6) Girls 0___ 1___ 2___ 3___ more than 3___

7) Do you live in Wood County?
Yes___ No___

8) Do you live in a county bordering on Wood County?
Yes___ No___

9) How far did you travel from home to hunt at Sandhill?
25 miles or less___ 26-50___ 50-100___ 100+___

10) Are you a resident of Wisconsin?
Yes___ No___

11) Do you approve of the regulated system of waterfowl hunting used at Sandhill?
Disagree___ No opinion___ Agree___

12) Do you feel that the system of assigning hunting units at Sandhill gives everyone an equal opportunity?
Disagree___ No opinion___ Agree___

13) Are you in favor of the Sandhill system of hunting being initiated on other public waterfowl hunting areas in Wisconsin?
Disagree___ No opinion___ Agree___

14) Why do you hunt at Sandhill?

_____

_____

_____

20

64) What is the highest grade you completed in school?

_____

65) Which of the following was the last educational institution you graduated from?
Grade school___
High school___
Junior college___
College___
Post graduate college___

66) Did you attend a vocational or trade school?
Yes___ No___

Do you purchase, subscribe to, or read any of the following sporting or outdoor magazines?
67) Field and Stream___
68) Outdoor Life___
69) Sports Afield___
70) Wis. Conservation Bulletin___
71) Other (specify)_____

72) Have you ever read a book on wildlife management written by a professional wildlife expert?
Yes___ No___

73) How many years have you been duck hunting?
1st year___ 1-5___ 6-10___ 11-15___ 16+___

74) Do you feel that the regulated system of hunting at Sandhill provides good quality hunting?
Disagree___ No opinion___ Agree___

75) Scientific studies should form the basis for all game management programs.
Disagree___ No opinion___ Agree___

76) The present U.S. Fish and Wildlife Service policy of selective shooting for hunting waterfowl, (requiring the hunter to identify the species of duck before shooting), works to the benefit of the hunter and our waterfowl populations.
Disagree___ No opinion___ Agree___

77) Do you feel that the goose hunting offered along the border of the Necedah National Wildlife Refuge is good quality hunting?
Disagree___ No opinion___ Agree___

78) How many years have you been hunting waterfowl at Sandhill?
1st year___ 1-2___ 3-4___ 5-6___ 6-9___

79) Do you read the hunting regulations before going hunting?
Yes___ No___ Sometimes___

80) A new policy for the regulation of waterfowl hunting, making all species of waterfowl equally legal within the bag limit; but, lowering the daily bag limit, would be of more benefit to the hunter and to our waterfowl populations than the present system.

(e.g. A bag limit not to exceed 3 ducks per day. Which can be made up of any combination of waterfowl species, or 3 ducks of the same species (all species included mallard, wood duck, canvasback, etc.).

Disagree___ No opinion___ Agree___

Comments:

APPENDIX D

Additional Tables

Table D1. The number of successful and unsuccessful duck hunting trips made to each hunting unit from 1963 through 1971. (Percentages are in parentheses)

Hunting Units	Number of Successful Hunting Trips	Number of Unsuccessful Hunting Trips
A	55 (3.1)	178 (2.8)
B	72 (4.1)	184 (2.9)
C & E	11 (0.6)	34 (0.5)
D	413 (23.6)	1,261 (19.7)
F	8 (0.5)	91 (1.4)
G	836 (47.8)	3,001 (46.9)
H	86 (4.9)	401 (6.3)
I	49 (2.8)	222 (3.5)
J	146 (8.4)	775 (12.1)
K	26 (1.5)	93 (1.5)
L	22 (1.3)	89 (1.4)
No Response[1]	25 (1.4)	67 (1.0)
Total	1,749 (100.0)	6,396 (100.0)

[1]Indicates the number of successful and unsuccessful duck hunting trips to each hunting unit by hunters who failed to have a hunting unit recorded.

Table D2. The number of successful and unsuccessful goose hunting trips made to each hunting unit from 1963 through 1971. (Percentages are in parentheses)

Hunting Units	Number of Successful Hunting Trips	Number of Unsuccessful Hunting Trips
A	1 (0.2)	232 (3.1)
B	3 (0.5)	253 (3.3)
C & E	0 (0.0)	45 (0.6)
D	117 (21.5)	1,557 (20.5)
F	12 (2.2)	87 (1.1)
G	377 (69.2)	3,460 (45.5)
H	6 (1.1)	481 (6.3)
I	3 (0.5)	268 (3.5)
J	20 (3.7)	901 (11.9)
K	0 (0.0)	119 (1.6)
L	1 (0.2)	110 (1.5)
No Response[1]	5 (0.9)	87 (1.1)
Total	545 (100.0)	7,600 (100.0)

[1]Indicates the number of successful and unsuccessful goose hunting trips to each hunting unit by hunters who failed to have a hunting unit recorded.

Table D3. The number of hunter trips made to each of Wisconsin's Counties from Sandhill and out of state from 1963 through 1971. (Percentages are in parentheses)

County Number[1]	Name of County	Number of Hunter Trips	
-50 Mile Counties			
1	Adams	26	(0.3)
10	Clark	160	(2.0)
27	Jackson	15	(0.2)
29	Juneau	123	(1.5)
37	Marathon	61	(0.8)
41	Monroe	120	(1.5)
49	Portage	172	(2.1)
69	Waushara	30	(0.4)
71	Wood	4,236	(52.9)
	Total	4,943	(61.7)
50 - 100 Mile Counties			
6	Buffalo	0	(0.0)
9	Chippewa	2	(0.0)
11	Columbia	20	(0.2)
12	Crawford	1	(0.0)
13	Dane	291	(3.6)
14	Dodge	19	(0.2)
17	Dunn	5	(0.1)
18	Eau Claire	6	(0.1)
20	Fond du Lac	10	(0.1)
24	Green Lake	9	(0.1)
25	Iowa	3	(0.0)
32	La Crosse	61	(0.8)
34	Langlade	8	(0.1)
35	Lincoln	9	(0.1)
39	Marquette	0	(0.0)
44	Outagamie	4	(0.0)
46	Pepin	1	(0.0)
50	Price	14	(0.2)
52	Richland	8	(0.1)
54	Rusk	0	(0.0)
56	Sauk	142	(1.8)
58	Shawano	2	(0.0)
60	Taylor	8	(0.1)
61	Trempealeau	6	(0.1)
62	Vernon	1	(0.0)
68	Waupaca	2	(0.0)
70	Winnebago	199	(2.5)
72	Menominee	0	(0.0)
	Total	831	(10.4)

Table D3. (Cont.)

County Number	Name of County	Number of Hunter Trips	
100+ Mile Counties			
2	Ashland	2	(0.0)
3	Barron	2	(0.0)
4	Bayfield	0	(0.0)
5	Brown	13	(0.2)
7	Burnett	0	(0.0)
8	Calumet	4	(0.0)
15	Door	2	(0.0)
16	Douglas	9	(0.1)
19	Florence	0	(0.0)
21	Forest	1	(0.0)
22	Grant	13	(0.2)
23	Green	9	(0.1)
26	Iron	1	(0.0)
28	Jefferson	34	(0.4)
30	Kenosha	34	(0.4)
31	Kewaunee	48	(0.6)
33	Lafayette	2	(0.0)
36	Manitowoc	22	(0.3)
38	Marinette	11	(0.1)
40	Milwaukee	494	(6.2)
42	Oconto	0	(0.0)
43	Oneida	13	(0.2)
45	Ozaukee	106	(1.3)
47	Pierce	0	(0.0)
48	Polk	1	(0.0)
51	Racine	243	(3.0)
53	Rock	808	(10.1)
55	St. Croix	6	(0.1)
57	Sawyer	0	(0.0)
59	Sheboygan	2	(0.0)
63	Vilas	0	(0.0)
64	Walworth	17	(0.2)
65	Washburn	0	(0.0)
66	Washington	63	(0.8)
67	Waukesha	100	(1.2)
	Total	2,060	(25.7)
00	Out-of-State	171	(2.1)

Table D3. (Cont.)

County Number	Name of County	Number of Hunter Trips	
	Total Number of Valid Hunter Questionnaires	8,005	(100.0)
	Total Number of Invalid Hunter Questionnaires	140	

[1]Each Wisconsin County was issued a number between 1 and 72, according to alphabetical order. Menominee County was given No. 72 because it became a county after the study began.

Table D4. The number of waterfowl hunting trips made to Sandhill each year from 1963 through 1971. (Percentages are in parentheses)

	Number of Return Trips Made to Sandhill By Each Hunter						
Year	1	2	3	4	5	6	7
1963	297 (66.9)	70 (15.8)	30 (6.8)	14 (3.2)	5 (1.1)	14 (3.2)	1 (0.2)
1964	309 (68.6)	69 (15.3)	33 (7.3)	19 (4.2)	6 (1.3)	6 (1.3)	4 (0.9)
1965	214 (63.3)	60 (17.7)	25 (7.4)	19 (5.6)	9 (2.7)	5 (1.5)	0 (0.0)
1966	426 (70.6)	109 (18.1)	35 (5.8)	13 (2.2)	8 (1.3)	6 (1.0)	1 (0.2)
1967	519 (76.0)	88 (12.9)	34 (5.0)	18 (2.6)	13 (1.9)	6 (0.9)	3 (0.4)
1968	348 (63.8)	100 (18.3)	42 (7.7)	25 (4.6)	9 (1.7)	9 (1.7)	4 (0.7)
1969	315 (60.8)	92 (17.7)	38 (7.3)	25 (4.8)	14 (2.7)	12 (2.3)	5 (1.0)
1970	280 (63.5)	80 (18.2)	33 (7.5)	15 (3.4)	10 (2.3)	10 (2.3)	3 (0.7)
1971	326 (63.3)	91 (17.7)	29 (5.6)	23 (4.5)	19 (3.7)	7 (1.3)	6 (1.2)

Table D4. (Cont.)

Year	Number of Return Trips Made to Sandhill By Each Hunter						
	8	9	10	11	12	13	14
1963	3 (0.7)	5 (1.1)	2 (0.4)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)
1964	1 (0.2)	1 (0.2)	3 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
1965	2 (0.6)	2 (0.6)	1 (0.3)	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)
1966	2 (0.3)	2 (0.3)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
1967	1 (0.1)	1 (0.1)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
1968	3 (0.5)	1 (0.2)	0 (0.0)	0 (0.0)	2 (0.4)	1 (0.2)	0 (0.0)
1969	6 (1.2)	5 (1.0)	2 (0.4)	1 (0.2)	1 (0.2)	0 (0.0)	0 (0.0)
1970	1 (0.2)	0 (0.0)	4 (0.9)	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)
1971	7 (1.3)	3 (0.6)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.2)

Table D4. (Cont.)

Year	Number of Return Trips Made to Sandhill By Each Hunter						
	15	16	17	18	19	20	21
1963	1 (0.2)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
1964	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
1965	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
1966	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
1967	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
1968	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)
1969	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
1970	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
1971	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Table D4. (Cont.)

Year	Number of Return Trips Made to Sandhill By Each Hunter					
	21	22	26	38	No Response[1]	Total
1963	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	444 (100.0)
1964	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	451 (100.0)
1965	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	338 (100.0)
1966	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	603 (100.0)
1967	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	684 (100.0)
1968	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	545 (100.0)
1969	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	518 (100.0)
1970	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	441 (100.0)
1971	0 (0.0)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)	515 (100.0)
Total Number of Individual Hunters (1963 - 1971)						4,539

[1]Indicates the number of hunters who hunted at Sandhill but did not record their hunting license number and therefore were not recorded as having ever returned to the area.

Table D5. The number of waterfowl killed in relation to the gauge of the shot gun used by the hunter, from 1963 through 1969.[1] (Percentages are in parentheses)

Gun Gauge	Waterfowl Kill	Number of Hunter Trips	Average Number of Waterfowl Killed Per Hunter Trip
10	29 (1.1)	79 (1.3)	0.4
12	2,304 (85.8)	5,273 (84.3)	0.4
16	79 (2.9)	261 (4.2)	0.3
20	217 (8.1)	457 (7.3)	0.5
28	0 (0.0)	5 (0.1)	0.0
410	8 (0.3)	9 (0.1)	0.9
Other	5 (0.2)	5 (0.1)	1.0
No Response[2]	44 (1.6)	166 (2.6)	0.3
Total	2,686 (100.0)	6,255 (100.0)	0.4

[1]No information collected from 1970 through 1971.
[2]Indicates the number of waterfowl killed, the number of hunter trips, and the average number of waterfowl killed per hunter trip, for hunters who did not indicate the gauge shot gun they used.

Table D6. The number of waterfowl killed in relation to the shot size used by the hunter, from 1963 through 1969.[1] (Percentages are in parentheses)

Shot Size	Waterfowl Kill	Number of Hunter Trips	Average Number of Waterfowl Killed Per Hunter Trip
BB	20 (0.7)	57 (0.9)	0.4
2	182 (6.8)	647 (10.3)	0.3
4	1,141 (42.5)	2,865 (45.8)	0.4
5	195 (7.3)	450 (7.2)	0.4
6	491 (18.3)	1,139 (18.2)	0.4
7½	0 (0.0)	19 (0.3)	0.0
Other	4 (0.1)	12 (0.2)	0.3
Combination[2]	605 (22.5)	948 (15.2)	0.6
No Response[3]	48 (1.8)	118 (1.9)	0.4
Total	2,686 (100.0)	6,255 (100.0)	0.4

[1]No information collected from 1970 through 1971.
[2](Combination); indicates the use of more than one shot size per hunter trip.
[3]Indicates the number of waterfowl killed, the number of hunter trips, and the average number of waterfowl killed per hunter trip, for hunters who did not indicate the shot size they used.

Table D7. The response of hunters to the Hunter Characteristics Questionnaire Page 1, 1971. (Percentages are in parentheses)

Page 1 of Questionnaires A, B, and C
Questions 1-14
294 questionnaires returned

1. How old are you?

0-15	16-30	31-60[1]	61-75	No Response[2]	
14	167	102	10	1	
(4.8)	(56.8)	(34.7)	(3.4)	(0.3)	(100.0)

2. Sex?

Male	Female	No Response	
281	12	1	
(95.6)	(4.1)	(0.3)	(100.0)

3. Race?

White	Black	Amer. Indian	Other	No Response	
291	2	1	0	0	
(99.0)	(0.7)	(0.3)	(0.0)	(0.0)	(100.0)

4. Marital status?

Single	Married	Widowed	Divorced	No Response	
97	187	1	6	3	
(33.0)	(63.6)	(0.3)	(2.1)	(1.0)	(100.0)

How many children do you have?

	0	1	2	3	more than 3	No Response	
5. Boys	136	72	30	19	9	28	
	(46.2)	(24.5)	(10.2)	(6.5)	(3.1)	(9.5)	(100.0)
6. Girls	146	65	31	20	4	28	
	(49.7)	(22.1)	(10.5)	(6.8)	(1.4)	(9.5)	(100.0)

Table D7. (Cont.)

7. Do you live in Wood County?

Yes	No	No Response	
137	157	0	
(46.6)	(53.4)	(0.0)	(100.0)

8. Do you live in a county bordering on Wood County?

Yes	No	No Response	
39	253	2	
(13.3)	(86.0)	(0.7)	(100.0)

9. How far did you travel from home to hunt at Sandhill?

25 miles or less	26-50	50-100	100+	No Response	
113	49	18	113	1	
(38.5)	(16.6)	(6.1)	(38.5)	(0.3)	(100.0)

10. Are you a resident of Wisconsin?

Yes	No	No Response	
279	14	1	
(94.9)	(4.8)	(0.3)	(100.0)

11. Do you approve of the regulated system of waterfowl hunting used at Sandhill?

Disagree	No Opinion	Agree	No Response	
12	51	230	1	
(4.1)	(17.4)	(78.2)	(0.3)	(100.0)

12. Do you feel that the system of assigning hunting units at Sandhill gives everyone an equal opportunity?

Disagree	No Opinion	Agree	No Response	
20	37	236	1	
(6.8)	(12.6)	(80.3)	(0.3)	(100.0)

Table D7. (Cont.)

13. Are you in favor of the Sandhill system of hunting being initiated on other public waterfowl hunting areas in Wisconsin?

Disagree	No Opinion	Agree	No Response	
29	72	189	4	
(9.9)	(24.5)	(64.3)	(1.3)	(100.0)

14. Why do you hunt at Sandhill?[3]

Non-crowded	Good Hunting	Convenient	Thought would try it
57	57	10	50
(19.4)	(19.4)	(3.4)	(17.0)

No Opinion	No Response	
120	0	
(40.8)	(0.0)	(100.0)

[1]The age category of 31-60 is used to correct the mistake in the questionnaire for the age classes (31-54 and 46-60).
[2]Indicates the number of hunters who did not answer the question.
[3]The fill-in-the-blank answers were placed in these most commonly used categories for ease of presentation.

Table D8. The response of hunters to Hunter Characteristics Questionnaire A, 1971. (Percentages are in parentheses)

Questionnaire A
Questions 15-44
102 questionnaires returned

15. When you were born did your parents live:

In a large city	In a small city	In a village	On a farm
21 (20.6)	43 (42.2)	9 (8.8)	27 (26.5)

No Response[1]

2 (1.9) (100.0)

16. In your childhood years, from 7 to 20, did you live most of the time:

In a large city	In a small city	In a village	On a farm
15 (14.7)	42 (41.2)	11 (10.8)	28 (27.4)

No Response

6 (5.9) (100.0)

17. At the present time do you live:

In a large city	In a small city	In a village	On a farm
18 (17.6)	48 (47.1)	18 (17.6)	14 (13.8)

No Response

4 (3.9) (100.0)

18. Were you born in Wisconsin?

Yes	No	No Response	
81 (79.4)	17 (16.7)	4 (3.9)	(100.0)

Table D8. (Cont.)

From the following list select the outdoor activities that you frequently participate in.

	Yes	No	No Response	
19. Skiing	22 (21.6)	78 (76.5)	2 (1.9)	(100.0)
20. Skating	13 (12.8)	87 (85.3)	2 (1.9)	(100.0)
21. Snowshoeing	12 (11.8)	88 (86.3)	2 (1.9)	(100.0)
22. Snowmobiling	34 (33.4)	66 (64.7)	2 (1.9)	(100.0)
23. Tennis	3 (3.0)	97 (95.1)	2 (1.9)	(100.0)
24. Skeet or trap shooting	44 (43.2)	56 (54.9)	2 (1.9)	(100.0)
25. Golfing	22 (21.6)	78 (76.5)	2 (1.9)	(100.0)
26. Boating or canoeing	52 (51.0)	48 (47.1)	2 (1.9)	(100.0)
27. Swimming	46 (45.1)	54 (53.0)	2 (1.9)	(100.0)
28. Fishing	83 (81.4)	17 (16.7)	2 (1.9)	(100.0)
29. Hunting	94 (92.2)	6 (5.9)	2 (1.9)	(100.0)
30. Camping	62 (60.8)	38 (37.3)	2 (1.9)	(100.0)
31. Nature study	8 (7.9)	92 (90.2)	2 (1.9)	(100.0)
32. Bird watching	7 (6.9)	93 (91.2)	2 (1.9)	(100.0)
33. Hiking	16 (15.7)	84 (82.4)	2 (1.9)	(100.0)

Table D8. (Cont.)

34. When you go hunting, do you usually go:

Alone	With one other person	With two other persons	With several persons
11 (10.8)	45 (44.1)	17 (16.7)	17 (16.7)

No Response	
12 (11.7)	(100.0)

35. Do you take your son(s) hunting?

Yes	No	Have no sons	No Response	
28 (27.4)	12 (11.8)	59 (57.8)	3 (3.0)	(100.0)

36. Do you do the majority of your hunting on:

Private land	Your own property	State, Federal or county forest land	State public hunting areas
27 (26.5)	5 (4.9)	16 (15.7)	19 (18.6)

Private shooting preserves	No Response	
0 (0.0)	35 (34.3)	(100.0)

37. Do you feel that to have a successful hunt it is necessary to fill your legal bag limit?

Yes	No	No Response	
9 (8.8)	90 (88.2)	3 (3.0)	(100.0)

38. If you hunt in a group, do you usually hunt with:

Immediate Family	Relatives	Intimate friends	Other friends
16 (15.7)	10 (9.8)	40 (39.2)	5 (4.9)

Table D8. (Cont.)

Do not hunt in groups	No Response	
2 (1.9)	29 (28.5)	(100.0)

39. Do you hunt with the same companions from year to year?

Yes	No	No Response	
85 (83.3)	13 (12.8)	4 (3.9)	(100.0)

40. When game hunting do you ever shoot at non-game animals just for something to shoot at?

Yes	No	Sometimes	No Response	
7 (6.9)	77 (75.5)	14 (13.7)	4 (3.9)	(100.0)

41. Do you want your son(s) to grow up to enjoy hunting?

Yes	No	Have no sons	No Response	
52 (51.0)	3 (2.9)	42 (41.2)	5 (4.9)	(100.0)

42. Do you believe that a hunter should:

Have a respect for the wildlife that he hunts, considering them equally as important as himself in the scheme of nature.

88
(93.6)

Consider himself superior to and therefore master of the wildlife he hunts.

6
(6.4)

No Response

0
(0.0)

(100.0)

Table D8. (Cont.)

43. Part of the pleasure of hunting is to see beautiful sunsets, wildlife, and other wonders of nature.

Disagree	No Opinion	Agree	No Response	
2 (1.9)	7 (6.9)	89 (87.3)	4 (3.9)	(100.0)

44. I would like to continue the hunt until I kill at least one piece of game.

Disagree	No Opinion	Agree	No Response	
47 (46.1)	23 (22.6)	24 (23.5)	8 (7.8)	(100.0)

[1]Indicates the number of hunters who did not answer the question.

Table D9. The response of hunters to Hunter Characteristics Questionnaire B, 1971. (Percentages are in parentheses)

Questionnaire B
Questions 45-63
92 questionnaires returned

45. What was (or is) your father's main or major occupation?[1]

Professional	White collar	Blue collar	Laborer
4 (4.3)	9 (9.8)	14 (15.2)	26 (28.3)

Other	No Response[2]	
17 (18.5)	22 (23.9)	(100.0)

46. What is your main or major occupation?[1]

Professional	White collar	Blue collar	Laborer
5 (5.4)	12 (13.0)	19 (20.7)	30 (32.6)

Other	No Response	
9 (9.8)	17 (18.5)	(100.0)

47. Are you unemployed?

Yes	No	No Response	
24 (26.1)	58 (63.0)	10 (10.9)	(100.0)

48. What is your approximate total yearly income?

Less than $3000	$3000 - $6999	$7000 - $10999	
9 (9.8)	17 (18.5)	31 (33.7)	

$11000 - $14999	$15000 or over	No Response	
11 (12.0)	5 (5.4)	19 (20.6)	(100.0)

Table D9. (Cont.)

49. Do you own a 1970 or newer model car?

Yes	No	No Response	
21	63	8	
(22.8)	(68.5)	(8.7)	(100.0)

50. Does your family own more than one car?

Yes	No	No Response	
54	32	6	
(58.7)	(34.8)	(6.5)	(100.0)

51. Is your home:

Rented	Owned by you but mortgaged	Fully owned by you	No Response	
25	24	30	13	
(27.2)	(26.1)	(32.6)	(14.1)	(100.0)

52. Do you own a vacation cabin?

Yes	No	No Response	
10	73	9	
(10.9)	(79.3)	(9.8)	(100.0)

Have you been or are you a member of any of the following Conservation Organizations?

	Yes	No	No Response	
53. Ducks Unlimited	7	80	5	
	(7.6)	(87.0)	(5.4)	(100.0)
54. Izaak Walton League	7	80	5	
	(7.6)	(87.0)	(5.4)	(100.0)
55. Local Sportsmans Club	17	70	5	
	(18.5)	(76.1)	(5.4)	(100.0)
56. Other	8	79	5	
	(8.7)	(85.9)	(5.4)	(100.0)

Table D9. (Cont.)

57. How many shotguns do you own?

0	1	2	3	More than 3	No Response	
2	34	23	15	13	5	
(2.2)	(37.0)	(25.0)	(16.3)	(14.1)	(5.4)	(100.0)

58. Do you load your own shotgun shells?

Some	All	None	No Response	
18	6	63	5	
(19.6)	(6.5)	(68.5)	(5.4)	(100.0)

59. Do you make your own decoys?

Some	All	None	No Response	
11	0	75	6	
(12.0)	(0.0)	(81.5)	(6.5)	(100.0)

60. Do you own a hunting dog?

Yes	No	No Response	
35	52	5	
(38.0)	(56.6)	(5.4)	(100.0)

61. Are you retired?

Yes	No	No Response	
3	83	6	
(3.3)	(90.2)	(6.5)	(100.0)

62. Do you train your own dog(s) to hunt?

Yes	No	Have no dog(s)	No Response	
34	9	37	12	
(37.0)	(9.8)	(40.2)	(13.0)	(100.0)

63. When you bring game home, do you and your family eat the game?

Sometimes	Never	Always	No Response	
4	0	78	10	
(4.3)	(0.0)	(84.8)	(10.9)	(100.0)

Table D9. (Cont.)

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[1]The job categories in questions 45 and 46 cover the following occupations:

Professional:

Doctor
Elementary School Principal
Psychologist
Biologist
Lawyer
Teacher

White Collar:

Store Owner
Sales Supervisor
Contractor
Salesman
Office Worker
Service Manager
Clerical Worker
Small Businessman
Plant Manager
Store Manager
Soft Drink Bottler
Computer Operator

Blue Collar:

Carpenter
Postal Employee
Barber
Electrician
Baker
Policeman
Tool and Die Maker
Tin Smith
Security Guard
Meat Inspector
Machinist
T.V. Repairman
Printer
Railroad Telegrapher
Railroad Fireman
Railroad Brakeman

Laborer:

Truck Driver
Milk Man
City Employee
Mill Worker
Press Operator
Foundry Worker
Machine Operator
Factory Laborer
Mechanic
Stereotyper
Maintenance Man
Construction Worker
Production Control
Steel Worker
Lithographer
Meat Packer
Asbestos Worker
Custodian
Heat Treater
Service Station Attendant

Other:

Farmer
Student
Cabinet Maker
Retired
Nursery Owner
No appropriate answer

[2]Indicates the number of hunters who did not answer the questions.

Table D10. The response of hunters to Hunter Characteristics Questionnaire C, 1971. (Percentages are in parentheses)

Questionnaire C
Questions 64-80
100 questionnaires returned

64. What is the highest grade you completed in school?[1]

1-4	5-8	9-12	College	Post Grad. College
1 (1.0)	7 (7.0)	58 (58.0)	26 (26.0)	3 (3.0)

No Response[2]	
5 (5.0)	(100.0)

65. Which of the following was the last educational institution you graduated from?

Grade School	High School	Junior College	College
28 (28.0)	54 (54.0)	1 (1.0)	11 (11.0)

Post Grad. College	No Response	
3 (3.0)	3 (3.0)	(100.0)

66. Did you attend a vocational or trade school?

Yes	No	No Response	
31 (31.0)	64 (64.0)	5 (5.0)	(100.0)

Do you purchase, subscribe to, or read any of the following outdoor magazines?

	Yes	No	No Response	
67. Field and Stream	51 (51.0)	47 (47.0)	2 (2.0)	(100.0)
68. Outdoor Life	58 (58.0)	40 (40.0)	2 (2.0)	(100.0)
69. Sports Afield	40 (40.0)	58 (58.0)	2 (2.0)	(100.0)

Table D10. (Cont.)

	Yes	No	No Response	
70. Wisconsin Conservation Bulletin	36 (36.0)	62 (62.0)	2 (2.0)	(100.0)
71. Other	19 (19.0)	79 (79.0)	2 (2.0)	(100.0)

72. Have you ever read a book on wildlife management written by a professional wildlife expert?

Yes	No	No Response	
44 (44.0)	53 (53.0)	3 (3.0)	(100.0)

73. How many years have you been duck hunting?

1st year	1-5	6-10	11-15	16+
9 (9.0)	44 (44.0)	11 (11.0)	10 (10.0)	21 (21.0)

No Response	
5 (5.0)	(100.0)

74. Do you feel that the regulated system of hunting at Sandhill provides good quality hunting?

Disagree	No Opinion	Agree	No Response	
6 (6.0)	19 (19.0)	73 (73.0)	2 (2.0)	(100.0)

75. Scientific studies should form the basis for all game management programs.

Disagree	No Opinion	Agree	No Response	
12 (12.0)	22 (22.0)	63 (63.0)	3 (3.0)	(100.0)

Table D10. (Cont.)

76. The present U.S. Fish and Wildlife Service policy of selective shooting for hunting waterfowl, (requiring the hunter to identify the species of duck before shooting), works to the benefit of the hunter and our waterfowl populations.

Disagree	No Opinion	Agree	No Response	
16	19	63	2	
(16.0)	(19.0)	(63.0)	(2.0)	(100.0)

77. Do you feel that the goose hunting offered along the border of the Necedah National Wildlife Refuge is good quality hunting?

Disagree	No Opinion	Agree	No Response	
35	36	27	2	
(35.0)	(36.0)	(27.0)	(2.0)	(100.0)

78. How many years have you been hunting waterfowl at Sandhill?

1st Year	1-2	3-4	5-6	6-9
50	12	24	5	5
(50.0)	(12.0)	(24.0)	(5.0)	(5.0)

No Response	
4	
(4.0)	(100.0)

79. Do you read the hunting regulations before going hunting?

Yes	No	Sometimes	No Response	
89	4	5	2	
(89.0)	(4.0)	(5.0)	(2.0)	(100.0)

80. A new policy for the regulation of waterfowl hunting, making all species of waterfowl equally legal within the bag limit; but, lowering the daily bag limit, would be of more benefit to the hunter and to our wildlife populations than the present system.

(e.g. A bag limit not to exceed 3 ducks per day, which can be made up of any combination of waterfowl species, or 3 ducks of the same species (all species included - mallard, wood duck, canvasback, etc.)

Disagree	No Opinion	Agree	No Response	
32	19	42	7	
(32.0)	(19.0)	(42.0)	(7.0)	(100.0)

Table D10. (Cont.)

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[1]The fill-in-the-blank answers were placed in the most convenient categories for ease of presentation.
[2]Indicates the number of hunters who did not answer the questions.