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Pheasant Use and Waterfowl Production on State and Private Lands

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PHEASANT USE AND WATERFOWL PRODUCTION ON STATE AND PRIVATE LANDS

by

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ON STATE AND PRIVATE LANDS

This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable as meeting the thesis requirements for this degree, but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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PHEASANT USE AND WATERFOWL PRODUCTION ON STATE AND PRIVATE LANDS

Abstract

CHARLES R. ELLIOTT

Ring-necked pheasant (Phasianus colchicus) use on state-owned game production areas was compared to that on privately-owned areas in east-central South Dakota. Four 80-acre and four 160-acre tracts of state lands were paired with private areas of the same size having the same amount of wetland and were selected from aerial photographs taken before the purchase of the state-owned areas.

None of four nests were successful on private areas in 1968 and three of five nests were successful on game production areas. In 1969, three of 19 nests were successful on private areas and 10 of 21 nests were successful on state lands. During the two years 21 pheasant chicks were produced on private areas and 110 were produced on state areas. Eight of 37 duck nests were successful on private areas and produced 66 ducklings, and 18 of 48 duck nests were successful on state areas and produced 151 ducklings in 1969.

The difference between pheasant nesting success on state and private areas was significant ($P < .05$), but no

significant difference was found in numbers of duck nests. A highly significant difference ($P < .01$) was noted between private and state areas in numbers of pheasant chicks and ducklings produced based on eggs hatched and unhatched.

Restricted random transects were used to make brood counts. During the two years 30 pheasants were flushed on private and 105 on state areas.

On opening weekend of pheasant hunting season in 1968, 36 hunters spent 5 hours bagging four pheasants (0.14 birds/man hour) on private areas. On state areas 280 hunters spent 59 hours bagging 118 birds (0.41 birds/man hour). In 1969, four hunters spent 2 hours and bagged no pheasants on private areas. On state areas 109 hunters spent 32 hours bagging 23 birds (0.21 birds/man hour).

Aerial counts on January 25, 1969, showed 25 pheasants (3/100 acres) on private areas and 768 pheasants (80/100 acres) on state areas. On March 5, there were 54 pheasants (6/100 acres) on private areas and 747 pheasants (78/100 acres) on state lands.

Twelve crowing cocks were heard on private areas and 22 on state areas between April 16 and May 9, 1969.

INTRODUCTION

Habitat is largely responsible for the abundance of animals in a given area and the changing habitat for the pheasant in South Dakota has been cause for concern (Dahlgren 1967). Through the past years the South Dakota Department of Game, Fish and Parks has acquired individual tracts of land totaling 117,829 acres for game management purposes (Anonymous 1969). These areas provide food, water and undisturbed cover at a time when intensified agriculture has resulted in less favorable habitat on private lands for wildlife. It is believed that state areas will become increasingly more important in the future.

This study was to determine pheasant use and waterfowl production on state areas and comparable private lands.

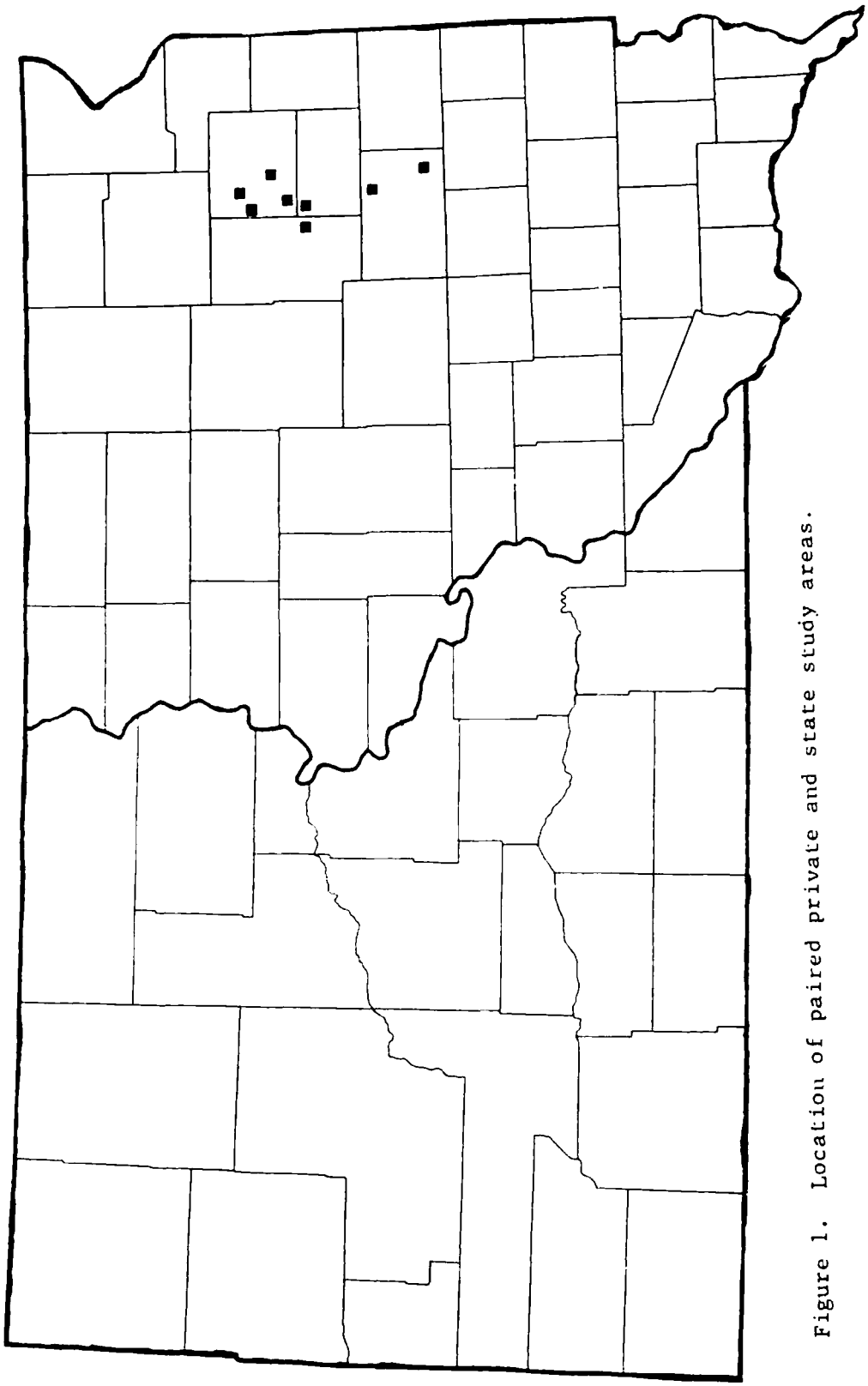

Figure 1. Location of paired private and state study areas.

DESCRIPTION OF STUDY AREAS

Eight state game production areas (public shooting areas) and eight privately-owned tracts of land in prime pheasant range were chosen for study (Figure 1). The areas were small (eight 80 acres; eight 160 acres) so that an adequate sampling intensity could be maintained, yet large enough to gather sufficient data for analysis. All areas were associated with a wetland surrounded by upland in pasture, trees, crops or other cover types (Table 1). Wetlands on private areas averaged 14 acres less than those on state areas when aerially photographed in 1953 and 1955. Wetland acreage on private areas was 441 acres and 553 acres on state areas.

Total acres of wetlands were less on private areas than state areas because of (1) an insufficient number of private wetlands in the same vicinity, (2) permission could not be received from some landowners owning larger wetlands, and (3) upland around several wetlands was of insufficient size.

State area wetlands totaled 551 and 555 acres in 1968 and 1969, respectively, but private areas fluctuated from 383 total wetland acres in 1968 under dry conditions to 419 in 1969, a wet year. No burning or draining took place, but grazing and close farming resulted in a decrease in the number of acres of wetland habitat on private areas since 1953.

Figure 2. Aerial photographs of one state area and its paired private area.

Table 1. Land use on study areas, 1968-69.

Cover Type	Private				State			
	1968		1969		1968		1969	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Wetlands	383.3	40.0	418.9	43.7	550.8	57.3	555.5	57.9
Upland	31.6	3.3	16.6	1.7	142.8	14.8	149.1	15.5
Trees	8.7	0.9	8.7	0.9	6.0	0.6	6.0	0.6
Oats	14.7	1.5	10.6	1.1	30.3	3.2	36.0	3.8
Wheat	8.8	0.9	1.8	0.2	12.0	1.3	3.0	0.3
Pasture (grazed)	87.8	9.2	67.3	7.0	--	--	--	--
Pasture (ungrazed)	15.7	1.6	10.4	1.0	--	--	--	--
Flax	168.9	17.6	179.6	18.8	--	--	5.4	0.6
Rye	7.0	0.7	7.0	0.7	--	--	--	--
Idle Acres	--	--	19.0	2.0	--	--	--	--
Farmyard	5.8	0.6	5.8	0.6	--	--	--	--
Summer Fallow	86.5	9.0	151.8	15.8	--	--	--	--
Sweet Clover	--	--	--	--	28.9	3.0	27.0	2.8
Oats and Sweet Clover	--	--	--	--	42.0	4.4	31.8	3.3
Alfalfa and Brome	--	--	--	--	--	--	3.3	0.3
Barley and Sweet Clover	--	--	--	--	--	--	11.2	1.2
Corn	91.7	9.6	--	--	100.6	10.5	67.6	7.0
Sorghum	--	--	--	--	--	--	9.0	0.9
Millet	--	--	--	--	15.0	1.6	30.5	3.2
Soilbank	4.6	0.4	--	--	--	--	--	--
Barley	6.6	0.7	--	--	7.0	0.7	--	--
Alfalfa	38.3	4.0	62.5	6.5	24.6	2.6	24.6	2.6
TOTALS	960.0	100.0	960.0	100.0	960.0	100.0	960.0	100.0

Private areas were more intensively farmed (Table 1) and had a considerable portion of land in summer fallow because low areas adjacent to wetlands were difficult to farm.

Farming was practiced on all state study areas by private landowners on contract with the Department of Game, Fish and Parks. The Department received one-third of the crop which was either harvested or left as winter food depending upon the requirements of each area. Usually part or all of the corn and/or millet were left on the areas for wildlife use. Oats, wheat, flax, and barley were normally sold as cash crops.

Climate is continentally characterized by large seasonal and daily temperature fluctuations. Average annual precipitation is 20 - 22 inches falling mainly between April and September (Anonymous 1962).

Study areas were in the Poinsett-Parnell-Buse-Sinai soil association (Westin et al. 1967). These soils are deep, medium to moderately-fine textured that are well or poorly drained, developed in silty or loamy glacial drift (Ollila et al. 1966). Land use was based on a general livestock and corn-grain economy.

METHODS

State areas were representative of the majority of game production areas and were chosen because of similar ecological properties so that they could be grouped in four pairs. The public areas were paired to permit future studies of the effects of land management practices on pheasant populations.

Privately-owned areas were selected from the U. S. Soil Conservation Service aerial photographs taken before the purchase of the state-owned areas. A private and state area was considered a pair when each had equal amounts of wetlands at the time of the aerial photograph. An amount of upland in the same direction from the wetland as on the state-owned area was chosen for the private area from the aerial photograph to balance the areas in size (Figure 2). Private areas were an average distance of six miles from their matched state area so that any weather change on one area would likely be experienced on the other area.

Boundaries for the private areas were determined from the aerial photograph before the area was visited to prevent bias. Permission was received from private landowners to conduct the study on their land.

To estimate production, random transects were used to cover five percent of all nesting cover types in 1968.

Figure 3. Nest searching between windrows in a harvested wheat field, 1969.

Figure 4. Determining fate of a pheasant nest on a private study area, 1969.

Nest searching did not begin until July 24, 1968, due to the length of time required for the selection of study areas, and nest searching of the first cutting of alfalfa was not possible. Road ditches and fence rows were not searched either year of study. As large a sample as possible was taken through all nesting cover types in 1969. Nest searching began on June 5 with the first cutting of alfalfa and continued until September 2, 1969. Because of the wet spring most slough fringes were under water during the nesting season and were not searched. In fields of small grain or alfalfa, where the crop was windrowed, the areas between windrows were searched (Figure 3). These areas amounted to approximately 86 percent of the entire field. A complete search of permanent cover types such as diverted or idle acres was attempted. Hockey sticks were used to separate dense vegetative cover in fields of alfalfa-brome or sweet clover. The width of transect searched was dependent on density of the vegetation. A 25 percent random sample was used when the entire field was not searched. When a pheasant or duck nest was discovered, fate of the nest and total number of eggs were determined (Figure 4). Two or more eggs constituted a nest (Klonglan 1954). Chi-square tests were used to determine significance in nesting and young produced between private and state areas.

Figure 5. Pheasant concentrations on a state study area, March 5, 1969.

Figure 6. Pheasant concentrations on a state study area, March 5, 1969.

Brood counts were made in 1968 and 1969 by walking restricted random transects. Restrictions required that no transect be closer than 40 yards to the nearest transect. Transects totaling three miles were walked on each 80-acre area, and transects of six miles were walked on each 160-acre area. One state area and its paired private area were walked simultaneously to minimize a weather bias. When broods flushed, observers counted the birds but made no attempt to flush additional birds.

Questionnaires were placed on the windshields of hunter's vehicles to estimate hunting pressure and success on opening weekends in 1968 and 1969. Questionnaires required five answers: (1) number of hunters in party, (2) number of hours spent on area, (3) number of pheasants bagged, (4) number of cripples lost and (5) number of pheasants seen. A map was attached to each questionnaire so hunters would confine information to hunting done on that particular study area. Instructions were to leave the completed questionnaire at a stake that was placed next to his vehicle.

Two aerial counts were made over all study areas to determine pheasant use during winter. A Cessna 150 aircraft was used to fly over each area as many times as required to count all pheasants on the area. Photographs (Figures 5 and 6) were taken of pheasant concentrations

Figure 7. Fall cover on Curley game production area, 1968.

Figure 8. Winter cover on Curley game production area, 1969.

numbering more than 25 in order that more complete counts could be made later by examination of the photographic prints and 35 mm slides.

Crowing cocks were counted twice on each study area between April 16, 1969, and May 9, 1969. Counting periods were from 30 minutes before to one hour after sunrise (Robertson 1958). Two private and two state areas were selected each counting morning to minimize bias. Positions of crowing cocks were determined on each area by triangulation.

RESULTS AND DISCUSSION

Pheasant Nesting 1968 and 1969

The four nests found on private areas in 1968 were unsuccessful. On state areas three of five nests were successful and produced 21 pheasant chicks. These nesting data were not statistically analyzed because of small numbers.

Three of 19 pheasant nests were successful on private areas and produced 21 chicks (Table 2) in 1969. Thirteen of these nests were in alfalfa and 12 were destroyed by mowing operations. Two of the three alfalfa fields that accounted for all pheasant nests found in private alfalfa fields were mowed June 18 and June 24. These were late mowing dates as at least 50 percent of state-wide alfalfa fields were mowed before June 14 (personal communication, Dwayne Breyer), however, 92.3 percent of the pheasant nests in these late mowed fields were destroyed. Cover mowed as early as July 15 would be of little value to those hens disturbed from the first cutting of alfalfa since renesting interval, egg laying, and incubation would result in a hatching date after July 15.

Ten of 21 pheasant nests were successful on state areas and produced 89 chicks (Table 2). Most of the nests were in upland and alfalfa which was not disturbed and

nesting success was high (Appendix I). On state areas, 3.3 times more nests were successful and 4.2 times more chicks were produced. Unmowed alfalfa comprised only 8.3 percent of the total nesting cover yet produced 52.8 percent of all pheasant chicks on state areas. Small grain comprised 25.6 percent of the total nesting cover in 1969 but produced no pheasant chicks.

Three pheasant and three duck nests were found before June 5 in residual sweet clover before systematic nest searching began; however, late spring plowing destroyed all of them. Apparently this cover type was used extensively be early nesting birds.

Table 2. Pheasant nests and young produced on study areas, 1969.

	Nests			Eggs		
	Total	Succ.	Unsucc.	Total	Not Hatched	Young Produced
Private Areas	19	3	16	133	112	21
State Areas	21	10*	11	187	98	89**

*significant ($P < .05$) $X^2 = 4.62$ at 1 d.f.

**highly significant ($P < .01$) $X^2 = 35.9$ at 1 d.f.

Chi-square analysis showed a significant difference ($P < .05$) in numbers of pheasant nests between state and private areas (Table 2). A highly significant difference ($P < .01$) was found between state and private areas in the number of pheasant chicks produced.

Hen mortality was higher on private areas. Eight dead hens were found on private areas compared to three on state areas. All dead hens on private areas were associated with nests in alfalfa while on state areas none of the dead hens was near a nest and cause of death was unknown.

The 47.6 percent pheasant nesting success on state areas was higher than reported by other workers. Shick (1952) in Michigan found a nesting success of 21.9 percent; Hamerstrom (1936) reported 23 percent in Iowa; Randall (1940) in Pennsylvania found 25.4 percent; and Trautman (1960) in South Dakota found 20.0 and 24.3 percent in 1958 and 1959, respectively. The 15.8 percent nesting success on private areas was more consistent with findings by Nelson (1950) in South Dakota of 12 percent success and Klonglan (1954) in Iowa of 17.3 percent success.

Duck Nesting 1969

Many different species of ducks were observed on study areas, but blue-winged teal (Anas discors) were probably the most common nesters. No attempt was made to identify duck nests as to species.

Eight of 37 duck nests were successful on private areas and produced 66 ducklings (Table 3). Seven of the eight successful nests were produced on one area in two flax fields planted very early. The early planting and late harvesting no doubt influenced the success of these nests.

Eighteen of 48 duck nests were successful on state areas and produced 151 ducklings (Table 3). On state areas, 2.3 times more nests were successful and 2.3 times more ducklings were produced.

Table 3. Duck nests and young produced on study areas, 1969.

	Nests			Eggs		
	Total	Succ.	Unsucc.	Total	Not Hatched	Young Produced
Private Areas	37	8	29	307	241	66
State Areas	48	18	30	403	252	151**

**highly significant ($P < .01$) $X^2 = 19.8$ at 1 d.f.

The 37.5 percent nesting success on state areas is comparable with four studies in Minnesota where nest success was 31, 31, 35, and 42 percent (Moyle 1964). However, Kalmbach (1939) stated a figure of 70 percent as a satisfactory management goal for any given area. The 21.6 percent nesting success on private areas appears low, but considerably higher than the 11.2 percent found in a 4-year study in Nebraska by Evans and Wolfe (1962).

Chi-square analysis showed no significant differences in duck nesting between state and private areas although there was a highly significant difference ($P < .01$) in number of ducklings produced. Almost 24 percent of all ducklings produced on state areas came from one 24.6-acre alfalfa field.

Six hen ducks were killed by mowers on private areas. Two dead hens were found on state areas and cause of death was unknown.

Pheasant Brood Counts 1968-69

In 1968, 25 birds were flushed on private areas and 75 birds were flushed on state areas. In 1969, five were flushed on private areas and 30 on state areas. Over 42 percent of the pheasants were found in corn fields (Table 4). During the two years 3.5 times more pheasants were flushed on state areas.

Table 4. Number of birds flushed in cover types on study areas, fall 1968-69.

Cover Type	Private			State		
	1968	1969	Combined	1968	1969	Combined
Corn	11	--	11	34	12	46
Slough Fringe	13	4	17	--	3	3
Flax Stubble	1	--	1	--	--	--
Upland	--	--	--	8	15	23
Oats Stubble	--	1	1	--	--	--
Wheat Stubble	--	--	--	1	--	1
Alfalfa	--	--	--	4	--	4
Oats and Sweet Clover	--	--	--	14	--	14
Sweet Clover	--	--	--	14	--	14
Totals	25	5	30	75	30	105

Pheasant Hunting Pressure and Success 1968-69

Of 77 questionnaires given to hunters in 1968, 63 were returned with usable data (83.1 percent). Of 49 questionnaires handed out in 1969, 34 were returned with usable data (69.4 percent).

State areas received 12.1 times more hunting pressure than private areas, and hunters bagged 3 times more birds per hour and harvested 34.8 times as many birds (Table 5). The 2-year averages were 1.7 gun hours/100 acres on private areas and 20.5 gun hours/100 acres on state areas. The 2-year average yield was 0.21 birds/100 acres on private areas and 7.3 birds/100 acres on state areas. In Michigan, Shick (1952) reported 15.1 birds/100 acres for 167 gun hours/100 acres, and Allen (1947) reported a seven year average harvest of 9.5 birds/100 acres for 160 gun hours/100 acres, however, both studies continued for Michigan's 22-day season.

In this study hunting pressure and success were measured only for opening weekends of 1968 and 1969, and represent a 2-year average for the first 2 days of the season. Hunting pressure continued on state areas throughout the season, but no evaluation was made after opening weekend. The drop in hunting pressure and success in 1969 (Table 5) may be explained in part by the abundance of cover that year. Few corn fields were harvested in the state and there was no cold weather to concentrate the birds.

Table 5. Hunting pressure and success on study areas opening weekends, 1968-69.

	Private			State		
	1968	1969	Combined	1968	1969	Combined
Gun Hours/ 100 Acres	3.0	0.4	1.7	30.0	11.0	20.5
Birds/100 Acres	0.52	0.0	0.21	12.3	2.4	7.3
Birds/Man Hours	0.14	0.0	0.12	0.41	0.21	0.36
Gun Hours/Bird	7.10	0.0	8.10	2.42	4.67	2.79

Some hunting parties complained of few birds on state areas, not realizing several hunting parties had hunted the area the same day. Heavy hunting pressure was the main reason birds/man hour on state areas was not higher and substantiates the unreliability of hunter success as an index of pheasant numbers when figures are based on heavily hunted areas (Allen 1947).

Pheasant Winter Counts 1969

Aerial counts were made over each study area on January 25 and March 5. Conditions were excellent with winds over 20 miles per hour, temperatures under 10 F and skies were cloudy. There were 79 birds on private areas and 1515 birds on state areas (Table 6 and Appendix G). State areas wintered more birds and probably drew birds from surrounding areas because of availability of winter protection and a food source. Counts from photographic prints

and slides gave improved accuracy over ocular estimates. Visual estimates from the aircraft resulted in counts 15 percent less than counts from photographs. Counts of pheasants on a projected slide were most accurate.

Table 6. Aerial counts on study areas, January and March 1969.

Date	Private	State
January 25	25	767
March 5	54	748
Totals	79	1515

Sloughs and weed patches normally provide excellent cover (Figure 7), but because of heavy amounts of snow in 1968-69 this cover was inadequate and volunteer willow and shelterbelts were the main source of protection (Figure 8). During aerial flights two game production areas (Tenneboe and Eidsness) had food present but few birds were observed wintering on these areas because of no winter cover.

Pheasant Crowing Counts 1969

Crowing counts indicated a greater number of breeding birds on state areas than on private lands. Twelve birds were heard on private areas and 22 on state areas. Variability in number of crowing cocks was observed on the study areas between the first and second counts (Appendix H).

CONCLUSIONS AND RECOMMENDATIONS

Throughout this study state areas had higher year-around pheasant use and higher duck production than private areas. There was a significant difference ($P < .05$) in pheasant nesting between state and private areas, but no significant difference in numbers of duck nests. More importantly, there was a highly significant difference ($P < .01$) in numbers of pheasant chicks and ducklings produced. Undisturbed nesting cover was probably the most important reason for pheasant and duck nesting success on state areas. State areas also had a greater amount of brood use in the fall and more crowing cocks in the spring.

More hunters spent more time and bagged more pheasants with higher success on the state areas than on the private areas. During aerial flights in January and March 1969, most state areas showed extensive winter pheasant concentrations due to the presence of winter cover and a food supply.

Small grain fields are important to pheasant nesting success in South Dakota (Trautman 1960). However, on state areas alfalfa produced proportionately more pheasants and ducks than any other nesting cover type. A good huntable pheasant population is dependent upon young of the year birds. Provision of the best nesting habitat should be

emphasized on game production areas to obtain maximum production. It is recommended that a larger percentage of small grains be sacrificed for permanent cover types, especially alfalfa, and mowing be delayed until August 1.

Winter habitat is needed on some of the state study areas. Corn left on some state areas was not utilized by pheasants because there was no protective vegetation above the snow. Additional winter cover should be encouraged.

Sweet clover fields offer good winter cover and excellent residual nesting cover. Three pheasant and three duck nests were destroyed because of late plowing in these fields and it is believed additional nests were also destroyed since no systematic search was made. When plowing is done in sweet clover, it should be done as soon as possible in the spring to avoid nest destruction. By late plowing landowners may have one less operation, but these are game production areas and should be operated to produce a maximum crop of game.

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APPENDIX

Appendix Table A. Location of private and state study areas.

Area	Private	State
Tenneboe	N½,NW¼, Sec 27; T110N, R53W	S½,NE¼, Sec 33; T110N, R53W
Arnold	N½,NW¼, Sec 22; T112N; R55W	S½,SW¼, Sec 9; T112N; R54W
Dybvig	SW¼,SE¼, Sec 27; T116N; R55W and NW¼,NE¼, Sec 34; T116N; R55W	N½,NE¼, Sec 12; T115N; R56W
Curley	SW¼,SE¼, Sec 19; T116N; R55W and NW¼,NE¼, Sec 30; T116N; R55W	E½,NW¼, Sec 12; T116N; R55W
Christopherson	SE¼, Sec 16; T116N; R55W	SE¼, Sec 34; T117N; R54W
Nichols	SE¼, Sec 28; T116N; R55W	NW¼, Sec 33; T118N; R55W
Scott	E½,E½, Sec 29; T116N; R55W	W½,W½, Sec 6; T117N; R55W
Eidsness	S½,S½, Sec 12; T116N; R55W	S½,N½, Sec 6; T115N; R55W

Appendix Table B. Pheasant nests and young produced on study areas, 1969.

Study Areas	Acres	PRIVATE NESTS Total	Successful	Unsuccessful	Chicks Produced
Tenneboe	80	0	0	0	0
Arnold	80	0	0	0	0
Dybvig	80	7	1	6	8
Curley	80	6	0	6	0
Christopherson	160	0	0	0	0
Nichols	160	2	0	2	0
Scott	160	4	2	2	13
Eidsness	160	0	0	0	0
Totals	960	19	3	16	21

Study Areas	Acres	STATE NESTS Total	Successful	Unsuccessful	Chicks Produced
Tenneboe	80	0	0	0	0
Arnold	80	0	0	0	0
Dybvig	80	1	0	1	0
Curley	80	0	0	0	0
Christopherson	160	6	5	1	45
Nichols	160	3	1	2	11
Scott	160	2	1	1	6
Eidsness	160	9	3	6	27
Totals	960	21	10	11	89

Appendix Table C. Duck nests and young produced on study areas, 1969.

PRIVATE

Study Areas	Acres	NESTS			Chicks Produced
		Total	Successful	Unsuccessful	
Tenneboe	80	1	0	1	0
Arnold	80	5	0	5	0
Dybvig	80	7	0	7	0
Curley	80	13	1	12	7
Christopherson	160	1	0	1	0
Nichols	160	1	0	1	0
Scott	160	9	7	2	59
Eidsness	160	0	0	0	0
Totals	960	37	8	29	66

STATE

Study Areas	Acres	NESTS			Chicks Produced
		Total	Successful	Unsuccessful	
Tenneboe	80	8	1	7	10
Arnold	80	0	0	0	0
Dybvig	80	0	0	0	0
Curley	80	2	1	1	7
Christopherson	160	10	5	5	42
Nichols	160	10	5	5	42
Scott	160	4	1	3	8
Eidsness	160	14	5	9	42
Totals	960	48	18	30	151

Appendix Table D. Hunting pressure and success on study areas opening weekend, October 19 and 20, 1968.

PRIVATE

Study Areas	Total Hunters	Man Hours	Pheasants Bagged	Cripples Lost	Pheasants Seen
Tenneboe	0	0	0	0	0
Arnold	8	9.25	1	0	30
Dybvig	0	0	0	0	0
Curley	2	1	0	0	3
Christopherson	2	1	0	0	1
Nichols	1	1	2	0	12
Scott	0	0	0	0	0
Eidsness	23	16.00	1	0	5
Totals	36	28.25	4	0	51

STATE

Study Areas	Total Hunters	Man Hours	Pheasants Bagged	Cripples Lost	Pheasants Seen
Tenneboe	2	2	0	0	6
Arnold	9	22	14	2	55
Dybvig	26	26	6	1	27
Curley	20	18	9	1	131
Christopherson	47	52.25	14	11	154
Nichols	13	32.75	8	6	120
Scott	66	41.25	8	2	139
Eidsness	97	91.50	59	8	434
Totals	280	285.75	118	31	1066

Appendix Table E. Hunting pressure and success on study areas opening weekend, October 18 and 19, 1969.

PRIVATE

Study Areas	Total Hunters	Man Hours	Pheasants Bagged	Cripples Lost	Pheasants Seen
Tenneboe	0	0	0	0	0
Arnold	2	2	0	0	5
Dybvig	0	0	0	0	0
Curley	2	2	0	0	3
Christopherson	0	0	0	0	0
Nichols	0	0	0	0	0
Scott	0	0	0	0	0
Eidsness	0	0	0	0	0
Totals	4	4	0	0	8

STATE

Study Areas	Total Hunters	Man Hours	Pheasants Bagged	Cripples Lost	Pheasants Seen
Tenneboe	2	2	0	0	3
Arnold	8	4	0	0	1
Dybvig	29	29.75	10	4	35
Curley	6	7	1	0	3
Christopherson	7	5.75	2	0	6
Nichols	8	12.5	1	1	11
Scott	16	11.0	5	3	66
Eidsness	33	35.5	4	0	33
Totals	109	107.5	23	8	185

Appendix Table F. Number of birds flushed during brood counts, September 1968-69.

Study Areas	Private		State	
	1968	1969	1968	1969
Tenneboe	0	0	0	0
Arnold	0	3	0	0
Dybvig	0	1	14	10
Curley	7	0	7	0
Christopherson	12	0	6	3
Nichols	5	0	5	8
Scott	1	0	10	4
Eidsness	0	1	33	5
Totals	25	5	75	30

Appendix Table G. Number of birds counted on study areas, January and March 1969.

Study Areas	Private		State	
	January 25	March 5	January 25	March 5
Tenneboe	0	0	0	0
Arnold	15	50	78	31
Dybvig	0	4	250	547
Curley	1	0	0	31
Christopherson	5	0	110	63
Nichols	0	0	301	50
Scott	0	0	24	25
Eidsness	4	0	5	0
Totals	25	54	768	747

Appendix Table H. Crowing cocks on study areas, April and May 1969.

Study Areas	Private		State	
	1st Count	2nd Count	1st Count	2nd Count
Tenneboe	0	0	0	1
Arnold	1	1	1	1
Dybvig	1	2	0	1
Curley	0	1	0	1
Christopherson	0	0	0	1
Nichols	1	3	2	3
Scott	0	0	4	2
Eidsness	1	1	1	2
Totals	4	3	11	11
Grand total	12		22	

Appendix Table I. Comparison of pheasant nesting in cover types on private and state areas, 1969.

Cover Type	Total Acres	Percent Searched	Nests Total	Nests Succ.	Nests Unsucc.	Percent Total	Percent Succ.	Produced
PRIVATE								
Alfalfa	62.5	86	13	1	12	68	7.7	8
Upland	16.6	100						
Oats	10.6	86						
Wheat	1.8	86						
Trees	8.7	25						
Pasture (grazed)	67.3	100	2	0	2	11		
Flax	179.6	86	2	1	1	11	50.0	6
Rye	7.0	86						
Idle Acres	19.0	86						
Barnyard	1.8	70	1	0	1	5		
Pasture (ungrazed)	14.4	100	1	1	0	5	100.0	7
TOTALS & AVERAGES	389.3		19	3	16	100.0	15.8	21
STATE								
Upland	116.1	100	10	3	7	47.6	30.0	27
Upland (partial sample)	33.0	25	2	1	1	9.5	50.0	7
Sweet Clover	27.0	100	1	1	0	4.8	100.0	8
Flax	5.4	86						
Oats and Sweet Clover	31.8	86	1	0	1	4.8		
Alfalfa and Brome	3.3	100	1	0	1	4.8		
Trees	6.0	25						
Oats	36.0	86						
Alfalfa	24.6	100	6	5	1	28.5	83.3	47
Wheat	3.0	86						
Barley and Sweet Clover	11.2	0*						
TOTALS & AVERAGES	297.4		21	10	11	100.0	47.6	89

*Not harvested

Appendix Table J. Comparison of duck nesting in cover types on private and state areas, 1969.

Cover Type	Total Acres	Percent Searched	Nests Total	Nests Succ.	Nests Unsucc.	Percent Total	Percent Succ.	Young Produced
PRIVATE								
Alfalfa	62.5	86	22	1	21	59.5	4.6	7
Upland	16.6	100	4	0	4	10.8		
Oats	10.6	86						
Wheat	1.8	86						
Trees	8.7	25						
Pasture (grazed)	67.3	100	1	0	1	2.7		
Flax	179.6	86	9	7	2	24.3	77.8	59
Rye	7.0	86						
Idle Acres	19.0	86						
Barnyard	1.8	70	1	0	1	2.7		
Pasture (ungrazed)	14.4	100						
TOTALS & AVERAGES	389.3		37	8	29	100.0	21.6	66
STATE								
Upland	116.1	100	25	8	17	52.1	32.0	66
Upland (partial sample)	33.0	25	4	1	3	8.3	25.0	8
Sweet Clover	27.0	100	8	3	5	16.7	37.5	25
Flax	5.4	86						
Oats and Sweet Clover	31.8	86	3	2	1	6.2	66.7	16
Alfalfa and Brome	3.3	100						
Trees	6.0	25						
Oats	36.6	86						
Alfalfa	24.6	100	8	4	4	16.7	50.0	36
Wheat	3.0	86						
Barley and Sweet Clover	11.2	0*						
TOTALS & AVERAGES	297.4		48	18	30	100.0	37.5	151

*Not harvested