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Wildlife Utilization of Stock Ponds in Minnehaha County, South Dakota

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WILDLIFE UTILIZATION OF STOCK PONDS IN MINNEHAHA COUNTY, SOUTH DAKOTA

BY

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This thesis is approved as a creditable, independent investigation by a candidate for the degree, Master of Science, and 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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CHAPTER I

INTRODUCTION

Drainage and Wetlands

Man's agricultural activities in South Dakota have greatly altered environmental conditions for nearly all forms of wildlife. Draining and ditching in eastern South Dakota have decreased the acreage of wetlands available to waterfowl and furbearers. Results of conservation practices carried out under the Agricultural Conservation Program as reported by the U. S. Department of Agriculture (1) show that between 1936 and 1957 South Dakota farmers had drained 760,198 acres.

Drainage of wetland areas changed once valuable wildlife habitat into drylands which are of little value to waterfowl and furbearers. Waterfowl breeding grounds have been so greatly reduced that few natural breeding grounds remain in southeastern South Dakota.

The U. S. Department of Interior (19) conducted a wetlands inventory in 1953 and estimated that there were approximately 752,000 acres of wetlands remaining in South Dakota. This excluded the Black Hills, all stock ponds, and reservoirs. About 90 per cent of the wetland area, or 680,000 acres, occurs east of the Missouri River where three per cent (approximately 19 acres for every square mile) of the land is wet. West of the Missouri River only 0.3 per cent, or less than two acres per square mile, is wetland.

Stock ponds were first constructed under Federal assistance

in 1936. From 1936 to 1957, the U. S. Department of Agriculture (1) reported that 97,434 ponds had been built in South Dakota with most of them being in western South Dakota. Otterby (13) estimated that there were over 300 in Minnehaha County in 1958 while the U. S. Department of Interior (19) estimated in 1953 that 5,223 acres of wetlands of all types existed in this county.

Stock ponds are important water areas in western South Dakota because of the few natural water bodies in that portion of the state. During the seasons of scant precipitation, many of the natural wetlands dry up leaving some stock ponds as the only permanent water areas in portions of western South Dakota.

Reasons for Undertaking the Study

This study was initiated to determine what particular type of man-made stock pond is the most attractive to waterfowl and to determine if ponds will help substitute for drained wetlands. It was also designed to determine how much the ponds were utilized by wildlife other than waterfowl.

Methods

Six ponds in Minnehaha County (eastern South Dakota) were selected on the basis of size, shape, and distance from other water areas as these factors appear to be important in the degree of waterfowl utilization of the ponds.

The ponds are designated by numbers ranging from one to six. The

study period was divided into two portions; one period began June 2, 1958, and was concluded on November 13, 1958. During this period two stock ponds went dry, pond number 6 on October 11 and pond number 4 on October 23. The second study period began on March 22, 1959, and was concluded on April 30, 1959.

Direct observations with binoculars were made of each pond from a blind set up on a vantage point from which a clear view could be had of the water and shoreline area. Observations lasting from a half hour to one hour were made in the early morning and early evening. If weather conditions permitted, morning and evening observations of this type were made on each pond once each week. Spot checks of all ponds, lasting only a few minutes, were made at all times of the day. A total of 442 observations was made of all the combined stock ponds.

At the conclusion of each observation, a check was made for tracks in the moist areas around the pond. After the tracks were recorded, a two-foot wide lane perpendicular to the water's edge was raked so as to get an accurate count of mammal tracks at each pond.

In June a search was made for waterfowl nests in the area around each pond.

All wildlife species noted, tracks, number of animals grazing around each pond, weather, and water conditions were recorded on a field form.

Waterfowl were identified to species if this was possible before they were out of range when flushed. Pairs, lone drakes, and lone hens

were counted as breeding pairs. The lone drakes and lone hens were considered to be paired but apart from their mate at the time of observation. In 1939 no breeding pairs were recorded due to the difficulty of separating them from other migrants during the spring migration in late March and April.

Results of the observations were tabulated both according to the average number of individuals of all species per observation and to the per cent of occurrence. The per cent of occurrence of wildlife species was obtained by dividing the number of occurrences by the number of observations.

The description made of each pond included size, depth, shoreline development, and acres of water less than one foot deep. The average height of the vegetation was determined from measurements taken on vegetation 100 feet away from the pond and at 50-foot intervals around the pond. Aerial photos were used to determine the distance to other water areas from each pond.

Grazing pressure was measured and shorelines were classified after Bue's (6) methods.

Seining operations were carried out to determine what food organisms were present in each pond.

CHAPTER II

REVIEW OF LITERATURE

Studies of wildlife utilization of different types of stock ponds have been carried on in several states in various sectors of the country. Previous studies of stock ponds have been made in western South Dakota.

Bue (6) studied 50 ponds over a two-year period in Stanley County in western South Dakota, and found blue-winged teal, mallards, pintails, shovellers, gadwalls, baldpates, Canada geese, and coots breeding around the ponds. The blue-winged teal, mallard, and pintail made up 81.2 and 74.8 per cent of the breeding pairs in 1950 and 1951 respectively. The average number of breeding pairs per pond in 1950 was 5.52 and 6.02 in 1951. Brood studies showed that 20.7 and 23.5 ducks per pond were raised to or near the flight stage in 1950 and 1951 respectively.

Grass-type shorelines in areas where grazing pressure is within the carrying capacity of the range had two to three times as many breeding pairs of waterfowl per shoreline length as mud-type shorelines in areas heavily overgrazed. In areas not grazed, shorelines developing with tall emergent plants supported less breeding pairs than grass shorelines; however, such areas were more productive for waterfowl than mud shorelines.

With the shoreline cover constant, it was shown that steep shorelines and deep shoreline water depths hold less breeding pairs than

do gently sloping shorelines and shallow shoreline water depths.

Brood usage of ponds lacking animal and plant food was nearly non-existent. Grassed shoreline ponds attracted more brood usage than other type shorelines for all three major breeding species which Bue observed in the area.

An aerial survey made by Murdy (12) in 1950 showed there were about 40,000 stock ponds making up 100,000 acres of wetlands west of the Missouri River in South Dakota. These ponds harbored 141,000 ducks in 1950.

In the wetlands inventory of South Dakota (19), stock ponds were rated as having low value for mink and deer with medium value for antelope and shorebirds.

Twelve species of waterfowl were observed by Smith (16) in studies of 124 artificial reservoirs in eastern Montana. The three most abundant species—mallard, pintail, and blue-winged teal—comprised 86.3, 81.2, and 74.8 per cent of the total summer populations in 1949, 1950, and 1951 respectively. From late May into July, total populations decreased, then increased until the end of August. Larger ponds received the greatest usage. Over a three-year period, he located 22 nests of mallards, pintails, blue-winged teal, green-winged teal, and gadwalls. The mallard, pintail, and blue-winged teal produced about 75 per cent of the broods observed each summer. Greatest use and brood production occurred on meadow type reservoirs while the least occurred on open reservoirs.

Waterfowl brood production and movements on stockwater ponds were

studied during 1953 and 1954 in eastern Montana by Berg (5). Twelve fenced ponds and 12 unfenced control ponds ranging in size from 0.1 to 4.5 acres were studied. A total of 29 broods was observed. Thirteen resident and five transient broods were seen on the fenced ponds, and two resident and nine transient broods were on the control ponds. It could not be concluded that fenced ponds were superior in brood production to unfenced ponds; although, it appeared that they were.

Pond size appeared to have more influence on brood usage than the vegetative height, density, and species composition; but, ponds with vegetation were used more than those without. Brood movement was generally from smaller ponds without riparian and emergent vegetation to larger ponds with emergent vegetation. No broods were known to use ponds 0.6 acre or less in size; but, ponds this size and smaller appeared important to waterfowl as mating areas.

Ninety-one ponds in Missouri, ranging in size from 0.1 acre to 2.0 acres, were censused at five different periods for wildlife utilization (9). Ponds were classified as to quality on the basis of nine physical and environmental features including cover, size, access, disturbance, and animals available to use them.

Bobwhite quail and cottontail rabbit use was greatly increased in pond areas of high quality, while use by other species was influenced positively, but in varying degrees. Use of ponds by ducks was low with 27 occurrences; blue-winged teal made up 19 of these. A total of 90 species of birds were recorded during the study.

Barstow (3) made studies of 21 clear and 13 turbid ponds in

Oklahoma during the 1956 spring waterfowl migration. Thirteen species of waterfowl were observed with pintails making up 34.3 per cent of the total. The top five species, in order of abundance, constituting 81.1 per cent of all waterfowl observed, were: pintail, baldpate, green-winged teal, gadwall, and ring-necked duck. Dabblers made up 84.6 per cent of the total number. The data collected in this study indicated that the smaller the pond, the greater was the waterfowl usage; but no definite conclusion could be reached.

During 1953, 1954, and 1955, studies were made of 559 small, man-made marshes in New York (4). Breeding pairs of waterfowl used 81.4 per cent of 458 of these marshes checked for breeding ducks; 69.9 per cent of 449 marshes supported broods. Either broods or breeders were supported by 99 per cent of 347 areas checked for both of these classes.

Data indicated that on the average, there were two breeding pairs and nearly one and a half broods observed per water unit. These marshes were attracting ducks at the rate of 40 pairs per 100 acres. Over a period of years, larger marsh areas in New York averaged 10 to 15 pairs of breeders per 100 acres. The marshes also received considerable use by fall migrants and in general, the areas that had the most summer use also had the most waterfowl in September when a survey was made.

Allan (2) reported that blue-winged teal, mallards, pintails, and ruddy ducks have nested near and reared their young in small ponds in Colorado, New Mexico, and Texas. Fifty young were raised in 1938

on five such ponds in Colorado, all of which were an acre or smaller. In the summer of 1938, eleven ponds supported a resident duck population of 107 birds, of which 73 were young.

Data tabulated on 1,476 farm ponds in Ohio showed that almost 65 per cent are used by waterfowl, largely by ducks, at some time during the year (10). Use during the fall migration was about 40 per cent, and in the winter it dropped to about eight per cent. Almost 26 per cent of the ponds harbored at least one brood of wild ducks since they were built. The main duck species raised on these areas in order of their importance were mallard, wood duck, blue-winged teal, and black duck.

Forty ponds were constructed in Ohio in 1953 in an area of about 4,000 acres. These ponds averaged three quarters of an acre and were located within one mile of a 13,000 acre flood control reservoir. Twenty-eight broods of ducks, with a total of 176 young, were observed on these ponds during a three month study period. All of these ponds, because of their newness, were almost devoid of vegetation in 1954.

Elder (7) studied two man-made waterholes in the southern Arizona desert. These waterholes consisted of concrete reservoirs level with the ground and having one end open from which wildlife drank. Water was supplied by windmills. Ten mammals and 25 birds were seen drinking at these waterholes. The critical period for wildlife in the study area was from about May 1 to late July. The peak of utilization was in late July just before the summer rains began. Mule deer, gray fox, bobcat, badger, and javelina were most commonly seen watering at night,

but the arrival time of the javelina could not be predicted. White-winged doves showed definite morning and afternoon watering peaks. Gambel's quail drank both in the morning and afternoon. Hawks were never seen watering until after sunrise, while owls were never seen until the sun had completely set.

CHAPTER III

THE STUDY AREA

Location

Field work was carried on in the southwestern portion of Minnehaha County, located in southeastern South Dakota. The study area measures 11 by 12 miles, comprising approximately 84,480 acres.

Geology and Soil

In South Dakota the area east and north of the Missouri River is almost completely covered by glacial drift (8). The early French fur traders returning from trips into South Dakota referred to an area they called "Coteau des Prairie" - the Prairie Hills (14). The Coteau des Prairie is a 200-mile highland plateau in extreme eastern South Dakota, extending in a north-south direction from the northern boundary of the state through Minnehaha County (3). It is drained to the south by the Big Sioux River. Lakes are scattered upon the surface of the Coteau. Elevation of the Coteau in Minnehaha County is near 1,400 feet above sea level.

The soils of most of eastern South Dakota have a deep, dark-colored surface horizon rich in organic matter and are known as Chernozem soils (13). Minnehaha County soil is moderately sloping with loess material covering glacial till. It is composed of silt loam, silty clay loam, calcareous material, or clay loam depending on the degree of slope

and the locality.

Climate

South Dakota has extremes of winter cold and summer heat with rapid fluctuations in temperatures (11). Temperatures range from 100° Fahrenheit to below zero readings with the average annual maximum temperature of 57.5° Fahrenheit and a average annual minimum temperature of 34° Fahrenheit (17).

The average annual precipitation recorded at the U. S. Weather Bureau at Sioux Falls is 25.24 inches. Total precipitation in 1958 was 15.33 inches and by the end of June, precipitation was 3.18 inches below normal. August and October of 1958 were each the fourth driest on record; the precipitation was 9.53 inches below normal by the end of October. Most of the precipitation in the study area comes in the spring and early summer.

Winds are northwesterly during the cold season and southeasterly in the warm seasons.

In the average year, there are 120 to 140 clear days, 100 to 130 partly cloudy days, and 100 to 120 cloudy days.

Vegetation

Southeastern South Dakota lies in the tall-grass area with the most typical grasses being big and little bluestem, Indian grass, needlegrass, slender wheatgrass, needle and thread, and Junegrass (15). Construction operations and overgrazing around the ponds may have caused

the disappearance or thinning of some of the grasses and the subsequent invasion of forbs.

Description of the Ponds

All measurements of the ponds and vegetation studies were made in early June of 1958. A description of each pond is shown in Table I, but supplemental data follow.

Mud shorelines were present on all ponds due to low water levels in 1958 or to heavy grazing pressure in 1957. No livestock had grazed around pond 3 since its construction. No livestock grazed around pond 4 in 1958. The area around pond 5 was the only one in 1959 in which grazing was permitted at the close of the study. The high grazing pressure in the area surrounding pond 2 was the result of approximately 300 sheep and 70 cattle pasturing the area. Pond 6 had a one-foot variation in the height of the vegetation surrounding it because haying operations were carried out on one side of the pond and grazing was permitted on the other side. Figures 1-8 illustrate the six study ponds.

No aquatic plants were present in the ponds studied. A list of the prevalent plants around the ponds is presented in Table II.

Ponds 1 and 4 are located approximately 1.2 miles from large permanent marshes. A 217-acre lake in a state game preserve is 3.5 miles from ponds 3 and 6 while pond 5 is 1.6 miles from this lake. A small marsh that was heavily used by waterfowl during the study period is 0.2 mile from pond 2. Small wooded areas are located 0.1 mile from ponds 4 and 6.

TABLE I. MEASUREMENTS, GRAZING PRESSURE, VEGETATION HEIGHT, AND CONSTRUCTION DATES OF SIX MINNEHAHA COUNTY PONDS

Pond	Acres	Depth	Acres of water less than 1' deep	Shoreline Development	Grazing[1] Pressure	Vegetation Height	Construction Date
1	.91	6'	.050	1.61	74	4"	Sept., 1951
2	3.63	5'	.151	2.51	348	9"	Sept., 1948
3	3.84	21'	.110	1.69	None	8"	Sept., 1956
4	.70	5'	.032	1.72	None	7"	Aug., 1954
5	.46	8'	.022	1.15	100	13"	Aug., 1957
6	.79	5'	.047	1.38	107	4" (SE Side) 12" (NW Side)	April, 1956

[1]Calculated in livestock days per acre.

Bluegills and largemouth bass were present in ponds 2 and 3, and crayfish were found in ponds 2 and 6.

Figure 1. Pond 1. Note Evidence of Heavy Grazing.

Figure 2. A Portion of Pond 2. This Pond had the Greatest Shore-line Development.

Figure 3. Another Portion of Pond 2.

Figure 4. Pond 3. The Largest of the Study Ponds, this Pond was Fenced to Prevent Grazing Close to Water's Edge.

Figure 5. A Northwesterly View of Pond 3 Showing Steep Banks.

Figure 6. Pond 4. Note Presence of Some Tall Vegetation Around Shore Area.

Figure 7. Pond 5. This was the Smallest and Supported the Tallest Vegetation of the Study Ponds.

Figure 8. Pond 6. Note Tall Vegetation on Northwest Side in Comparison to the Mowed Area in the Foreground Side.

TABLE II. GRASSES, LEGUMES, AND FORBS OCCURRING AROUND THE STUDY AREA PONDS

Grasses	Forbs	Legumes
Kentucky Bluegrass	Prairie Sage	White Melilotus
Porcupine Grass	Prairie Coneflower	Yellow Melilotus
Side-Oats Grama	Common Ragweed	Leadplant
Blue Grama	Rigid Goldenrod	
Panic-Grass	Floodman's Thistle	
Prairie Sedgegrass		
Smooth Brome		
Bearded Wheatgrass		
Western Wheatgrass		

CHAPTER IV

RESULTS

Waterfowl Use

In this study, waterfowl was considered to be ducks, geese, coots, and mergansers. Grebes and herons were designated as water birds.

A total of 2,022 ducks, 19 geese, 13 coots, and 24 mergansers was observed during the entire study. This included 10 species of ducks, three of geese, two of mergansers, and 11 unidentified ducks (Table III). Lesser and greater scaup were not listed separately because of the difficulty of differentiating them when flushed. Mallards and blue-winged teal made up 63.8 and 14.3 per cent respectively of the total number of waterfowl observed.

Average Number of Waterfowl Observed

The most intensive use of all the ponds by waterfowl occurred in March when the average number of waterfowl per observation was 49.3 (Table IV). For all ponds combined, the average number of waterfowl during the entire study was 3.71.

Individual pond use varied greatly. Pond number 2 had the greatest use with 17.31 birds per observation (Table V). Waterfowl use according to numbers followed a pattern of evident attraction to the larger ponds with the exception of ponds 2 and 3. Pond 2 ranked second in size, but ranked first in average numbers of waterfowl per observation; pond 3 ranked first in size, but was second according to the

TABLE III. TOTAL WATERFOWL OBSERVED ON OBSERVATION PONDS[1]

Species	Pond 1	2	3	4	5	6	Total
Mallard	18	800	463	11	7	31	1330
Blue-Winged Teal	36	82	120	4	23	33	298
Scaup	55	9	50	26	2		142
Baldpate	11	29	48		6		94
Pintail	7	20	46		10	2	85
Shoveller	2	10	6	4	1		23
Gadwall	4	2			11		17
Green-Winged Teal	2		9				11
Unidentified Ducks		1	3	7			11
Ruddy Duck			8				8
American Golden-Eye			3				3
Hutchin's Canada Goose			12				12
Blue Goose						6	6
Snow Goose			1				1
Coot		1	1	14		2	18
Hooded Merganser			6	16			22
American Merganser		2					2
Total	135	956	776	82	60	74	2083

[1]See appendices for scientific names of animals and plants occurring around the study ponds.

TABLE IV. MONTHLY WATERFOWL USE OF PONDS

Month	Average Number of Waterfowl Per Observation	Frequency of Occurrence In Per Cent
March	49.5	72.2
April	12.5	58.3
June	1.93	65.3
July	0.09	9.5
August	0.40	15.1
September	1.22	33.3
October	0.54	20.0

TABLE V. WATERFOWL USE OF EACH POND

Pond Number	Average Number of Waterfowl Per Observation	Frequency of Occurrence In Per Cent
1	1.90	23.9
2	17.01	58.9
3	7.11	42.2
4	1.03	46.8
5	1.01	19.6
6	1.08	6.8

number of waterfowl observed on it.

Waterfowl numbers based on shoreline development (the irregularity or length of shoreline) followed no definite pattern except that pond 2, which had the greatest shoreline development, had the greatest number of waterfowl per observation. Pond 5, with the least shoreline development, attracted the least number. The other four ponds showed no relationship between shoreline development and waterfowl numbers.

Waterfowl use based on the average numbers of birds observed and on acres of water less than one foot deep followed a definite trend: the pond having the most area of water less than one foot deep attracted the most waterfowl. This trend occurred for all ponds.

The distance of the study ponds from other water areas (exclusive of streams) compared to the numbers of waterfowl observed showed no relationship except that pond 2 which was the closest to a slough area also had the greatest waterfowl use.

There appeared to be no uniform relationship between the age of the ponds and waterfowl use; although, the oldest pond attracted the most waterfowl and the newest pond attracted the fewest. The remaining four ponds showed no relationship between numbers and age.

Frequency of Occurrence of Waterfowl

The greatest frequency of occurrence of waterfowl (58.9 per cent) was on pond 2 (Table V). The average frequency of occurrence for all ponds was 32.8 per cent. Waterfowl appeared at the ponds most often during March, occurring with a frequency of 72.2 per cent (Table IV).

The use in March was probably high because of the spring migration at that time.

Pond 2 which had the greatest frequency of waterfowl use also ranked first in shoreline development, had the shortest distance to another water area, had more acres of water under one foot deep than the other ponds, and was second in size. This indicates a possible relationship between these physical factors and the frequency of use by waterfowl. However, frequency of occurrence of waterfowl at the other five ponds showed no relationship to these factors.

Numerical values were assigned to the ponds to further determine if a relationship existed between average numbers of waterfowl and frequency of use with size, shoreline development, distance from other water areas, and acres of water under one foot deep. The value of six was given for each factor as follows: the largest in size, the greatest shoreline development, the shortest distance from another water area, and the largest area of water under one foot deep. Thus, values from 6 to 24 were possible: empirical values are given in Table VI. This was done in the belief that the above factors are conducive to use by waterfowl.

Pond 2, according to this method, ranked first followed in order by ponds 3, 1, 4, 6, and 5. Ponds 2, 3, and 1 also had the largest average numbers of waterfowl observed; pond 5, with the least number of points, also had the least number of waterfowl per observation. Ponds 4 and 6 did not follow the pattern of the other ponds. Pond 2 which ranked first in points also ranked first in waterfowl frequency of

TABLE VI. NUMERICAL RATINGS OF OBSERVATION PONDS BY RELATIVE IMPORTANCE OF VARIOUS ECOLOGICAL FACTORS

Factor Considered	Pond 1	2	3	4	5	6
Shoreline Development	3	6	4	5	1	2
Size	4	5	6	2	1	3
Distance from Other Water	5	6	3	5	4	3
Acres of Water Under One Foot Deep	4	6	5	2	1	3
Total Points	16	23	18	14	7	11

occurrence. Other than this, no relationship appeared between the four factors and frequency of utilization by waterfowl.

Breeding Waterfowl

A total of 66 breeding pairs of ducks was observed on all ponds (Table VII). The major breeding species were the pintail, blue-winged teal, and mallard in this order of abundance. They made up 90.9 per cent of the paired breeding population on the study ponds. Ponds 2, 3, and 5 attracted 88.3 per cent of the breeding pairs of ducks observed.

One nest of a blue-winged teal was found 150 feet away from pond 5 on June 2, 1958, but it was later abandoned. No other nests were found in the vicinity of the ponds. One brood of 10 mallards was observed on pond 3, but was not seen on later observations. From the observation of one nest and one brood, no relationship could be shown

TABLE VII. BREEDING PAIRS OF DUCKS OBSERVED ON OBSERVATION PONDS IN 1958

Species	Pond 1	2	3	4	5	6	Total
Pintail	4	6	7		6	1	24
Blue-Winged Teal		11	2		6	1	20
Mallard	3	1	8		3	1	16
Gadwall	2				1		3
Shoveller	1				1		2
Scaup					1		1
Total	10	18	17		18	3	66

between grazing pressure and duck nesting around the ponds.

Bird Use

A total of 34 species of birds (Table VIII) was observed during the period of study. Birds occurred at a frequency of over 90 per cent at all ponds so it was not possible to tell what type of pond would be the most attractive to bird life. The greatest number of species occurred around pond 3. Killdeer occurred the most frequently on all combined ponds, while the mourning dove was the second most frequent visitor. A total of 23 pheasants was observed around all ponds, with 9 of these being seen around pond 5 which had the tallest vegetation in June. The remaining 14 were observed around the other ponds in varying numbers.

TABLE VIII. FREQUENCY OF OCCURRENCE OF BIRDS
(PER CENT OF POSITIVE OBSERVATIONS)

Species	Pond 1	2	3	4	5	6	Average
Killdeer	36.6	44.6	51.3	44.4	44.6	32.2	41.4
Mourning Dove	45.3	21.3	11.9	25.3	21.3	32.2	26.9
Brewer's Blackbird	18.3	1.7	15.5	18.9	13.2	13.5	13.5
Bronzed Grackle	7.2	14.2	8.2	7.5	14.2	6.7	10.1
Barn Swallow	18.2		20.1	3.7	14.7	2.8	9.9
Red-Wing	2.8	12.5	16.5	1.2	4.4	6.7	7.3
(Northern) Cliff Swallow	1.7		24.7				4.4
Spotted Sandpiper	5.5	7.1	4.5	1.2	4.4	3.2	4.3
Ring-Necked Pheasant	4.2	1.7	2.7	3.7	4.4	8.4	4.1
Black Tern	4.2	16.1	2.7				3.8
Black-Crowned Night Heron	6.3	5.3		8.8	1.4		3.6
(Eastern) Solitary Sandpiper		12.5	4.6				2.8
Crow	2.8	7.1			2.9	1.6	2.4
Great Blue Heron	2.3	8.3	3.3				2.3
Robin	2.8			3.7	1.9	5.0	2.2
Lesser Yellow-Legs	4.2	3.4	1.8				1.5
Eastern Kingbird	1.4	1.7			1.9	1.6	1.1
Pied-Billed Grebe			6.4				1.06
Greater Yellow-Legs	1.4	1.7	1.8				.81

TABLE VIII. CONTINUED

Species	Pond 1	2	3	4	5	6	Average
Franklin's Gull		1.9	1.8				.61
Flicker	1.4					1.6	.50
Domestic Pigeon			2.9				.48
Eared Grebe			2.7				.45
Least Sandpiper		1.7					.28
Bobolink		1.7					.28
(Eastern) Belted Kingfisher			1.7				.28
Herring Gull			1.7				.28
Wilson's Snipe			1.7				.28
European Partridge			1.7				.28
(Eastern) Cowbird						1.6	.26
English Sparrow						1.6	.26
Horned Lark	1.4						.23
Marsh Hawk	1.4						.23
Meadowlark	1.4						.23

Mammals

Mammals Observed

Five different species of mammals were observed throughout the study. They were the cottontail rabbit, jackrabbit, red fox, muskrat, and mink. All mammals occurred with less than three per cent frequency. Both cottontail and jackrabbits were observed drinking from ponds 1, 4, and 5. Three red fox were seen drinking from pond 2 in June of 1958; their den was located about 150 feet away from the pond. In April, 1959, one mink was seen hunting around pond 1, and its den was found in the retaining embankment of the pond. A single muskrat was observed on three different occasions at pond 2.

Mammal Tracks

Mink and raccoon tracks were the only mammal signs observed around the ponds. Mink tracks occurred most frequently around pond 5 (Table IX). The substantial population of crayfish in pond 2 and the bluegill and bass populations in pond 5 may have been the attractants for both mink and raccoons respectively. Two of the other ponds (ponds 3 and 6) also supported fish and crayfish populations; however, the scarcity of mammal tracks around them indicated that these populations were not being utilized by either mink or raccoon. This same irregular pattern is indicated by the presence of mink and raccoon around ponds 1 and 4. Pond 1 had neither fish or crayfish, yet the evidence of mink and raccoon use was high. Pond 4 which was similarly devoid of fish and crayfish had the lowest occurrence of mammal tracks.

TABLE IX. FREQUENCY OF OCCURRENCE OF MAMMAL TRACKS (PER CENT OF POSITIVE OBSERVATIONS)

Mammal	Pond 1	2	3	4	5	6	Average
Mink	37.2	77.4	11.5	2.1	17.2	2.3	24.6
Raccoon	25.5	35.4	24.3	1.5	37.9	14.2	22.1

Wildlife Use and Weather

Waterfowl

Waterfowl utilization of stock ponds occurred the most frequently at an average daily temperature range from 30° to 69° Fahrenheit. The frequency of occurrence in this range of temperature was 46.8 per cent. Separation of this range of temperature into lesser ranges showed no appreciable differences in waterfowl utilization. From the average daily temperature of 70° to 89° Fahrenheit, utilization dropped to a frequency of 11.4 per cent. No observations were made when the average daily temperature was below 30° or above 89° Fahrenheit. The relation between temperature and waterfowl utilization may be expected because of low spring temperatures and high waterfowl numbers.

Wind velocity seemed to play no part in utilization of ponds by ducks. High and low occurrences were noted at both high and low wind velocities. Because of the differences in the location of retaining embankments, each pond was treated separately in order to determine if wind direction and waterfowl use were related. Attempts were made to

link high wind velocities and specific wind directions to waterfowl use of certain sheltered areas of individual ponds. No relationship could be found among these factors.

Cloudy, partly cloudy, and clear days all attracted waterfowl both in varying numbers and in varying frequencies; therefore, a definite trend cannot be established for use and cloud cover.

Birds

Bird life of some kind was present at the ponds at nearly all times of the study and in all kinds of weather. It was not possible to show a relationship between bird use and weather.

A noticeable trend was that the numbers of mourning doves utilizing the ponds increased with the hot days of July and August. No other species of birds followed a recognizable pattern of use relative to weather conditions.

CHAPTER V

SUMMARY AND CONCLUSIONS

1. This study was initiated to determine what particular type of man-made stock pond is the most attractive to waterfowl and to find out to what extent these ponds are utilized by other forms of wildlife.

2. The study was conducted on six stock ponds in Minnehaha County, South Dakota, from June 2, 1958, to November 13, 1958, and from March 23, 1959, to April 30, 1959.

3. A total of 442 observations lasting from a few minutes to an hour each was made on all combined stock ponds.

4. The depth, size, distance from other water, shoreline development, and acres of water under one foot deep was determined for each pond. Grazing pressure and vegetation height around each pond was also determined. All shorelines were classified as mud type.

5. A total of 2,022 ducks, 10 geese, 13 coots, and 24 mergansers was observed during the entire study. Mallards and blue-winged teal made up 63.8 and 14.3 per cent respectively of the total number of waterfowl observed.

6. The greatest use of all ponds by waterfowl occurred in March when the average number observed per observation was 40.5 and the average frequency of occurrence was 72.2 per cent. The average number of waterfowl observed per observation and frequency of occurrence on all ponds for the entire study was 4.71 and 32.3 per cent respectively.

7. Greatest waterfowl use as to average numbers observed and frequency of occurrence was on one of the larger ponds which had the greatest shoreline development, most water area less than one foot deep, and was the shortest distance to other water areas. The least numbers of waterfowl occurred on the smallest pond having the smallest shoreline development and least acres of water under one foot deep. The smallest frequency of occurrences were on the smaller ponds having the smaller shoreline development and water area under one foot deep, and greater distance from other water areas.

8. A total of 56 breeding pairs was observed; the major breeding species were the pintail, blue-winged teal, and mallard in this order of abundance. They made up 90.9 per cent of the breeding population.

9. Birds occurred at a frequency of over 90 per cent at all ponds with 34 species being observed. Killdeers and mourning doves occurred the most frequently on all combined ponds.

10. All mammals were observed at a frequency of less than three per cent. Mink and raccoon tracks occurred around all ponds at a frequency of 24.6 and 23.1 per cent respectively.

11. Weather and wildlife utilization of ponds showed no relation other than waterfowl occured most frequently at a temperature range from 30° to 69° Fahrenheit.

12. The larger stock ponds constitute an important resting area for migrating waterfowl; but, population levels on the stock ponds observed indicate that these ponds will not serve as substitutes for drained wetlands.

13. Large stock ponds with an abundance of shallow water, irregular shorelines, and proximity to other water areas are the most attractive to waterfowl.

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APPENDICES

APPENDIX A

SCIENTIFIC NAMES OF BIRDS OBSERVED AROUND THE PONDS[1]

Birds

Mallard	*Anas platyrhynchos platyrhynchos*
Pintail	*Anas acuta tzitzihoa*
Gadwall	*Anas strepera*
Blue-Winged Teal	*Anas discors*
Green-Winged Teal	*Anas carolinensis*
Shoveller	*Spatula clypeata*
Baldpate	*Mareca americana*
Scaup	*Aythya* spp.
American Golden-Eye	*Glaucionetta clangula americana*
Ruddy Duck	*Erismatura jamaicensis rubida*
Hutchin's Canada Goose	*Branta canadensis hutchinsi*
Blue Goose	*Chen caerulescens*
Snow Goose	*Chen hyperborea*
Coot	*Fulica americana*
Hooded Merganser	*Lophodytes cucullatus*
American Merganser	*Mergus merganser americanus*
Great Blue Heron	*Ardea herodias*
Black-Crowned Night Heron	*Nycticorax nycticorax hoactli*
Eared Grebe	*Colymbus nigricollis californicus*

Pied-Billed Grebe	Podilymbus podiceps podiceps
Ring-Necked Pheasant	Phasianus colchicus torquatus
European Partridge	Perdix perdix perdix
Marsh Hawk	Circus cyaneus hudsonius
Killdeer	Charadrius vociferus vociferus
Wilson's Snipe	Capella gallinago delicata
Spotted Sandpiper	Actitis macularia
(Eastern) Solitary Sandpiper	Tringa solitaria solitaria
Greater Yellow-Legs	Totanus melanoleucus
Lesser Yellow-Legs	Totanus flavipes
Least Sandpiper	Erolia minutilla
Herring Gull	Larus argentatus
Franklin's Gull	Larus pipixcan
Black Tern	Chlidonias nigra surinamensis
Domestic Pigeon	Columba livia
Mourning Dove	Zenaidura macroura
(Eastern) Belted Kingfisher	Megaceryle alcyon alcyon
Flicker	Colaptes auratus
Eastern Kingbird	Tyrannus tyrannus
Horned Lark	Eremophila alpestris
Barn Swallow	Hirundo rustica erythrogaster
(Northern) Cliff Swallow	Petrochelidon pyrrhonota albifrons
Crow	Corvus brachyrhynchos
Robin	Turdus migratorius
English Sparrow	Passer domesticus domesticus

Bobolink	Dolichonyx oryzivorus
Meadowlark	Sturnella magna
Red-Wing	Agelaius phoeniceus
Brewer's Blackbird	Euphagus cyanocephalus
Bronzed Grackle	Quiscalus versicolor
(Eastern) Cowbird	Molothrus ater ater

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[1] Nomenclature according to:

Peterson, Roger Tory, A Field Guide to the Birds, The Riverside Press: Cambridge, Massachusetts, 1947.

APPENDIX B

SCIENTIFIC NAMES OF OTHER ANIMALS OBSERVED AROUND OR IN THE PONDS[1]

Common Red Fox	Vulpes fulva
Raccoon (Tracks only)	Procyon lotor
Mink	Mustela vison
White-tailed Jackrabbit	Lepus townsendi
Common Cottontail	Sylvilagus floridanus
Largemouth Bass[2]	Micropterus salmoides
Bluegill[2]	Lepomis macrochirus
Crayfish	Cambarus spp.

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[1] Unless otherwise designated, nomenclature is according to:

Driver, Ernest C., Name That Animal, The Kraushar Press, Northampton, Massachusetts, 1950.

[2] Nomenclature according to:

Harlan, James R., and Speaker, Everett B., Iowa Fish and Fishing, 3rd Ed., State of Iowa, 1956.

APPENDIX C

SCIENTIFIC NAMES OF PREVALENT PLANTS OCCURRING AROUND THE PONDS

Grasses[1]

Kentucky Bluegrass	*Poa pratensis*
Porcupine Grass	*Stipa spartea*
Side-Oats Grama	*Bouteloua curtipendula*
Blue Grama	*Bouteloua gracilis*
Panic-Grass[2]	*Panicum perlongum*
Prairie Wedgegrass	*Sphenopholis obtusata*
Smooth Brome	*Bromus inermis*
Bearded Wheatgrass	*Agropyron subsecundum*
Western Wheatgrass	*Agropyron smithii*

Forbs[3]

Prairie Sage	*Artemisia cnephalodes*
Prairie Coneflower	*Ratibida columnaris*
Common Ragweed	*Ambrosia elatior*
Rigid Goldenrod	*Solidago rigida*
Flodman's Thistle	*Cirsium flodmanii*

Legumes[2]

Leadplant	Amorpha canescens
White Melilotus	Melilotus alba
Yellow Melilotus	Melilotus officinalis

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[1]Nomenclature according to:

Hitchcock, A. S., Manual of the Grasses of the United States, United States Government Printing Office: Washington, 1951.

[2]Nomenclature according to:

Fernald, M. L., Gray's Manual of Botany, 8th Ed., American Book Company: New York, 1950.

[3]Nomenclature according to:

South Dakota Weeds, Agriculture Extension Service, South Dakota State College: Brookings, South Dakota, 1956.