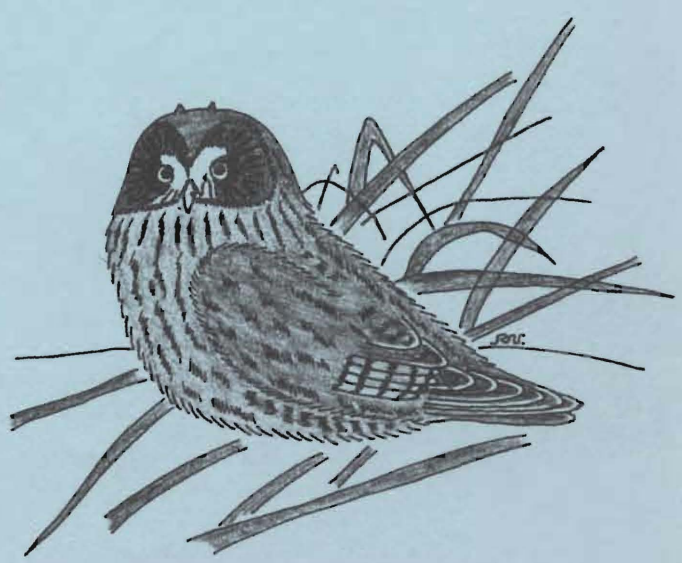
LAKE BREKKEN, HOLMES AND WILLIAMS STUDIES



INTRODUCTION

Wildlife and limnological investigations are being conducted in the Lakes Brekken-Holmes-Williams Area to monitor the effects of: (1) development of the Lake Brekken Recreation Area, and (2) testing of the prototype fish screen on Lake Brekken designed to stop biological transfer via the McClusky Canal. Investigations began in 1977 a study of the gull colony on Lake Williams and have been expanded to include land use and habitat, limnological studies, migratory shorebird use, and breeding bird surveys.

Description of the Lakes

Lakes Brekken, Holmes, Williams, and Unnamed Lakes No. 1 and No. 2 are shallow, meandered, highly saline lakes located in McLean County, north and east of the town of Turtle Lake, North Dakota. The 1979 surface areas of these lakes were: Lake Brekken-30 ha (74 acres), Lake Holmes-59 ha (145 acres), Lake Williams-325 ha (803 acres), Unnamed Lake No. 1-13 ha (33 acres), and Unnamed Lake No. 2 - 17 ha (43 acres).

The volume and quality of water in these lakes varies seasonally. Total dissolved solids (TDS) concentrations have ranged from 40,000 to 70,000 mg/l in Lake Brekken, from 50,000 to 125,000 mg/l in Lake Holmes, and from 25,000 to 125,000 mg/l in Lake Williams.

Major constituents of the TDS present in the water of Lakes Brekken, Holmes, and Williams include sodium (30 to 40 percent) and sulfate (60 to 70 percent). Minor amounts of carbonate, bicarbonate, calcium, magnesium, chloride, and other elements are also present in the lakes. Water quality in Unnamed Lakes No. 1 and No. 2 was assumed to be similar.

In the fall and winter, when the volume and the temperature of the water are relatively low, a layer of loose crystals of hydrated sodium sulfate

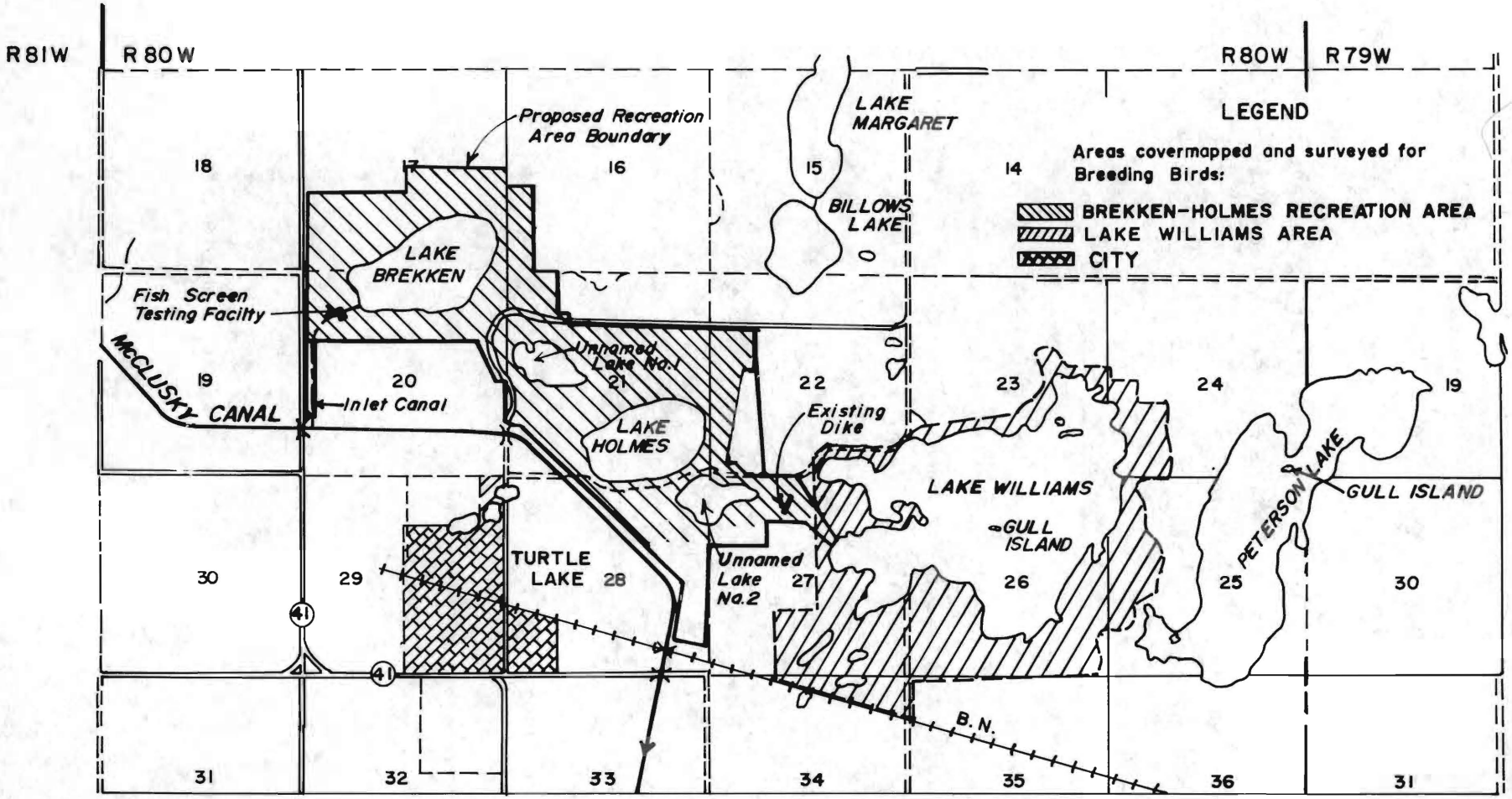


FIGURE 14

BREKKEN— HOLMES—WILLIAMS STUDY AREA
1979 BIOLOGICAL INVESTIGATIONS

(mirabilite) are deposited on the shore of the lakes. These deposited salts often disappear completely during the summer when the volume and temperature of the water are relatively high.

Numerous freshwater seep areas occur along the banks of the lakes. Analyses show TDS concentrations of approximately 1,400 mg/l with calcium and sodium the major cations and bicarbonate and sulfate the major anions.

Recreation Development Plans

Lakes Brekken and Holmes are in the GDU Lake Brekken Recreation Development Area (Figure 14). The proposed operating level of Lakes Brekken and Holmes is 1828.0 msl with a combined capacity of 12,335 m^3 (10,000 acre-feet). Lake Brekken would contain 4,441 m^3 (3,600 acre-feet) and have a surface area of 95 ha (235 acres). Lake Holmes would contain 7,894 m^3 (6,400 acre-feet) and have a surface area of 172 ha (425 acres).

Removing the salt water from Lakes Brekken and Holmes would facilitate the plan to improve water quality in the lakes so the State Game and Fish Department could develop a fishery in conjunction with the recreation area. The recreation plan has been described by the FSES 79-7 (USDI 1979).

Prototype Fish Screen

To prepare for testing of the prototype fish screen, 222 m^3 (180 acre-feet) of water was pumped from Lake Brekken to Lake Holmes in the fall of 1978. This reduced the amount of water in Lake Brekken to about 12 m^3 (10 acre-feet). Two hundred forty-six cubic meters (200 acre-feet) of water accrued to Lake Brekken in the spring of 1979 from runoff and seepage. About 210 m^3 (170 acre-feet of this water was pumped into Lake Holmes in 1979. Testing began in October of 1979 and continued through the middle of November.

Operation of the fish screen entails releasing McClusky Canal water through the fish screen into Lakes Brekken-Holmes. Lake Brekken will be filled first with about 4,441 m^3 (3,600 acre-feet) of water. After Lake Brekken is filled, additional test water would be released into Lake Holmes.

Original plans called for pumping excess water from Lake Holmes into Lake Williams. However, an agreement was reached between the FWS and BR in July of 1979 to limit the amount of water to be added to Lake Williams. The goal would be to manage Lake Williams at elevation 1812.5 during the fall migration to provide a maximum amount of crane habitat in the lake.

Biological Investigations

Studies of gulls began in 1977 in response to concerns that the gull nesting island on Lake Williams would be inundated by the development of the Lake Brekken Recreation Area, and continued through 1979.

Land use and habitat in the proposed recreation area and around Lake Williams were surveyed in 1979. These surveys documented the habitat to be inundated by the proposed recreation area as well as the total habitat available in the area.

Breeding birds and migratory shorebirds were surveyed in 1979 to document the effects of the proposed recreation development.

Limnology investigations were started in 1978 to: (1) document changes occurring to the aquatic ecosystem due to freshening Lakes Brekken and Holmes, (2) determine if it is possible to establish a fishery in those lakes, (3) to identify problems with establishing a fishery, and (4) suggest solutions based on the data.

Methods

The habitats and land use of the proposed Brekken-Holmes Recreation Area were covermapped in June 1979, following techniques described in the 1978 Annual Report (USBR 1979). Areas of habitat types were totalled separately for the entire recreation area and for that portion of the recreation area scheduled to be inundated by Lake Brekken-Holmes. Detailed habitat types were grouped into general categories for this report.

Results and Discussion

The areas of each habitat group and the percentage of each that will be inundated are shown in Table 38.

Grasslands comprise 200.5 ha (495 acres) or 41.6 percent of the proposed recreation area. Domestic grasslands, as well as heavily invaded native areas and former agricultural areas reseeded to grasses are included in this category.

Saline and freshwater wetlands cover 135.5 ha (334.8 acres) or 28.1 percent of the area. The saline wetlands, including Lakes Brekken and Holmes, are characterized by extensive areas of unvegetated shoreline. Emergent vegetation along the shorelines occur only at freshwater seeps. The freshwater wetlands cover 8.8 ha (21.7 acres) and include seasonally flooded basins and shallow marshes (Types I and III) and one deep wetland (Type IV).

Agricultural land comprises 106.0 ha (261.9 acres) or 22.0 percent of the recreation area. This category includes fallow and weedy fields.

Brush habitat covers 33.7 ha (83.4 acres) and includes wetland associated thickets as well as upland buckbrush and wild rose. Most of

Table 38

TOTAL AREAS BY HABITAT TYPE IN THE PROPOSED BREKKEN-HOLMES RECREATION AREA AND AREAS OF HABITATS THAT WILL BE INUNDATED BY DEVELOPMENT OF THE RECREATION AREA

	Proposed Recreation Area		Area to be Inundated		
	Hectares	Recreation Area (%)	Ha	% of Total Inundated Area	% of Total of Hab. Type
Agricultural	106.0	22.0	14.5	6.3	13.7
Grasslands	200.5	41.6	68.6	30.0	34.2
Brushland	33.7	7.0	15.0	6.6	44.5
Trees	3.3	0.7	--	--	0.0
Wetlands					
Fresh Water	8.8	1.8	4.0	1.7	45.5
Saline	126.7	26.3	126.7	55.4	100.0
(Total)	(135.5)	(28.1)	(130.7)	(57.1)	(96.5)
Miscellaneous	3.4	0.7	--	--	0.0
TOTAL	482.4	100.1	228.8	100.0	47.4

the dense thickets are located on the south shores of the saline wetlands, although additional shrublands occur in the ravines at the northeast end of Lake Brekken. Trees (predominantly single-row shelterbelts) and miscellaneous cover (construction areas, rock and dirt piles, and a gravel pit) each make up 0.7 percent of the recreation area.

Of the land that will be inundated by the creation of Lake Brekken-Holmes, wetlands and the associated brushland will be affected more than other habitat types. Over 96 percent (130.7 ha or 322.9 acres) of all wetlands will be flooded, including all of the saline wetlands and 46 percent (4.0 ha or 9.8 acres) of the freshwater wetlands. About 44 percent (15.0 ha or 37.0 acres) of the brushland on the area will be inundated. More than 34 percent (68.6 ha or 169.4 acres) of the grasslands, most domestic or heavily invaded native areas, lie within the area to be inundated. The most extensive area of native grassland, located at the northeast end of Lake Brekken, will not be flooded. About 24 percent (14.5 ha or 35.8 acres) of the agricultural land will be flooded.

This report discusses only those effects on habitats associated with the creation of Lakes Brekken-Holmes. Further changes in the area due to development of campgrounds, boat ramps, etc., should be determined when specific development plans are established.

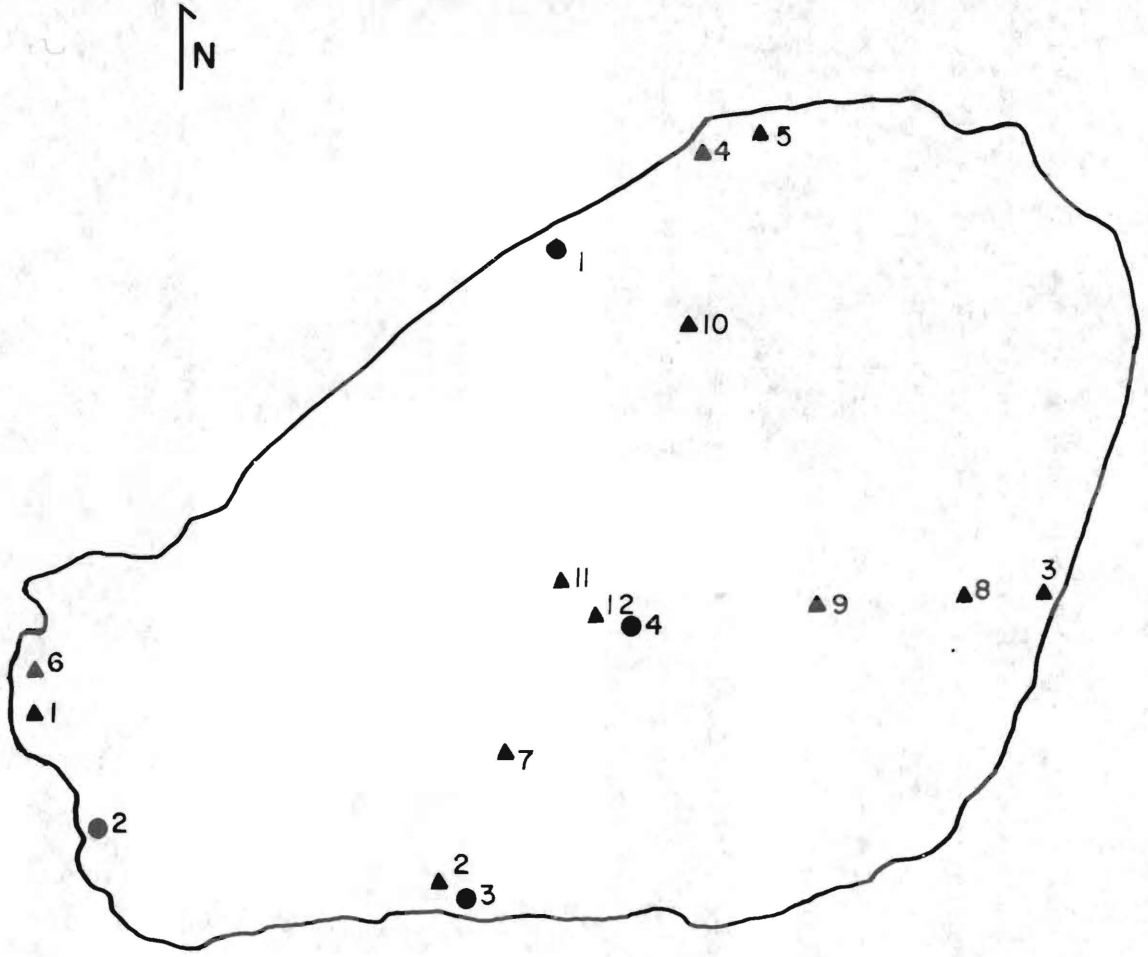
LIMNOLOGICAL INVESTIGATIONS

Methods

Invertebrate samples were collected from 12 sites each on Lakes Brekken, Holmes, and Williams, June 13, 1978 (Figures 15, 16, and 17). A benthic sample was collected at each site using an Ekman dredge. A plankton sample was taken at each site by pouring 10 liters (2.6 gallons) of surface water through an 80-micron plankton net.

In 1979, only four sites were sampled on each lake (Figures 15, 16, and 17). Three of the sampling sites on each lake were located at freshwater seep areas, which are characterized by lower TDS concentrations

Figure 15

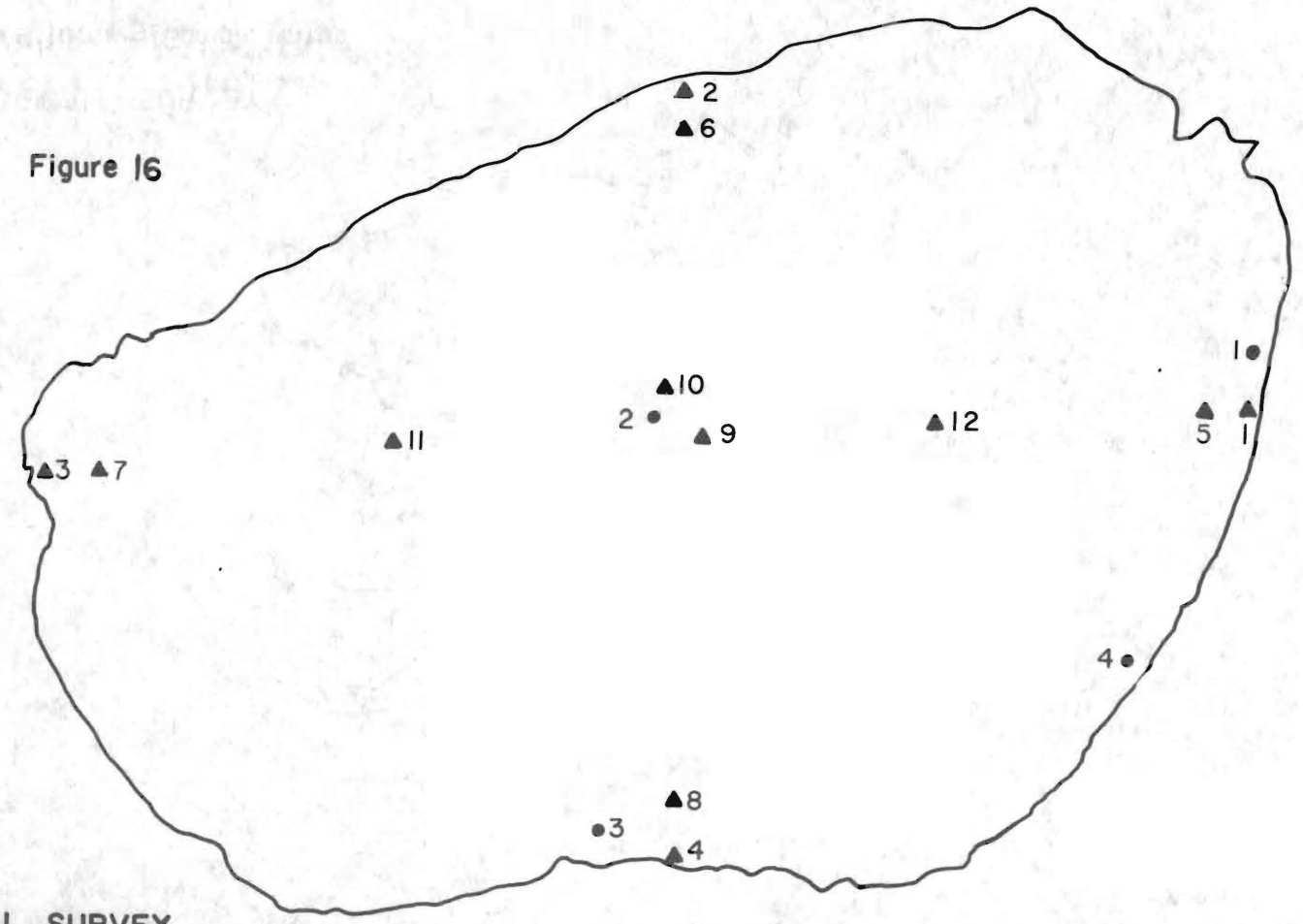


LIMNOLOGICAL SURVEY
Lake Brekken – Sample sites

▲ – 1978 sites
● – 1979 sites

T 147 N R 80 W Sects. 17, 20

Figure 16



LIMNOLOGICAL SURVEY

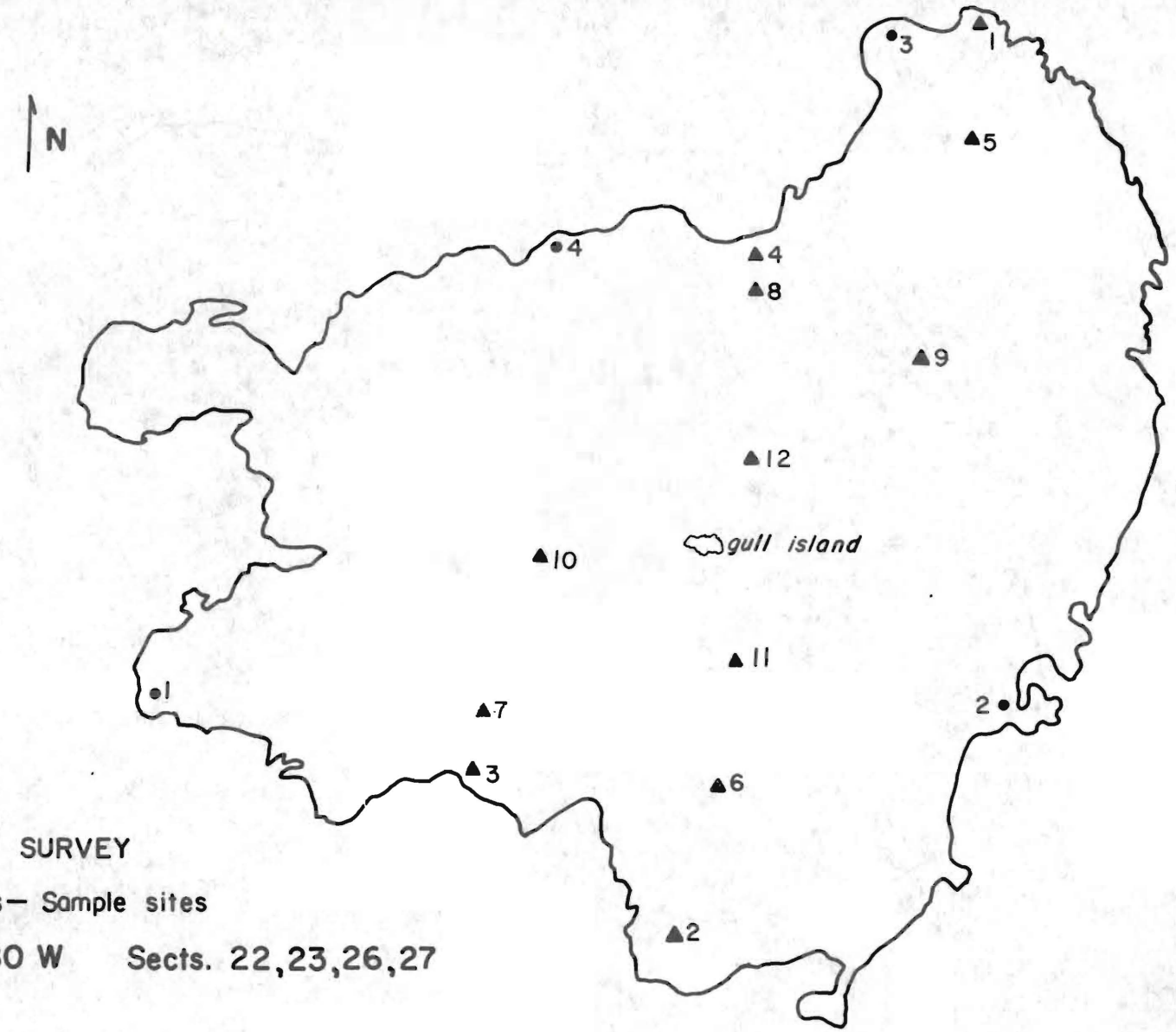
Lake Holmes – Sample sites

T 147 N R 80 W Sec. 21

▲ – 1978 sites

● – 1979 sites

Figure 17



LIMNOLOGICAL SURVEY

Lake Williams— Sample sites

T 147 N R 80 W Sects. 22,23,26,27

▲—1978 sites

●—1979 sites

and emergent vegetation. The fourth site at each lake was an open-water site. Sampling was started during the second week of June and continued every 2 weeks until freeze up in October. At each site, water was analyzed for pH, dissolved oxygen, temperature, and Redox potential using a multiparameter probe. Additionally, a water sample was analyzed in the laboratory for electrical conductivity. Water samples were collected monthly from one site on each lake and analyzed for specific ions and TDS. Two benthic samples were taken at each station using an Ekman grab. Samples were sieved through a standard No. 30 (590-micron) mesh littoral bucket. Two plankton samples were taken by pouring 19 liters (5 gallons) of water, representative of the water column, through a Wisconsin-style plankton net. Biota collected were then preserved in a final concentration of 10 percent formalin.

All invertebrate samples were analyzed by the Water and Power Resources Service's Denver Engineering and Research Center.

Results and Discussion

Seven species of invertebrates were collected in 1978 in the following order of abundance: Branchinecta, sp. (fairy shrimp); Sida, sp. (cladocera); Chromogaster, sp. (rotifer), unidentified Nauplius larvae; Ephydra, sp. (shore fly); Hydroporus, sp. (diving beetle), and Chironomus, sp. (midge).

By far, the Brachinecta, sp. and Chromogaster, sp. were the most abundant in Lakes Brekken and Holmes. Brachinecta, sp. and Sida, sp. were the most abundant species in Lake Williams (Table 39). These species comprised 99 percent of the totoal individuals collected.

The benthic populations of these lakes were very sparce, as shown by a total of only 13 individuals of benthic invertebrates collected at 36 stations.

The invertebrates collected in 1979 have not yet been identified. Water chemistry data collected in 1978 is shown in Table 40. Occurrence and

Table 39

ORGANISMS FOUND AT SAMPLING STATIONS ON LAKES BREKKEN, HOLMES, AND WILLIAMS

Names		Stations Where Found																															
		Lake Brekken												Lake Holmes										Lake Williams											
Common	Scientific	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Rotifer	Chromogaster	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X												
Brine shrimp	Branchinecta	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cladocera	Sida							X																		X	X	X	X	X	X	X	X	X	X	X	X
Beetle	Hydroporus							X																		X	X	X	X	X	X	X	X	X	X	X	X
Midge fly	Chironomus							X																													
Brine fly	Ephydra													X				X		X				X													

Table 40

PHYSICAL AND CHEMICAL PROPERTIES OF LAKES BREKKEN, HOLMES AND WILLIAMS - 1978 SAMPLE SITES UTILIZING A HACH DR-EL/2 SPECTROPHOTOMETER

Area	Average Depth (cm)	Avg. Water Temp. (°C)	pH	Nitrogen	Hardness	Sulfate	Alkalinity	Elec. Conduct. (m/ohms)	Avg. Secchi Disc. (cm)
Lake Brekken	64	17.8	9.95	0-NH_4 1.0-NO_3 0-NO_2	40	*200+	27,000	64,250	28
Lake Holmes	46	21	9.95	2.5-NH_4 0.1-NO_3 0-NO_2	2,000	150		122,000	45
Lake Williams	17	17.8	10.0	0-NH_4 0-NH_3 6-NH_2	40	150	100,000+	33,000	8

*Off the scale.

abundance of the invertebrate populations will be correlated with the water chemistry data when the identifications have been completed.

SHOREBIRDS

Methods

Shorebirds were surveyed weekly (from July 21 through September 9) on Lakes Brekken, Holmes, Williams, and on the two unnamed lakes in the proposed Brekken/Holmes Recreation Area (Figure 14). Surveys were conducted by two observers during the 4-hour period beginning ½-hour after surnrise, using 20-45X and 80-130X spotting scopes. Two or three observation points were selected around each of the four lakes in the recreation area so that most of the shoreline and mudflats could be observed. Several observation points were used on the east, south, and west sides of Lakes Williams. Each observer surveyed different parts of each lake. Shorebirds were counted and identified to the lowest taxonomic group possible.

Results and Discussion

The weekly shorebird totals for each lake are shown in Figure 18. Maximum numbers observed on each lake were: Lake Brekken (3,774), unnamed Lake No. 2 (1,982), Lake Williams (1,166), unnamed Lake No. 1 (1,046), and Lake Holmes (856). Total numbers declined on all lakes during the survey period. A pronounced decrease in the number of birds observed on Lakes Brekken and No. 1 occurred just after a cold front passed through the State on August 13. This system brought strong northwest winds (gusting to 48 km/hr or 30 mph) and unseasonably cold temperatures (a minimum of 1° C or 33° F on August 14). Lake Brekken, where numbers decreased the most, was surveyed the day after the cold front passed. The other lakes were surveyed on the following 2 days.

Twenty-two shorebird species were observed. Maximum and total numbers of birds for each lake are shown in Table 41. Some species (including white-rumped, Baird's, least, semi-palmated, and western sandpipers and

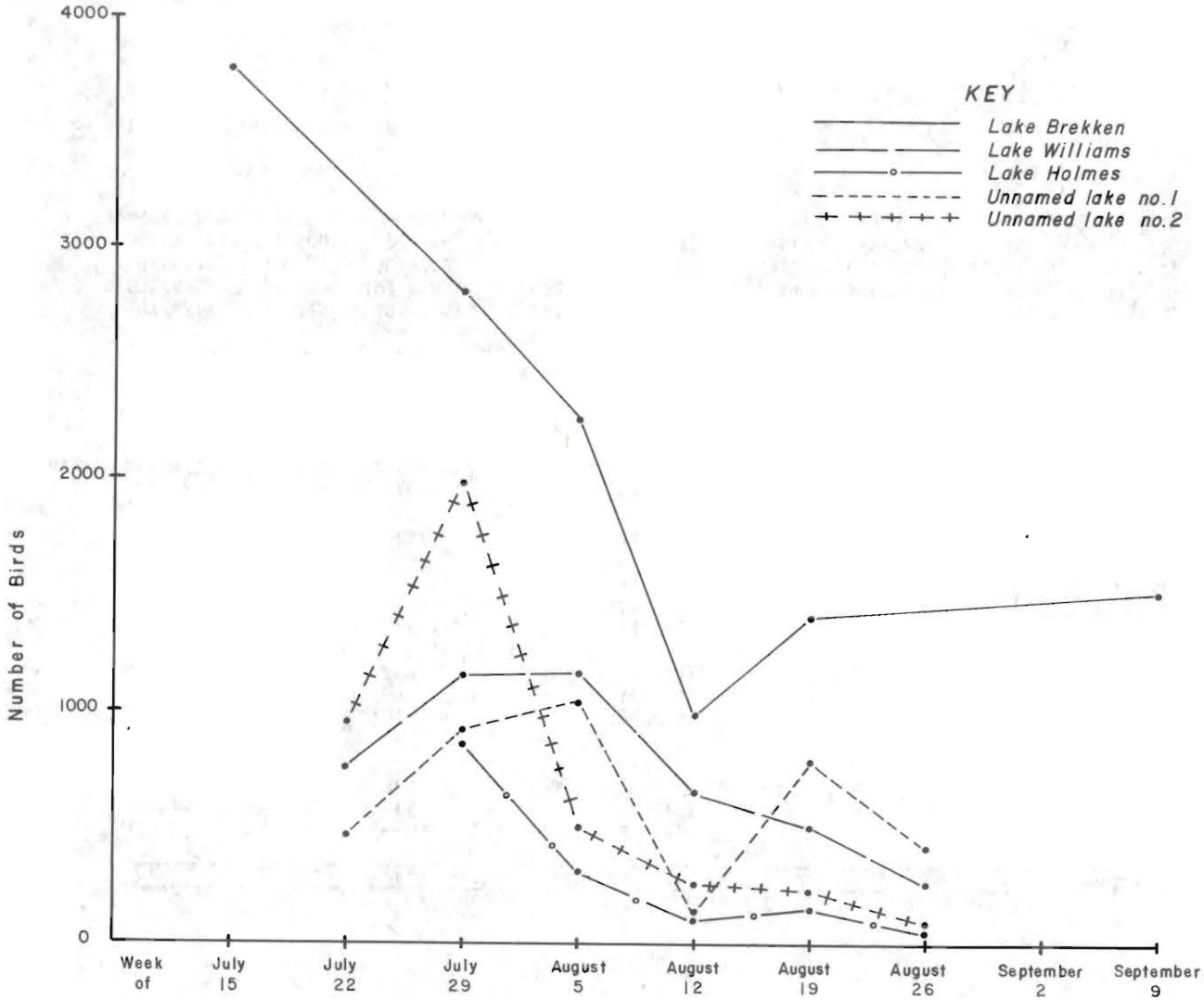


FIGURE 18

MIGRATING SHORE BIRD USE ON FIVE SALINE LAKES IN CENTRAL NORTH DAKOTA FALL 1979

Table 41

MAXIMUM AND TOTAL NUMBERS OF SHOREBIRDS OBSERVED ON WEEKLY SURVEYS OF LAKES BREKKEN, HOLMES, WILLIAMS, No. 1, AND No. 2 1/

Fall 1979

Species	Lake Brekken		Lake Holmes		Lake No. 1		Lake No. 2		Lake Williams		Overall
	Max. (Date)	Total	Max. (Date)	Total	Max. (Date)	Total	Max. (Date)	Total	Max. (Date)	Total	Total
Semipalmated plover	110(9/9)	307	--	--	3(8/9)	3	--	--	53(8/8)	136	446
Piping plover	43(8/7)	143	1(8/3)	1	5(7/23)	7	--	--	59(8/8)	146	297
Killdeer	17(8/7)	37	3(8/22)	5	7(7/31)	13	8(7/23)	9	12(8/8)	27	91
Black-bellied plover	1(8/20)	1	--	--	--	--	--	--	8(8/15)	8	9
Ruddy turnstone	1(8/7)	1	--	--	--	--	--	--	--	--	1
Spotted sandpiper	10(8/20)	10	10(8/16)	10	15(8/16)	15	--	--	2(8/8)	2	37
Solitary sandpiper	--	--	--	--	1(8/16)	1	--	--	--	--	1
Willet	3(8/14)	3	8(8/9)	16	6(8/21)	14	1(7/23 8/9 8/28)	3	27(8/8)	84	120
Greater yellowlegs	9(8/7)	13	8(8/3)	12	1(8/9)	1	--	--	23(8/2)	28	54
Lesser yellowlegs	65(8/7)	157	24(8/3)	56	73(7/23)	162	11(7/23)	20	83(8/2)	194	589
Yellowlegs, sp.	6(8/7)	6	4(8/9)	4	--	--	--	--	3(8/8)	4	14
Red knot	1(8/20)	1	--	--	1(7/31 8/9)	2	--	--	--	--	3
Pectoral sandpiper	16(8/7)	17	3(8/9)	6	1(8/9 8/16)	2	2(7/23 8/9)	5	12(7/25)	19	49
Baird's sandpiper	51(8/20)	67	4(8/16)	4	3(7/31)	6	--	--	23(8/22)	42	119
Least sandpiper	13(8/7)	19	1(8/9)	1	86(7/23)	97	12(7/23)	12	133(7/25)	141	270
Semipalmated sandpiper	288(8/20)	439	15(8/22)	28	196(8/9)	273	3(8/21)	3	170(8/22)	308	1,051
Sanderling	24(8/20)	46	--	--	10(8/9)	10	--	--	28(8/15)	58	114
Unidentified "peep"	905(9/9)	2,292	334(8/3)	428	544(7/31)	712	1(7/31)	1	530(8/2)	1,880	5,313
Long-billed dowitcher	--	--	--	--	1(8/28)	1	--	--	--	--	1
Dowitcher, sp.	2(8/20)	3	--	--	2(8/9)	4	--	--	6(8/15)	6	13
Stilt sandpiper	210(8/20)	773	7(8/3)	7	13(7/31)	30	--	--	10(8/2)	20	830
Marbled godwit	--	--	--	--	--	--	--	--	--	5	5
American avocet	997(8/1)	2,895	80(8/16)	217	24(7/31)	113	2(7/23)	2	147(8/2)	635	3,862
Wilson's phalarope	1,032(8/1)	2,510	409(8/3)	623	372(8/9)	1,239	568(7/31)	1,384	303(8/8)	671	6,427
Northern phalarope	31(8/20)	31	30(8/22)	61	247(8/9)	352	1,410(7/31)	2,458	33(8/2)	33	2,935
Phalarope, sp.	1,500(7/21)	1,500	3(8/16)	5	683(8/21)	691	95(7/23)	95	26(7/25)	26	2,317
Shorebird, sp.	1,449(7/21)	1,451	--	--	1(8/12)	1	--	--	6(8/15)	6	1,458
TOTALS		12,722		1,484		3,749		3,992		4,479	26,426

1/Six surveys on each lake except Lake Holmes (five surveys).

sanderlings) are difficult to differentate due to similarities in size, shape, and coloration. Individuals of these species were recorded as "peeps" when circumstances prohibited further identification. On the first survey (Lake Brekken, July 21) observers concentrated on obtaining a total count of all shorebirds rather than species identification, and many birds were not identified to species, as they were on subsequent surveys. Birds recorded as "peeps" and the unidentified shorebirds during the first survey represent 91 percent of all birds not identified to species.

Several species of special interest were observed. A red knot was observed on July 31, August 9, and August 20. Zimmer (1979) lists this species as a very rare migrant in the eastern part of the State, and it is more rare farther west (R. Randall, FWS-retired, pers. comm.). A ruddy turnstone was observed on August 7 at Lake Brekken. Zimmer (1979) describes it as a rare migrant in the western half of the State and uncommon in the eastern half. Sanderlings and black-bellied plovers are uncommon to rare migrants in this part of the State. Sanderlings were observed on nine occasions, with a maximum of 28 individuals on August 15. Black-bellied plovers were observed on two occasions: eight individuals on August 15 and one on August 20.

Although no white-rumped or western sandpipers were identified, it is very likely that a few migrated through the area and utilized these lakes. White-rumped sandpipers were observed on Lake Williams in 1978 (T. Gatz, WPRS biologist, pers. comm.), and both species are uncommon, but known to migrate through the area.

Northern phalaropes, the third most abundant species in the study area, have been described as only fairly common to uncommon migrants in the State as a whole (Zimmer 1979; R. Randall, pers. comm.). While Wilson's phalaropes occurred commonly on all five lakes studied, northern phalaropes were seen in large flocks only on Lakes No. 1 and No. 2. This suggests these lakes have special (though unknown) qualities making them especially attractive to northern phalaropes.

Construction and pumping activities in the proposed Brekken-Holmes Recreation Area have changed the character of three of the five lakes. Prior to the shorebird surveys, water was pumped from Lake Brekken into Lake No. 1, which was connected to Lake Holmes by a ditch. The water level in Lake Brekken was lowered about 45 cm (18 in) and was raised in the two lakes (Holmes and Lake No. 1) to which water was added. In most years, there are narrow mudflats, approximately 3 to 6 m (10 to 20 ft) wide, around Lakes Brekken and Holmes, while Lake No. 1 has only a small amount of shallow water in the center (T. Anderson, WPRS biologist, pers. comm.). In drought years, Lake No. 1 dries up completely and the mudflats around Lake Brekken increase to about 10 to 30 m (30 to 100 ft). This year, Lake Brekken was only a few centimeters deep and the mudflats around it were as much as 60-m (200-ft) wide. Lake Holmes had almost no exposed mudflats and Lake No. 1 had mudflats up to 1-m (3-ft) wide in a few places.

Overall, pumping activities increased shorebird habitat (beaches and mudflats) on Lake Brekken, and decreased it on Lake Holmes and Lake No. 1. Quantitative information on fall shorebird use for previous years is not available, but several observers verified that shorebirds used all three of these lakes extensively before construction and pumping began (R. Randall, T. Gatz, T. Anderson, pers. comm.). The area as a whole was, and is, an important resource for migrating shorebirds.

Shorebirds make long migrations requiring extensive fat accumulations for energy reserves (Matthiessen 1967, Post and Browne 1976). These fat reserves are acquired at rich feeding sites along the migration routes where birds may remain for an extended period of time (Page and Bradstreet 1068, Post and Browne 1976). The lakes surveyed in this study were used extensively by shorebirds throughout the study period. It is apparent that they provided important food resources for many migrating shorebirds.

This study was conducted over a relatively short period of time. To better reflect the value of the study area to migrant shorebirds, surveys should be conducted throughout the migration period, from July

Table 42

NUMBERS AND DENSITIES OF BREEDING SPECIES BY HABITAT

Brekken-Holmes Recreation Area Bird Surveys - 1979

Species	Number of Pairs (Pairs/km^2)														Total Rec. Area	
	Agricultural		Grasslands		Brush		Trees		Fresh Wet.		Saline Wet.		Misc.			
Horned grebe											2	(1.58)			2	(0.41)
Mallard											1	(0.79)			1	(0.21)
Pintail											3	(2.37)			3	(0.62)
Gadwall											4	(3.16)			4	(0.83)
Blue-winged teal									2	(22.73)	14	(11.05)			16	(3.32)
American wigeon									1	(11.36)	1	(0.79)			2	(0.41)
Northern shoveler											4	(3.16)			4	(0.83)
Marsh hawk			1	(0.50)											1	(0.21)
Gray (Hungarian) partridge			1	(0.50)											1	(0.21)
Sora									4	(45.45)	1	(0.79)			5	(1.04)
American coot									4	(45.45)					4	(0.83)
Killdeer	3	(2.83)	7	(3.49)					2	(22.73)	14	(11.05)	3	(88.24)	29	(6.01)
Upland sandpiper			2	(1.00)	1	(2.97)									3	(0.62)
Willet			4	(2.00)					1	(11.36)	1	(0.79)			6	(1.24)
American avocet			5	(2.49)					1	(11.36)	4	(3.16)			10	(2.07)
Wilson's phalarope			1	(0.50)							1	(0.79)			2	(0.41)
Mourning dove	1	(0.94)	2	(1.00)	39	(115.73)	11	(333.33)							53	(10.99)
Yellow-billed cuckoo					1	(2.97)									1	(0.21)
Black-billed cuckoo					2	(5.93)	1	(30.30)							3	(0.62)
Eastern kingbird			11	(5.49)	45	(133.53)	9	(272.73)							65	(13.47)
Western kingbird			3	(1.50)	1	(2.97)	19	(575.76)							23	(4.77)
Willow flycatcher					37	(109.79)	1	(30.30)							38	(7.88)
Least flycatcher					9	(26.71)	1	(30.30)							10	(2.07)
Horned lark	15	(14.15)	6	(2.99)	18	(53.41)									39	(8.08)
Barn swallow													1	(29.41)	1	(0.21)
Long-billed marsh wren									10	(113.64)					10	(2.07)
Gray catbird			2	(1.00)	41	(121.66)	1	(30.30)							44	(9.12)
Brown thrasher					16	(47.48)	8	(242.42)							24	(4.98)
American Robin							3	(90.91)							3	(0.62)

Table 42 cont.

NUMBERS AND DENSITIES OF BREEDING SPECIES BY HABITAT

Brekken-Holmes Recreation Area Bird Surveys - 1979

Species	Number of Pairs (Pairs/km^2)														Total Rec. Area	
	Agricultural		Grasslands		Brush		Trees		Fresh Wet.		Saline Wet.		Misc.			
Sprague's pipit					1	(2.97)									1	(0.21)
Cedar waxwing					6	(17.80)	2	(60.61)							8	(1.66)
Warbling vireo					1	(2.97)									1	(0.21)
Yellow warbler					41	(21.66)	1	(30.30)							42	(8.71)
Common yellowthroat			1	(0.50)	19	(56.38)			3	(34.09)					23	(4.77)
House sparrow							1	(30.30)							1	(0.21)
Bobolink	3	(2.83)	6	(2.99)											9	(1.87)
Western meadowlark	5	(4.72)	37	(18.45)	14	(41.54)	5	(151.52)	1	(11.36)					62	(12.85)
Yellow-headed blackbird			14	(6.98)	3	(8.90)			32	(363.64)	4	(3.16)			53	(10.99)
Red-winged blackbird	2	(1.89)	82	(40.90)	109	(323.44)	20	(606.06)	8	(90.91)	11	(8.68)			232	(48.09)
Orchard oriole					1	(2.97)	4	(121.21)							5	(1.04)
Brewer's blackbird					6	(17.80)									6	(1.24)
Common grackle			1	(0.50)	10	(29.67)	8	(242.42)							19	(3.94)
Brown-headed cowbird	5	(4.72)	58	(28.93)	93	(275.96)	22	(666.67)					2	(58.82)	180	(37.31)
American goldfinch					4	(11.87)									4	(0.83)
Lark bunting	5	(4.72)	1	(0.50)											6	(1.24)
Savannah sparrow			10	(4.99)											10	(2.07)
Grasshopper sparrow	6	(5.66)	86	(42.89)	13	(38.58)									105	(21.77)
Baird's sparrow			12	(5.99)	1	(2.97)									13	(2.69)
Sharp-tailed sparrow			1	(0.50)											1	(0.21)
Vesper sparrow			6	(2.99)	7	(20.77)			1	(11.36)					14	(2.90)
Clay-colored sparrow	1	(0.94)	39	(19.45)	44	(130.56)	2	(60.61)	1	(11.36)					87	(18.03)
Song sparrow			1	(0.50)	17	(50.45)	2	(60.61)							20	(4.15)
Chestnut-collared longspur	1	(0.94)	29	(14.46)	4	(11.87)									34	(7.05)
TOTALS	47	(44.34)	429	(213.97)	604	(1,792.28)	121	(3,666.67)	71	(806.82)	65	(51.30)	6	(176.47)	1,343	(278.40)

Table 43

NUMBERS AND DENSITIES OF BREEDING SPECIES BY HABITAT

Lake Williams Area Surveys - 1979

Species	Number of Pairs (Pairs/km^2)										Total Rec. Area	
	Agricultural		Grasslands		Brush		Trees		Fresh Wet.		Saline Wet.	
Pintail											3 (0.83)	3 (0.48)
Blue-winged teal											7 (1.94)	7 (1.11)
Northern shoveler											3 (0.83)	3 (0.48)
Piping plover											18 (4.99)	18 (2.85)
Killdeer			7	(2.88)							14 (3.88)	21 (3.33)
Common snipe			1	(0.41)								1 (0.16)
Spotted sandpiper											1 (0.28)	1 (0.28)
Willet			2	(0.82)					1	(67.11)	2 (0.55)	5 (0.79)
Marbled godwit											4 (1.11)	4 (0.63)
American avocet			8	(3.29)							53 (14.69)	61 (9.66)
Wilson's phalarope			1	(0.41)							23 (6.38)	24 (3.80)
California gull											304 (84.29)	304 (48.16)
Mourning dove					1	(37.31)	2	(114.94)				3 (0.48)
Eastern kingbird			8	(3.29)	4	(149.25)	8	(459.77)				20 (3.17)
Western kingbird			1	(0.41)			5	(287.36)				6 (0.95)
Willow flycatcher					2	(74.63)						2 (0.32)
Horned lark			35	(14.38)	3	(111.94)					1 (0.28)	39 (6.18)
Long-billed marsh wren											4 (1.11)	4 (0.63)
Gray catbird					3	(111.94)	1	(57.47)				4 (0.63)
Brown thrasher			1	(0.41)	2	(74.63)	5	(287.36)				8 (1.27)
Yellow warbler					1	(37.31)	1	(57.47)				2 (0.32)
Common yellowthroat					4	(149.25)					1 (0.28)	5 (0.79)
Bobolink			2	(0.82)								2 (0.32)
Western meadowlark			23	(9.45)			2	(114.94)			2 (0.55)	27 (4.28)
Yellow-headed blackbird			1	(0.41)					2	(134.23)	4 (1.11)	7 (1.11)
Red-winged blackbird	1	(4.71)	34	(13.97)	5	(186.57)	1	(57.47)	2	(134.23)	37 (10.26)	80 (12.67)
Common grackle							2	(114.94)				2 (0.32)
Brown-headed cowbird			75	(30.81)	7	(261.19)	10	(574.71)			11 (3.05)	103 (16.32)
Savannah sparrow			18	(7.39)							9 (2.50)	27 (4.28)
Grasshopper sparrow			124	(50.94)							4 (1.11)	128 (20.28)
Baird's sparrow			46	(18.90)							2 (0.55)	48 (7.60)
Sharp-tailed sparrow			3	(1.23)	1	(37.31)			1	(67.11)	13 (3.60)	18 (2.85)
Clay-colored sparrow			16	(6.57)	7	(261.19)	3	(172.41)				26 (4.12)
Song sparrow			2	(0.82)	5	(186.57)						7 (1.11)
Chestnut-collared longspur			6	(2.46)								6 (0.95)
TOTALS	1	(4.71)	414	(170.08)	45	(1,679.10)	40	(2,298.85)	6	(402.68)	572 (158.59)	1,078 (170.78)

Table 44

NUMBERS OF SPECIES, INDIVIDUALS, AND INDICATED PAIRS BY HABITAT

Brekken-Holmes Recreation Area Bird Surveys - 1979

Habitat	No. Species Observed	No. of Individuals	No. Breeding Species	No. Pairs
Agricultural	13	86	11	47
Grasslands	34	717	28	429
Brush	38	1,342	30	604
Trees	32	347	19	121
Fresh wetlands	18	123	14	71
Saline wetlands	26	1,656	15	65
Misc.	5	12	3	6
TOTAL	78	4,283	53	1,343

Table 45

NUMBERS OF SPECIES, INDIVIDUALS, AND INDICATED PAIRS BY HABITAT

Lake Williams Area Bird Surveys - 1979

Habitat	No. Species Observed	No. of Individuals	No. Breeding Species	No. Pairs
Agricultural	3	4	1	1
Grasslands	29	713	21	414
Brush	15	65	13	45
Trees	13	83	11	40
Fresh wetlands	5	9	4	6
Saline wetlands	30	1,400[1/]	23	572
TOTAL	55	2,270	36	1,078

1/Includes estimated numbers (for gulls and terns).

through October for the fall migration, and from April through May for the spring migration.

BREEDING BIRDS

Methods

Field methods used followed those of Stewart and Kantrud (1972). Areas shown in Figure 14 were surveyed at least once between May 31 and July 12, 1979. Estimates of the number of breeding pairs for each species in each habitat were determined separately for the proposed Brekken-Holmes Recreation Area and for the Lake Williams Area.

For those areas that were censused twice, the numbers of breeding pairs of early-nesting species were determined from the first survey. Numbers of pairs for mid-season nesting species were taken from the survey that showed the greatest number of indicated pairs. For late-nesting species, the number of indicated pairs observed on the second survey was used. Early-, mid-, and late-nesting species were according to Stewart and Kantrud (1972). Early-nesting species were not accurately censused due to the late survey dates.

Results and Discussion

The numbers and densities of breeding pairs for each species, by major habitat groups, are shown in Tables 42 and 43 for the proposed recreation area and the Lake Williams Area, respectively. The total numbers of breeding and nonbreeding species, and the numbers of individuals and breeding pairs for each major habitat group are shown in Tables 44 and 45.

Brekken-Holmes Recreation Area

In the area of the proposed recreation complex 4,283 individuals of 78 species were observed (Table 44). Over 1,300 pairs of 53 species

exhibited breeding behavior with an overall density of 278.40 breeding pairs/km^2 (720.9 pairs/mi^2)(Table 42).

The most common breeding species was the red-winged blackbird with 232 breeding pairs (48.09 breeding pairs/km^2 or 124.5 pairs/mi^2). The second most common species was the brown-headed cowbird with 180 breeding pairs (37.31 breeding pairs/km^2 or 96.63 pairs/mi^2).

The single habitat type that showed the highest breeding bird use was brush habitat with 604 breeding pairs of 30 species. The density of breeding birds for this habitat was 1,792.28 breeding pairs/mi^2 (4,635.46 pairs/mi^2).

Lake Williams Area

A total of 2,270 individuals of 55 species were observed in the Lake Williams Area (Table 45). Thirty-six species (1,078 pairs) exhibited breeding behavior with an overall dnesity of 170.78 breeding pairs/km^2 (442.3 pairs/mi^2)(Table 43).

The most common breeding species was the California gull with 304 breeding pairs and a density of 48.16 pairs/km^2 (124.7 pairs/mi^2). The second most common breeding psecies was the grasshopper sparrow followed by the brown-headed cowbird.

Tree habitat had the greatest density of breeding bird use with 40 pairs of 11 species (2,298.85 pairs/km^2 or 5,967.5 pairs/mi^2). The habitat with the greatest number of breeding pairs was the slaine wetlands with 572 breeding pairs followed by the grasslands with 414 breeding pairs and densities of 148.59 and 170.08 breeding pairs/km^2 (410.7 and 440.5 breeding pairs/mi^2, respecitvely).

Effects of Development of the Recreation Area, Brekken-Holmes Complex

Birds in the proposed Brekken-Holmes Recreation Area that will be most affected by development are those associated with the dense shrub

thickets bordering the saline lakes. The greatest numbers of individuals and species, both breeding and nonbreeding, were observed in this shrub habitat. The thickets are composed of a dense growth of small trees and tall shrubs dominated by Saskatoon serviceberry and hawthorn. Within the recreation area, they are found growing in deep ravines on the northeast side of Lake Brekken and on the steep slopes (especially those facing north) that border the saline lakes. Approximately 44.5 percent of the brushland will be inundated with development of the recreation area, eliminating breeding habitat for a large proportion of the birds presently using the area.

Bird communities in the recreation area that depend on saline wetlands and deep freshwater marshes will also be greatly affected or eliminated by project development. All the saline wetland habitat and several freshwater marshes will be eliminated. Some of the freshwater marsh habitat may be replaced by the freshening of Lakes Brekken and Holmes. However, bird use will depend on the quality of the emergent vegetation that develops.

Several of the species observed are considered to be uncommon to rare in this region of the State (Stewart 1975), including the yellow-billed cuckoo, eastern wood pewee, and cedar waxwing. Although proof of breeding (a nest or dependent young) was not found, the behavior of the yellow-billed cuckoo indicates that it may have nested in the area. It was observed on 4 days between June 28 and July 21, was always observed in the smae area, and was heard singing at least once. Wood pewees (assumed to be the eastern species) were seen in the dense brush fairly often, but were not heard singing, and therefore, were not recorded as breeding. Pairs of territorial cedar waxwings, though not abundant, were observed regularly in trees and dense brush.

The saline wetlands in the Lake Williams Area, including Lake Willams, had higher numbers of individuals and species and a greater density of breeding pairs than saline wetlands in the recreation area. Relatively small amounts of water may be added to Lake Williams under current agreements (USDI memo, 1979). Although few, if any, harmful effects to the bird community are expected, effects are unknown.

Information on what presently occurs on Lake Williams is important for monitoring and future management.

Species which occurred in 1979 that could be affected by changes in water level or water chemistry are: California gull, common tern, American avocet, Wilson's phalarope, killdeer, piping plover, red-winged blackbird, and sharp-tailed sparrow. Of these, the California gull and the piping plover could be disastrously affected by raising the water level enough to cover their nesting areas. Lake Williams was the location of one of only seven successful California gull colonies in the State in 1979 and is probably the second largest colony in the State. Eliminating this colony would destroy a substantial proportion of the available nesting habitat in North Dakota. The piping plover is another species that is dependent on this type of habitat. Its numbers have been declining steadily in almost every region of the country where it occurs.

CALIFORNIA AND RING-BILLED GULL STUDIES

California and ring-billed gulls and associated nesting species were studied to assess potential impacts associated with development of the Brekken-Holmes recreation complex.

Several objectives were given at the beginning of this field season: (1) determine the size of the Lake Williams gull colony, (2) locate and census other colonies in the State, (3) determine the percent of the State population nesting at Lake Williams, and (4) determine if movement occurs between colonies. Aerial surveys were used to address objectives (1) and (2). Ground observation and nest counts addressed objectives (1), (2), and (3). The question of gull movement was approached with banding and color-marking studies.

Methods

Aerial surveys between May 23 and 27, 1979 (Figure 19) covered Lake Sakakawea and locations of California and ring-billed gull colonies

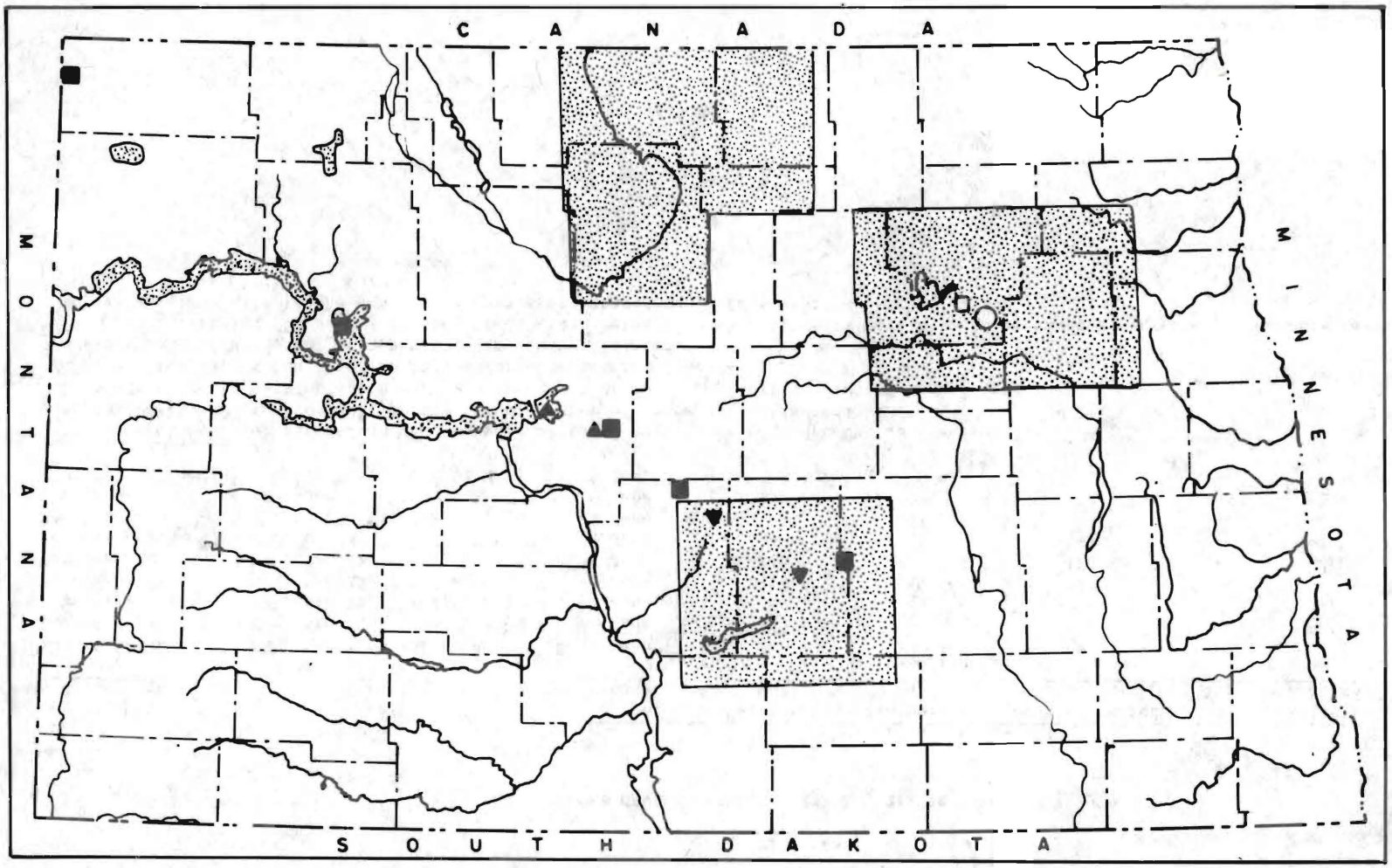


FIGURE 19 1979 SURVEY AREA AND GULL COLONY LOCATIONS

KEY

survey area

colony site

- California gull
- Ring-billed gull
- California and Ring-billed gull
- Unknown gull species
- open symbols indicate unsuccessful colonies.

Table 46

GULL COLONY CENSUS RESULTS (WITH ASSOCIATED SPECIES) - 1979

Colony Name	Location	Date of Census	Number of Active Nests: California Gull	Ring-billed Gull	Double-crested Cormorant	Common Tern	White Pelican
Lake Sakakawea	NW¼, Sec 5, T 151 N, R 91 W	9 June	220 1/	1,250 1/	--	20 2/	--
Lake Audubon	SW¼, Sec 31, T 148 N, R 82 W	21 June	115 1/	--	--	--	--
Lake Williams	NW¼, Sec 26, T 147 N, R 80 W	8 June	304	--	--	--	--
Peterson Lake	NE¼, Sec 25, T 147 N, R 80 W	9 June	160 3/	1,760 3/	190	--	--
Pelican Lake	NE¼, Sec 12, T 144 N, R 77 W	8 June	216	770	126	--	--
Phoenix Twp.	E½, Sec 28, T 143 N, R 75 W	21 June	--	6	-- 4/	--	--
Stony Lake	E½, Sec 7, T 140 N, R 71 W	8 June	--	407	-- 6/	--	-- 5/
Devils Lake	NE¼, Sec 7, T 152 N, R 63 W	6 June	124 5/	409 5/	18	--	3
East Devils Lake	Sec 19, T 152 N, R 62 W	6 June	0 5/	0 5/	--	--	--

1/Estimate of nests obtained from ground count of total population, divided by 1.3 (see text).
2/Approximately 400 to 500 adult common terns; number of nests not estimated.
3/Estimate of nests obtained from aerial photo count of total population, divided by 1.3 (see text).
4/Thirty flightless young observed August 23; none nesting June 8.
5/Nests were initiated, but colony was destroyed by flooding.
6/Cormorants renested (63 nests) in dead trees after being flooded out; there were also 50 to 60 double-crested cormorants nesting approximately ½ mile to the south in a dead tree (these counts from visit on August 22).

listed by Stewart (1975). Areas surveyed in 1977 and 1978 (USBR 1979) were not resurveyed. The Souris, Karlsruhe, New Rockford, and Warwick-McVille proposed irrigation areas were included in the survey areas.

All lakes in each survey area were checked for the presence of islands, and each island was checked for gulls. Counts of nests and/or adult gulls were made at eight colonies between May 28 and June 21. For colonies where adult gulls were counted, estimates of the number of nests were calculated using a correction factor (see results and discussion). Flightless young at Lake Williams and Peterson Lake were banded with standard FWS aluminum leg bands on June 25. Approximate areas of the islands and colonies at nine sites were determined from aerial photographs.

Results and Discussion

Eleven colonies were located (Figure 19). Ten were located during the aerial surveys, and an eleventh small colony (6 nests) was discovered by the Bismarck-Mandan Bird Club in northeastern Burleigh County. Three colonies were previously unreported: one in northeastern Burleigh County (Phoenix Township), one on Devils Lake in Benson County, and one on Lake Sakakawea in Mountrail County. The colony at Pelican Lake in northern Burleigh County was reported in 1978 (USBR 1979). The remaining colonies were listed by Stewart (1975). Six ring-billed gull colonies active between 1951 and 1979 and two California gull colonies active between 1961 and 1972 (Stewart 1975) no longer existed.

Numbers of active nests for the nine colonies censused are shown in Table 46. For those islands where nests were not counted, an estimate of the number of nests was made by dividing the number of adults counted by a conversion factor of 1.3. This was found to be the approximate proportion of adult gulls to nests on 1978 surveys of three colonies.

Lake Williams has one of the largest California gull colonies in the State. Only the Chase Lake colony is known to be larger with 779 and 443 gull nests in 1976 and 1977, respectively (Lingle 1977). The size

Table 47

GULL COLONY AND ISLAND AREAS[1/]

Colony Name	Island Size (hectares)	Colony Sizes (hectares)				
		California Gull	Ring-billed Gull	Gull, sp.	Double-crested Cormorant	Common Tern
Westby	0.5[2/]	--	--	0.5	--	--
Lake Sakakawea	2.4	1.2	0.4	--	--	0.01
Lake Audubon	0.3	--	--	--	--	--
Lake Williams	0.5	0.3	--	--	--	--
Peterson Lake	1.5	0.2	0.7	--	0.05	--
Pelican Lake	0.1	--	--	0.1	0.01	--
Phoenix Twp.	2.1	--	0.01	--	--	--
Stony Lake	0.4	--	0.2	--	0.04	--
Devils Lake [3/]	1.2	0.1	0.3	--	0.02	--
East Devils Lake [3/]	0.0	--	--	--	--	--

1/Areas determined from aerial photographs taken prior to 1979.
2/Includes area of island and penninsula used by nesting gulls.
3/Approximate sizes on June 6, 1979, Devils Lake colony later flooded; East Devils Lake had gulls nesting on May 25, but was flooded by June 6.

of the Westby colony is not known, but it is probably smaller than the Lake Williams colony. The area used by nesting gulls at the Westby colony is similar to that used at Lake Williams (Table 47), but both California and ring-billed gulls nest at Westby and the numbers and proportions of each are unknown. No major changes in colony sizes occurred for the three colonies censused last year (Lakes Williams, Peterson, and Pelican).

Two colonies were unsuccessful. Gulls began nesting at the Devils Lake and East Devils Lake colonies, but the nests were destroyed when the rising lake levels covered the islands. Pelican nests and double-crested cormorant nests were also destroyed at the East Devils Lake colony.

Table 48 shows the number of flightless young gulls that were banded. Adults were not banded or color-marked with patagial tags this year, pending evaluation of the effectiveness of the color-marking done in 1978 (USBR 1979), when 101 gulls were tagged (76 at Lake Williams). The patagial tags were not as visible as was expected, and gulls at colonies did not allow a close enough approach to read numbers on the tags. Although gulls color-marked at Lake Williams were observed frequently in the Lake Williams Area, the number returning to the colony could not be determined since tag numbers could not be read. Four tagged birds were the greatest number observed at any one time. Color-marked birds were not observed at any other colony although observers looked for them during colony censuses.

Table 48

FLIGHTLESS YOUNG GULLS BANDED IN 1979

Area	California Gulls	Ring-billed Gulls	Totals
Lake Williams	290	0	290
Peterson Lake	47	209	256
TOTALS	337	209	546