Waterbird populations and wetland habitats at Goose Lake study site, 1979

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March 1980

INTRODUCTION

The Special Studies section of the U. S. Fish and Wildlife Service conducted investigations in the large lake regime near Teshekpuk Lake in the National Petroleum Reserve-Alaska, each summer from 1977 through 1979, to aid in assessment of bird populations and of habitat used by waterbirds. Results from the 1977 and 1978 field seasons were reported in Derksen et al. (1977), and Rothe et al. (1978), respectively. This report summarizes results from the 1979 field season.

Major objectives of the 1979 season were: (1) record phenology of bird activities and habitat conditions; (2) conduct weekly bird surveys; (3) record nesting, production, and movement of birds; (4) document wetland use by waterbirds; (5) classify all wetlands within the 15.6 km^2 study area; and (6) sample aquatic invertebrates in several classes of wetlands. Distribution, habitat requirements, food preferences, and activity patterns of molting geese were also studied. Information regarding aquatic plant density and frequency of occurrence was gathered for inclusion into the Bergman et al. (1977) wetland classification system.

M. S. Bromley, S. G. Simpson and E. J. Taylor conducted field studies from 1 June to 15 August, 1979. Dr. D. V. Derksen provided expertise and field assistance with portions of the study throughout the summer. C. T. Todd assisted in the field from 6 August through 15 August.

METHODS

Snowmelt, Weather and Water Conditions

Minimum and maximum temperatures, wind direction and velocity, sky conditions and precipitation were recorded on a daily basis throughout the season. Temperatures recorded after 20 July were unreliable due to a malfunctioning thermometer. Weather data recorded at Lonely DEW-site were

obtained from S. Braden, U. S. G. S. - O. N. P. R. A. Qualitative assessments of snow cover, ice conditions and water levels were recorded incidentally.

Wetland Classification

All wetlands on the study area were classified according to Bergman et al. (1977). Area and percent composition of wetland classes were determined with a dot grid on 1:24,000 color aerial photographs. Calculations of area were based on water conditions in early June. Large areas of low-center polygons containing flooded tundra (I) wetlands were outlined, then dot transects (one or several depending on size and uniformity of area outlined) were sampled through each area to determine the actual portion which was water. Areas of other classes of wetlands were determined normally. Ice-wedge pools were not included in wetland classification.

Invertebrate Sampling

Invertebrates were sampled in wetland Classes II-V from 13 June through 11 August. Two representatives of Class II-IV and one of Class V were selected in the study area for invertebrate sampling. Benthic and free swimming macroinvertebrates were collected by taking two Ekman dredge samples and three 1 meter sweep samples in both the shoreward (usually vegetated) and open zone of each Class II-IV wetland. Fourteen Ekman dredge samples were collected from the Class V wetland. Invertebrates were counted, sorted into broad taxonomic groups, and preserved in 10 percent formalin solution. Water depth, sediment thaw depth, water temperature, specific conductance and pH were recorded at each sample for wetland Classes II-IV.

Aircraft Disturbance

Responses of birds and caribou to fixed and rotor-wing aircraft were recorded incidentally throughout the summer (see Appendix 1). Date, time,

location, description of aircraft, estimated altitude, and observed response were noted.

Bird Census and Chronology

Eight large bird censuses on the 15.6 km^2 study area, and eight small bird censuses on six 0.6 km^2 plots were conducted similar to Derksen et al. (1977). Censuses were done by two or three observers, beginning 10 June and thereafter at 6 to 9 day intervals until 2 August.

Information concerning migration, population densities, and activity patterns of birds using the study area and Goose Lake was recorded daily (Appendix 2).

Observers recorded size, age composition (where possible), location, habitat, activity and flight capability for flocks of white-fronted and Canada geese and black brant throughout the field season.

The term "study area" refers to the 15.6 km^2 area on which large bird censuses were conducted and including the small bird census plots. Figure 1 shows the location of the census areas.

Nesting and Production

Nests were found opportunistically and marked with a numbered stake. Nests were revisited after hatching had occurred in order to minimize disturbance. Consequently, we forfeited some data on clutch size and hatching success. Brood observations were recorded throughout the study period. In addition to recording size, age, and behavior of broods, information concerning habitat type and association with other birds was also noted.

Wetland Use

Observations of wetland use by waterbirds were compiled during large and small bird surveys. For each observation, date, weather, wetland class,

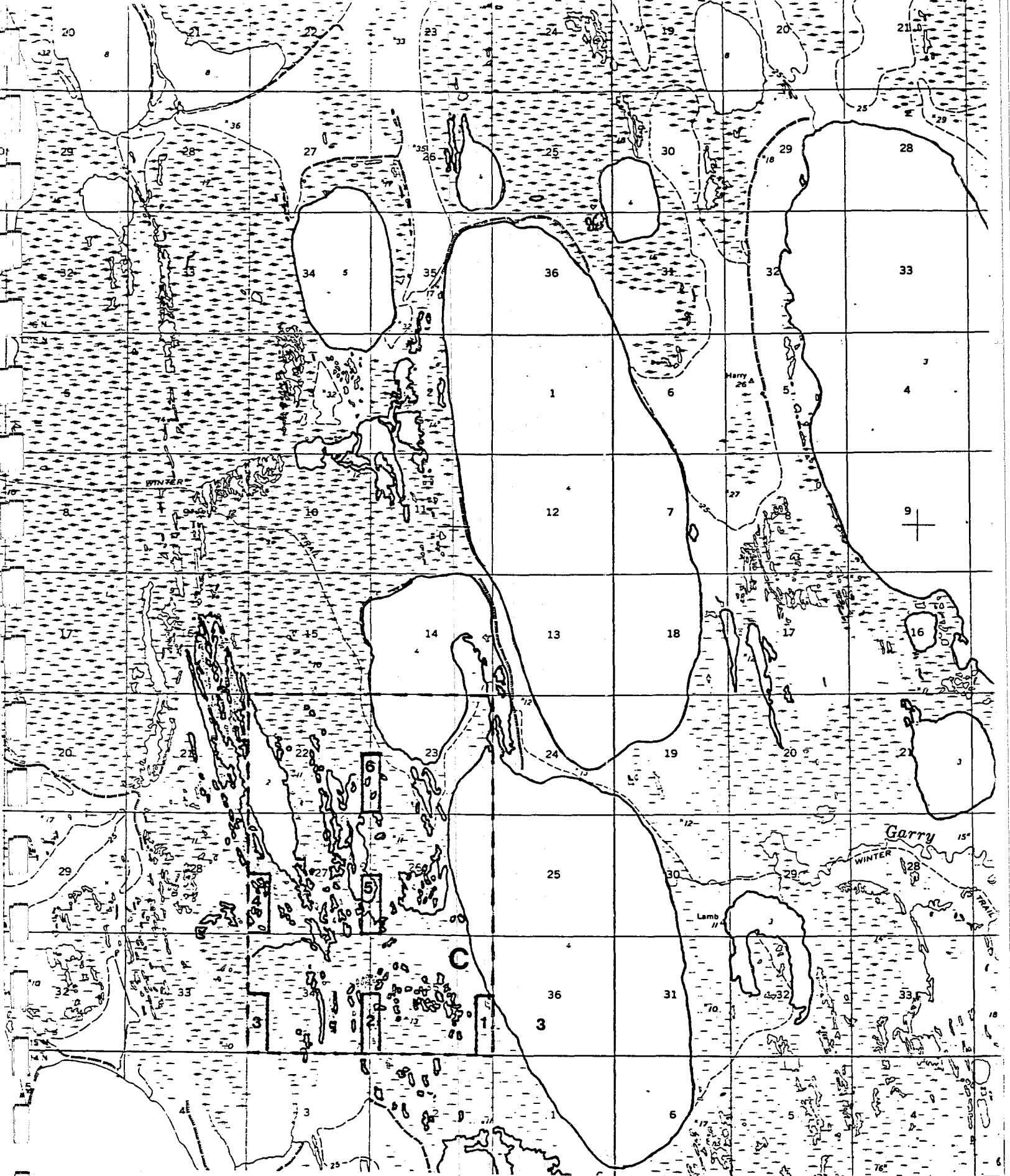

Fig. 1. Goose Lake 1979, 15.6 km^2 large bird census area (---) and six 0.16 km^2 small bird census plots. "C" = camp.

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species, flock size, sex (if known), and activity was recorded. Because observations were made during bird surveys, all wetland types were covered in proportion to their distribution. Data collected in this manner minimized observer bias.

Mammal Observations

Total numbers of caribou (Rangifer sp.) observed were recorded daily. Size and composition of major migrating herds were recorded on prepared data forms. Arctic fox (Alopex lagopus) and small mammal observations were made incidentally.

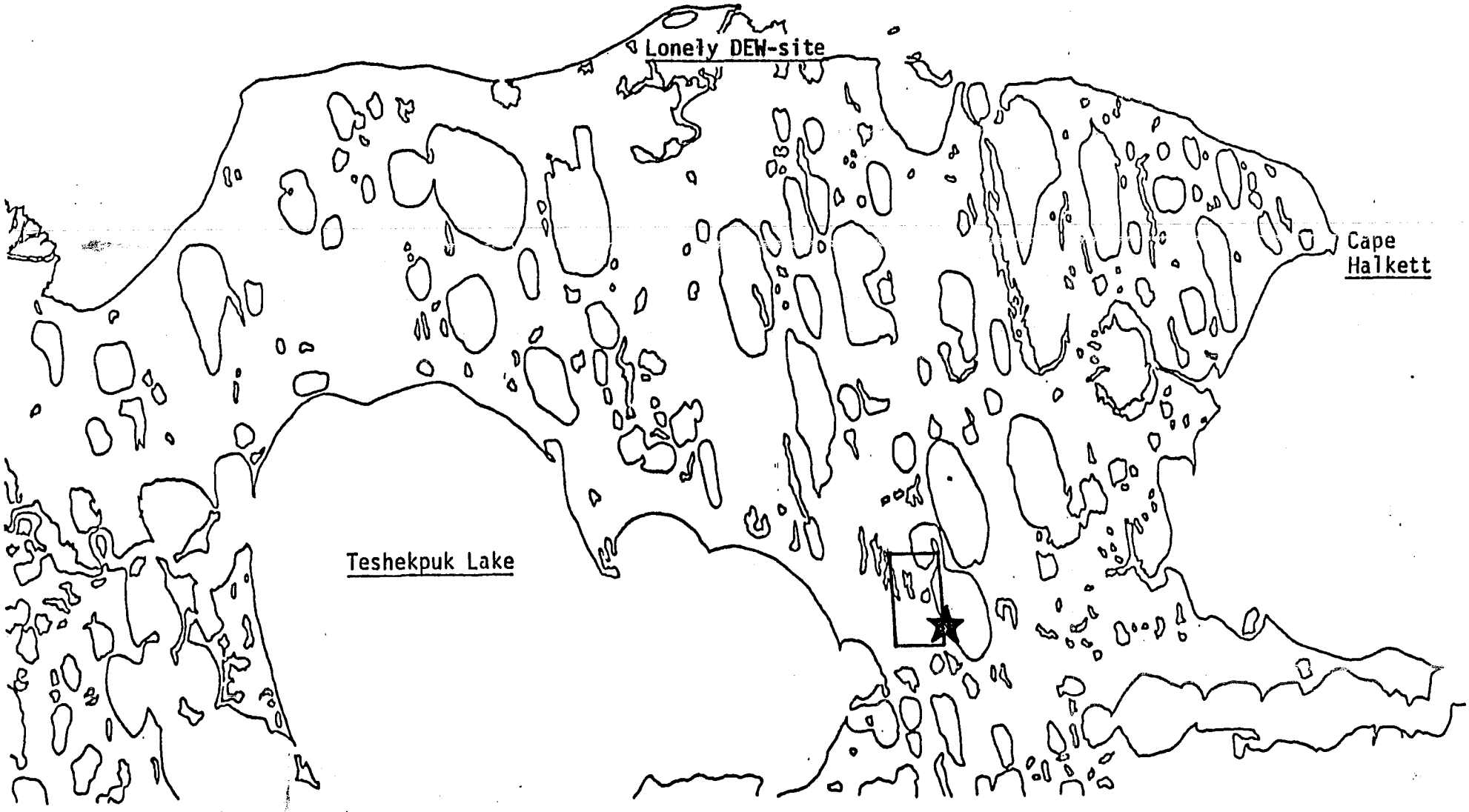
Plants

Plants were collected throughout the study period in conjunction with other field work. Entire plants were collected and pressed. A collection number was assigned to each specimen(s). Information on habitat, slope, relative soil moisture, soil texture, flower color and odor, and associated species was compiled for each collection.

Study Area

The Goose Lake study site was located 35 km south-southeast of Lonely DEW-site, less than 1.5 km east of Teshekpuk Lake (70° 35'N, 152° 50'W). The study area included sections 22, 23, 26, 27, 34 and 35 (T15N, R4W, Umiat meridian) on the U. S. Geological Survey map of Harrison Bay (C-5) quadrangle. Figure 2 shows the location of the study area in the large lake regime northeast of Teshekpuk Lake. A description of physical features of the study area is given in the Wetland Classification section of this report. Bergman et al. (1977) provides a more detailed description of the physical geography of the Arctic Coastal Plain.

Figure 2. Location of Goose Lake camp (★) and the Goose Lake study area (□) in the large lake regime northeast of Teshekpuk Lake, NPR-A.



RESULTS AND DISCUSSION

Snowmelt, Weather and Water Conditions

Spring thaw occurred earlier than in 1978. Snow cover on the Goose Lake study area was estimated at 40 to 60 percent on 1 June, but by 4 June was less than 10 percent. All large lakes and ponds were ice-covered on 1 June. By 10 June, nearly all flooded tundra (I) areas and shallow-Carex (II) ponds were ice free, open water had appeared in the larger deep-Arctophila (IV) wetlands, and patches of rotting ice appeared in Goose Lake (V). By 10 June, snow cover on the study area was less than 1 percent.

Summaries of seasonal temperatures, sky conditions and precipitation are presented in Tables 1 and 2. Winds blew from the northeast or east 44 of 75 days. During mid-July, temperatures recorded at Goose Lake were somewhat higher than temperatures at Lonely DEW-site (mean maximum 13 to 19 July at Goose Lake 19.4°C, at Lonely DEW-site 13.9°C). Otherwise, temperatures at the two sites appeared similar.

By 17 June, an open moat appeared around the west shore of the north end of Goose Lake, but it did not extend to the south end of the lake until the end of June. By 12 July large open leads appeared on Goose Lake. Warm temperatures on 13 to 15 July, followed by two days of east winds, completed break-up on Goose Lake. By 19 July only a small raft of ice remained in the southwest corner of the lake.

Most shallow-Arctophila (III) and deep-Arctophila (IV) wetlands were ice-free by 20 June, and by that date many flooded tundra (I) areas, both in large basins and in low-center polygons, were dry. There was some temporary reflooding of low-center polygons by rains around 10 July. By the end of July, 10 percent of the shallow-Carex (II) wetlands contained no standing water, although the sediment remained saturated or moist.

Table 1. Mean minimum and maximum temperatures (°C) recorded at Lonely DEW-site, summer 1979.

Date	Mean Minimum	Mean Maximum	Range
1- 7 June	-3.4	1.6	-4 to 3
8-14 June	0.3	5.7	-3 to 10
15-21 June	0.7	4.6	0 to 8
22-28 June	2.0	7.9	-1 to 13
29- 5 July	2.2	16.1	-1 to 22
6-12 July	2.0	9.3	0 to 14
13-19 July	3.7	13.9	2 to 23
20-26 July	3.4	10.7	1 to 20
27- 2 August	3.9	10.7	2 to 16
3- 9 August	0.9	5.3	-1 to 11
10-15 August	3.0	10.9	2 to 20

Table 2. Cloud cover and precipitation at Goose Lake, summer 1979.

Month	N	Number of Days				
		Clear	Partly Cloudy	Overcast	Fog	Precipitation
June	30	9	7	14	4	8
July	31	15	8	8	10	9
August	15	5	2	8	7	3
Season	76	29	17	30	21	20

Wetland Classification

Over half of the Goose Lake study area was composed of wetlands, one third of which were flooded tundra (I) (Table 3), at least during early June. Goose Lake (V) occupied most of the eastern and over one third of the northern boundaries of the study area. Deep-Arctophila (IV) wetlands were all located in the northern two-thirds of the study area in a large old drained lake basin. Numerous small shallow-Arctophila (IV) wetlands were in the center of the basin. The remainder of the basin was characterized by a network of low-center polygons in the north and shallow-Carex (II) and flooded tundra (I) wetlands in the south. The southern third of the study area contained upland habitat alternating with complexes of shallow-Carex (II) wetlands, and part of a large drained lake basin comprised of flooded tundra (I) and shallow-Arctophila (III) wetlands.

Wetland composition of the Goose Lake site was similar to that of the East Long Lake study area (Rothe et al. 1978) except in the proportion of flooded tundra (I) wetlands. If wetland area at Goose Lake was calculated as in the 1978 report, flooded tundra would comprise 54 percent of the total wetland area and 37 percent of the total study area in early June.

Invertebrate Sampling

Invertebrates were first observed on 3 June when tadpole shrimp (Notostraca) were observed in ice free holes of a deep-Arctophila (IV) wetland. Location of 7 wetlands sampled for invertebrates is shown in Figure 3. Wetland Classes II-IV were sampled 3 times each during the study period (Table 4). Association of major invertebrate groups with specific wetland types and frequency of occurence were summarized (Table 4). Volumetric analysis and identification of invertebrates by species have not been determined at this time. Wetland Classes II-IV contained the same major invertebrate groups. An exception was

Table 3. Area and percent composition of wetlands in the Goose Lake study area, 1979.

Wetland Class	Area (ha)	Percentage of total wetland areas	Percentage of total study area
I	294.5	34	19
II	108.5	13	7
III	31.0	4	2
IV	217.0	25	14
V	217.0	24	14
Total	868.0	100	56

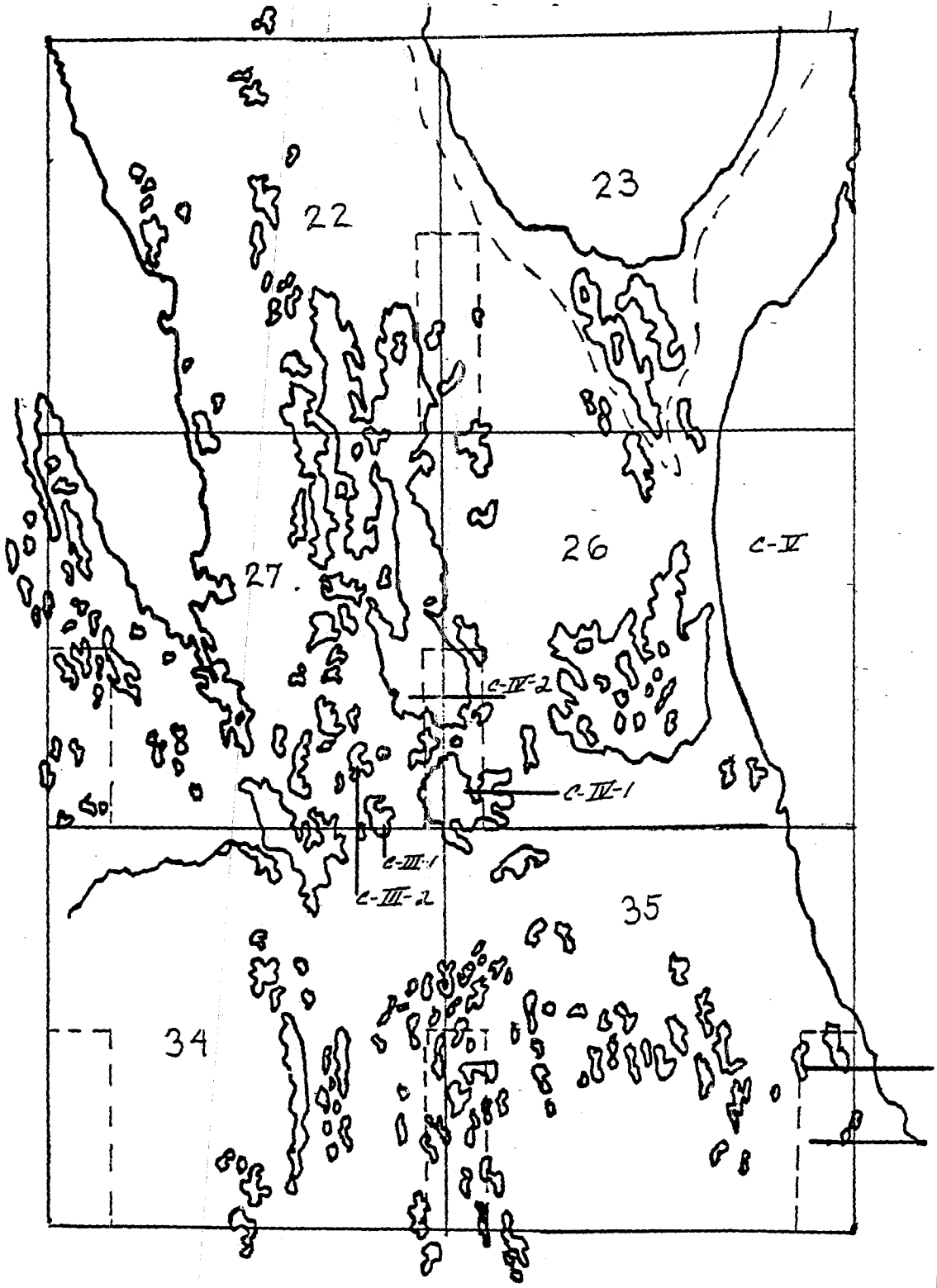


Figure 3. Location of wetlands sampled for invertebrates 13 June - 11 August 1979.

WETLAND	C-II-1			C-II-2			C-III-1			C-III-2			C-IV-1			C-IV-2			C-V
SAMPLE DATE	13 JUNE	21 JUNE	15 JULY	13 JUNE	21 JUNE	15 JULY	14 JUNE	27 JUNE	16 JULY	14 JUNE	27 JUNE	16 JULY	20 JUNE	28 JUNE	21 JULY	20 JUNE	28 JUNE	21 JULY	8-11 AUGUST
INVERTEBRATE TAXA																			
Coelenterata - Hydrozoa							•				•				•		•	•	
Platyhelminthes - Turbellaria	•	•	•	•	•	•	•	•	•		•	•					•	•	•
Nemertea		•	•		•				•				•			•	•	•	•
Nematoda		•	•				•		•					•	•		•	•	•
Nematomorpha									•									•	
Annelida																			
Oligochaeta	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•
Hirudinea	•																		
Arthropoda																			
Crustacea																			
Anostraca	•	•	•	•	•	•	•	•	•		•	•							
Notostraca	•				•		•	•	•		•	•		•	•		•	•	•
Conchostraca			•			•	•	•	•		•	•		•	•		•	•	
Cladocera			•			•	•	•	•		•	•		•	•		•	•	
Ostracoda			•			•													
Eucopepoda			•			•	•	•	•		•	•	•	•	•		•	•	
Amphipoda											•								
Arachnida																			
Hydracarina	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Insecta																			
Collembola				•	•	•	•	•	•		•	•							
Plecoptera	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	
Trichoptera	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Coleoptera			•					•											
Diptera																			
Tipulidae			•								•								
Culicidae						•			•			•					•	•	
Chironomidae	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Mollusca																			
Gastropoda	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Pelecypoda																			•

Table 4. Wetland sample dates and associated invertebrate groups, Goose Lake, 1979.

fairy shrimp (Anostraca), which occurred in samples taken from Class II and III ponds, but were not recorded in the 2 Class IV wetlands sampled.

During the first sample period (13-20 June free) swimming invertebrates collected with sweep nets were found principally in the shoreward (usually vegetated) zone (Table 5).

Major invertebrate groups collected with sweep nets during the period included stone fly (Plecoptera), caddisfly (Trichoptera), and midge (Chironomidae) larvae, water mites (Hydracarina) and flatworms (Turbellaria). Ekman dredge samples contained midge larvae, freshwater mites and aquatic earthworms (Oligochaeta).

In addition to invertebrates collected earlier, several new invertebrate groups appeared during the second sample period (21-28 June). Tadpole shrimp (Notostraca) were collected for the first time and were found in all wetlands. Springtails (Collembola) and water fleas (Cladocera) were found in 67 percent of the wetlands sampled. Clam shrimp (Conchostraca) and Hydra sp. (Coelenterata) were found in 50 percent of the wetlands sampled. On 28 June, adult midges were observed windrowed along the shore and on emergent Arctophila. One sweep sample in the vegetated zone of a deep-Arctophila (IV) wetland contained 279 adult midges. Roundworms (Nematoda) were found in dredge samples and occurred in 80 percent of the wetlands.

Because of work schedule conflicts, invertebrates were not sampled again until 15-21 July. Sweep samples contained a greater number and diversity of species. Large numbers of adult midges were replaced by an extreme abundance of cladocerans. Mean number of cladocerans collected in Class II and III open water sweep samples during this time was approximately 150 and 440/m^3, respectively.

Cladocerans were attracted to the open zone of shallow-Carex (II) wetlands, but were very abundant in open patches of Arctophila in Class III and IV

Table 5. Mean chemical and physical parameters and mean number of organisms/sweep sample of wetland classes II-IV, Goose Lake, 1979.

Parameter	Wetland	13-20 June	21-28 June	15-21 July
pH	C-II-1	7.7	7.6	8.2
	C-II-2	7.5	7.6	8.2
	C-III-1	7.7	7.7	8.8
	C-III-2	7.7	7.9	8.2
	C-IV-1	7.5	7.6	8.7
	C-IV-2	7.7	7.6	7.9
Conductivity (mmhos/cm)	C-II-1	105	110	170
	C-II-2	102	115	190
	C-III-1	60	130	215
	C-III-2	85	130	230
	C-IV-1	65	100	150
	C-IV-2	75	103	155
Temperature (°C)	C-II-1	3.5	5.5	17.5
	C-II-2	3.8	6.5	18.5
	C-III-1	3.8	7	18
	C-III-2	6	10	19
	C-IV-1	3	8	10
	C-IV-2	4.5	9	10.5
Sediment thaw (cm)	C-II-1 vegt. (5)[a]	6.9	15.1	35.0
	C-II-1 open (5)	6.9	14.6	36.7
	C-II-1 all (10)	6.9	14.8	35.8
	C-II-2 vegt. (5)	6.2	13.1	36.6
	C-II-2 open (5)	7.3	12.2	36.4
	C-II-2 all (10)	6.7	12.7	36.5
	C-III-1 vegt. (5)	6.0	14.5	37.2
	C-III-1 open (5)	5.4	13.8	33.5
	C-III-1 all (10)	5.7	14.1	35.4
	C-III-2 vegt. (5)	6.6	15.4	37.5
	C-III-2 open (5)	5.6	16.6	44.0
	C-III-2 all (10)	6.1	16.0	40.8
	C-IV-1 vegt. (5)	2.0	9.8	34.0
	C-IV-1 open (5)	0.5	10.1	33.8
	C-IV-1 all (10)	1.25	10.0	33.9
	C-IV-2 vegt. (5)	1.9	13.7	60.0
	C-IV-2 open (5)	4.1	15.6	59.0
	C-IV-2 all (10)	3.0	14.6	59.5
Sweep samples (organisms/m^3)	C-II-1 vegt. (3)	9	43.3	127.7
	C-II-1 open (3)	8	18	178
	C-II-1 all (6)	18.5	32.2	152.8
	C-II-2 vegt. (3)	18.7	56.3	64.7
	C-II-2 open (3)	0.33	1.7	181.7
	C-II-2 all (6)	9.5	30.7	123.2
	C-III-1 vegt. (3)	41	57	146
	C-III-1 open (3)	0.33	30.3	415.3
	C-III-1 all (6)	20.7	43.7	280.7
	C-III-2 vegt. (3)	62.7	64	52.7
	C-III-2 open (3)	0.67	75	545
	C-III-2 all (6)	31.67	69.5	298.8
	C-IV-1 vegt. (3)	52.3	190.7	122.3
	C-IV-1 open (3)	0	49	96.7
	C-IV-1 all (6)	26.2	119.8	109.5
	C-IV-2 vegt. (3)	20.7	112.3	4740.3
	C-IV-2 open (3)	0	24.3	1672.7
	C-IV-2 all (6)	10.3	68.3	3306

[a] Sample size in parentheses.

wetlands. A single sweep sample ($1m^3$) in the Arctophila zone of a Class IV wetland contained 11,322 Cladocerans. Copepods were found in at least 1 sweep sample in all wetlands and at greater numbers. Midge larvae and oligochaetes were the principal benthic organisms collected during this period.

Mean number of invertebrates per sweep sample was calculated (Table 5). Means were derived for vegetated and open zones (3 sweep samples per zone) and all samples combined (6 sweeps). Although sample size is small, invertebrates generally increased during the sample period (Figures 4-6). Because Ekman dredge samples were highly variable in respect to substrate type and actual volume, organisms per dredge sample was not calculated. For example, large samples consisting mostly of silt often contained few midge larvae as compared to small fibrous substrate samples.

A Class V wetland was sampled for invertebrates at 14 locations from 8-11 August (Figure 7). Twelve sites were located 100-200 m from shore in a circular pattern. Two additional sites were chosen where molting oldsquaws were observed feeding. Benthic organisms were sampled with an Ekman dredge; 1 dredge sample per site (site 1-12) and 3 dredge samples per site (oldsquaw feeding sites 1, 2). Midge larvae were dominant in most samples. Fingernail clams (Pelecypoda), oligochaetes, round worms, and freshwater mites were also common. In a sample which primarily consisted of green filamentous algae, water mites were especially abundant. Sample sites 115, located along the west shore, and oldsquaw feeding locations generally contained a higher number of midge larvae relative to sites 6-12, located along the east shore. Fingernail clams were not collected in any other wetland classes.

Mean physical and chemical parameters were summarized (Table 5). Temperature, pH, and conductivity generally increased during the sample period. Conductivity was greatest in Class III wetlands, though sample size is small. Mean sediment

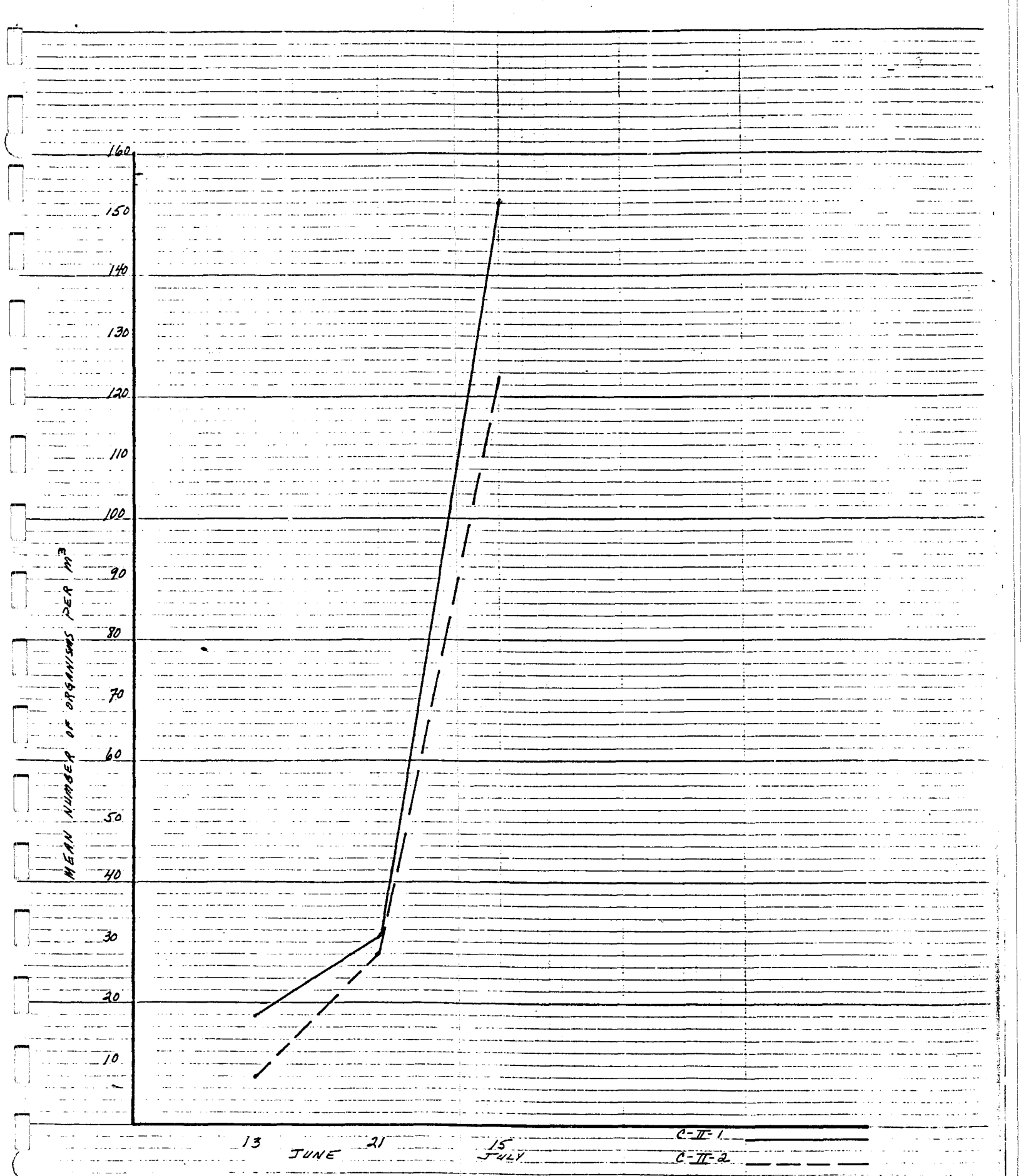


Figure 4. Mean number of invertebrates collected in 6 sweep net samples in wetlands C-II-1 and C-II-2 on 13, 21, June and 15 July 1979.

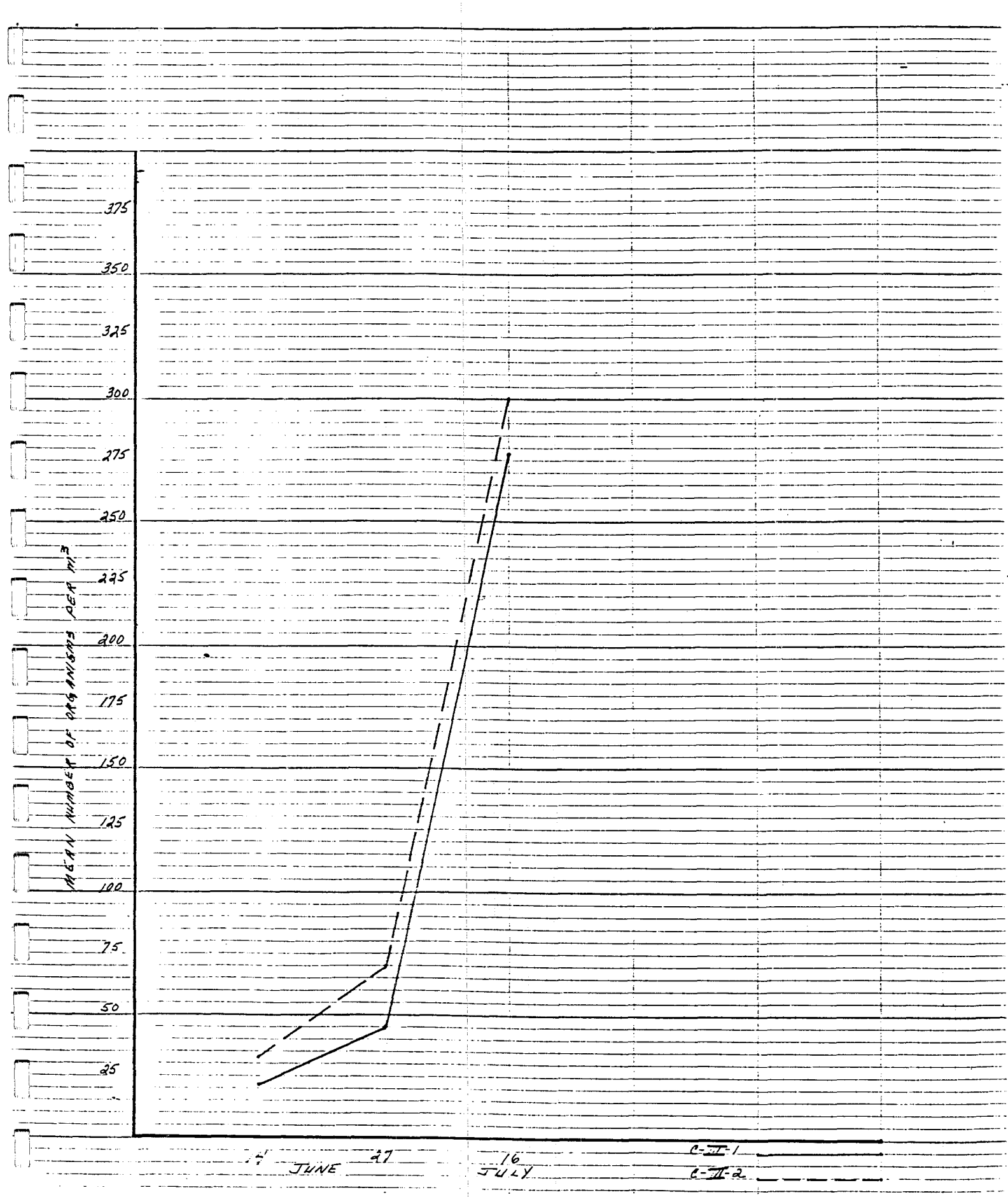


Figure 5. Mean number of invertebrates collected in 6 sweep net samples in wetlands C-III-1 and C-III-2 on 14, 27, June and 16 July 1979.

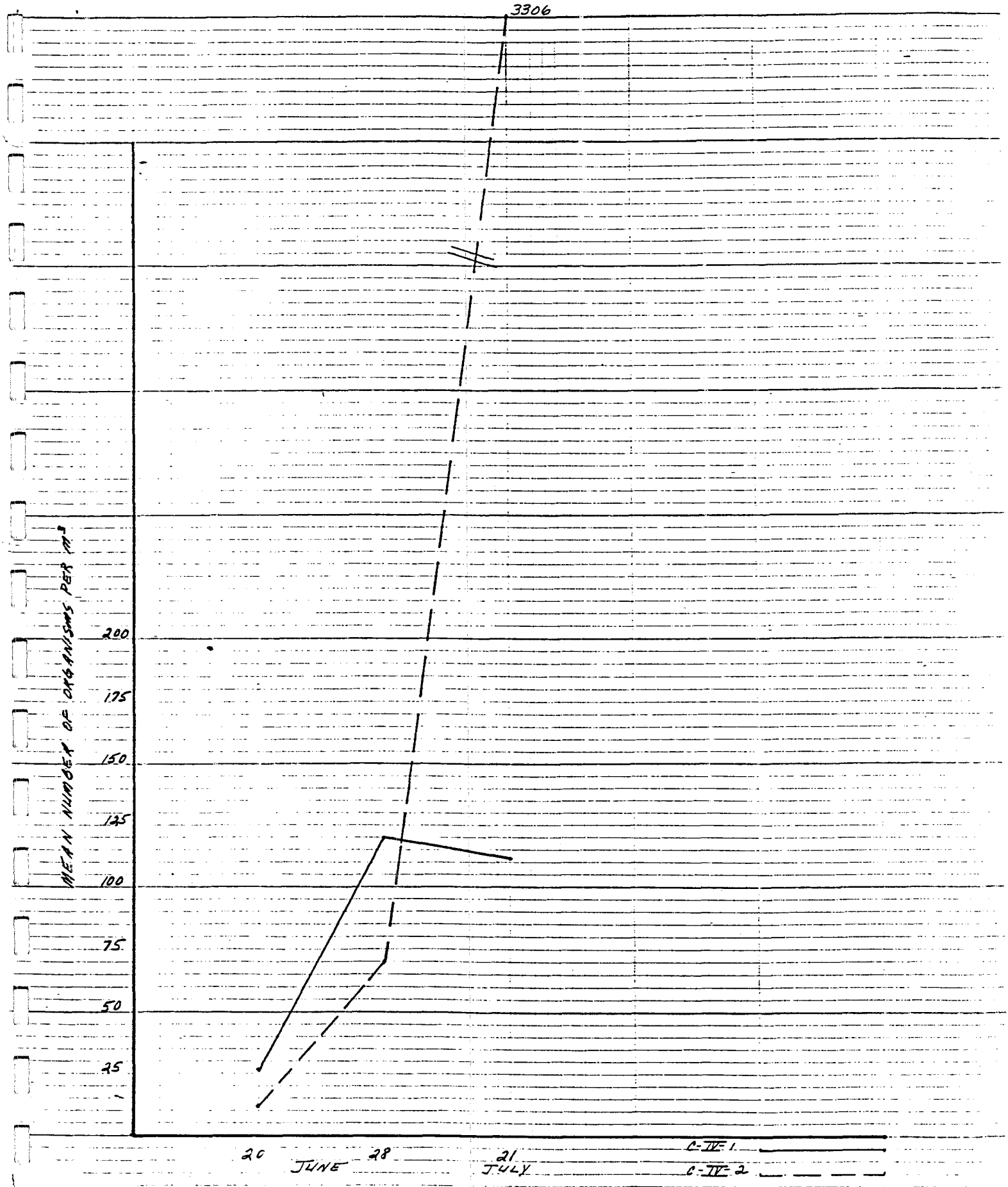


Figure 6. Mean number of invertebrates collected in 6 sweep net samples in wetlands C-IV-1 and C-IV-2 on 20, 28, June and 21 July 1979.

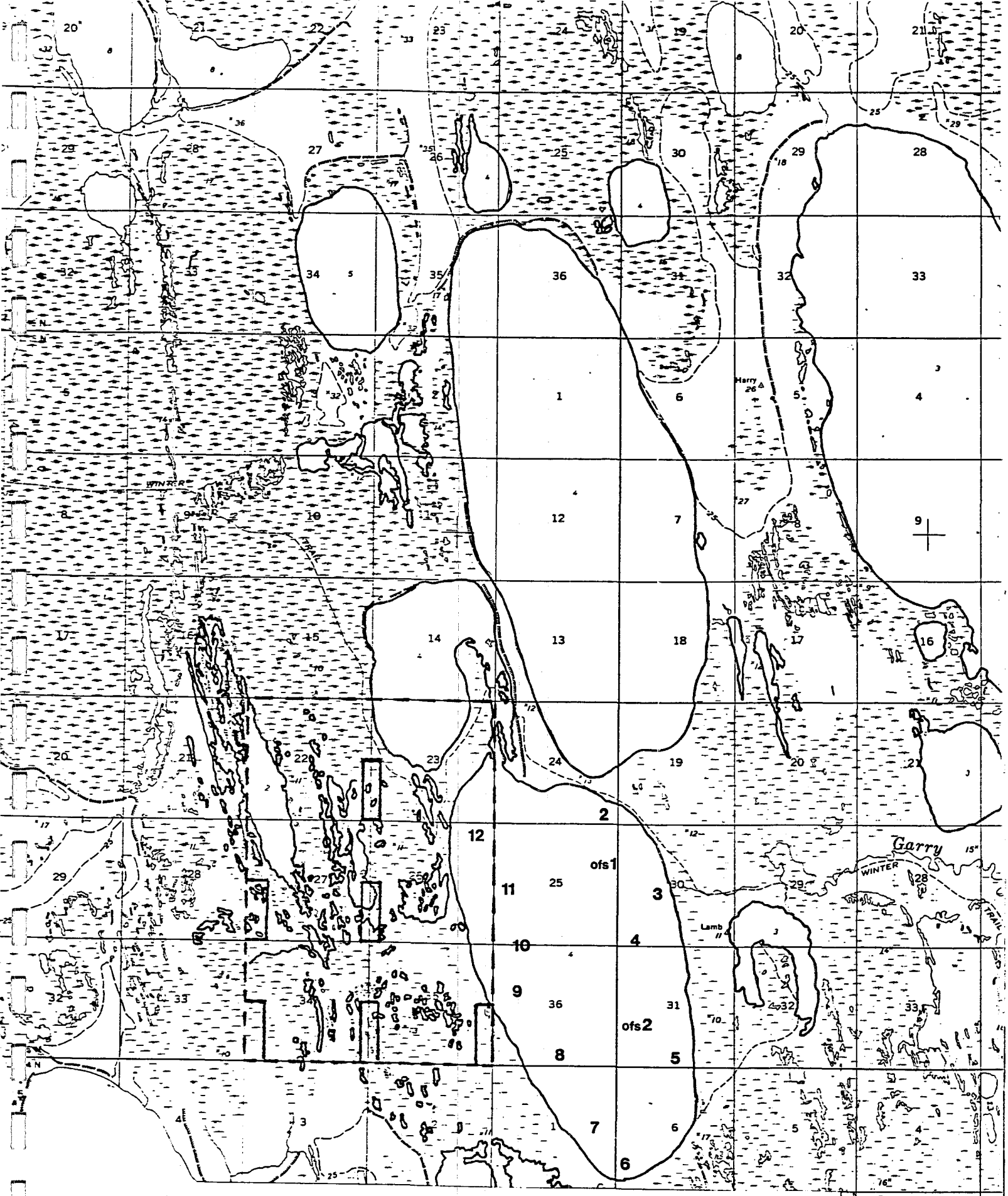


Figure 7. Class V invertebrate sample sites. O.F.S. refers to oldsquaw feeding site.

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thaw depth was calculated for the vegetated zone (5 samples/wetland/sample period), open zone (5 samples/wetland/sample period) and both zones combined (10 samples). Water depth and sediment thaw depth of vegetated and open zones in each wetland were plotted (Figures 8-13).

Recommendations

Invertebrates sampled more frequently and systematically would provide greater information on diversity and density. All wetland classes should be sampled within several days in order to compare information. Sample sites within a particular wetland should remain constant. Volume and substrate type of each Ekman dredge sample should be recorded before actual sorting and counting. Conductivity and pH measurements should be collected in the same location of a wetland, preferably the open zone. Water depth was often difficult to obtain by using a meter stick because of wave action and problems in determining when the bottom was reached (top sediments allowed the meter stick to sink through - creating a bias). By using an electronic depth indicator, this problem would be eliminated. Invertebrate sampling on Class V wetlands should start when ice begins to break up during early July.

Aircraft Disturbance

Air traffic over the study area ranged from no aircraft on days of inclement weather to at least three helicopter and four airplane overflights per day.

Responses of geese to aircraft were most readily noted prior to the onset of molting. Black brant flushed in response to a Bell 205 helicopter approximately three miles away on one occasion, but two days earlier four black brant did not fly when the same aircraft passed over within one-quarter mile at an altitude between 300 feet and 500 feet. Small groups of white-fronted geese flushed when fixed-wing aircraft flew over at 1000 feet and 1500 feet, but

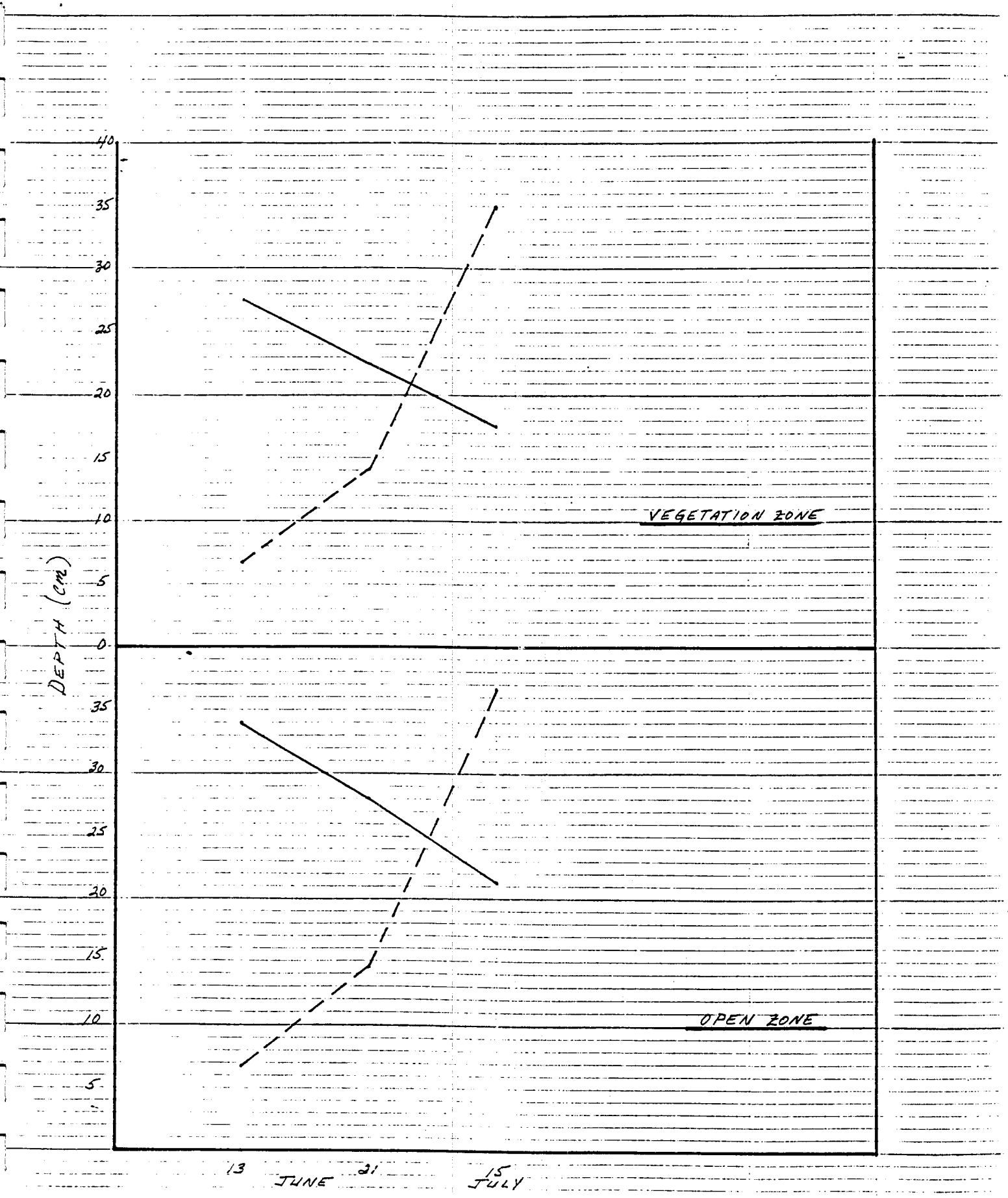

Figure 3. Water and sediment depth in vegetated and open zone of wetland C-II-1 on 13, 21, June and 15 July 1979.

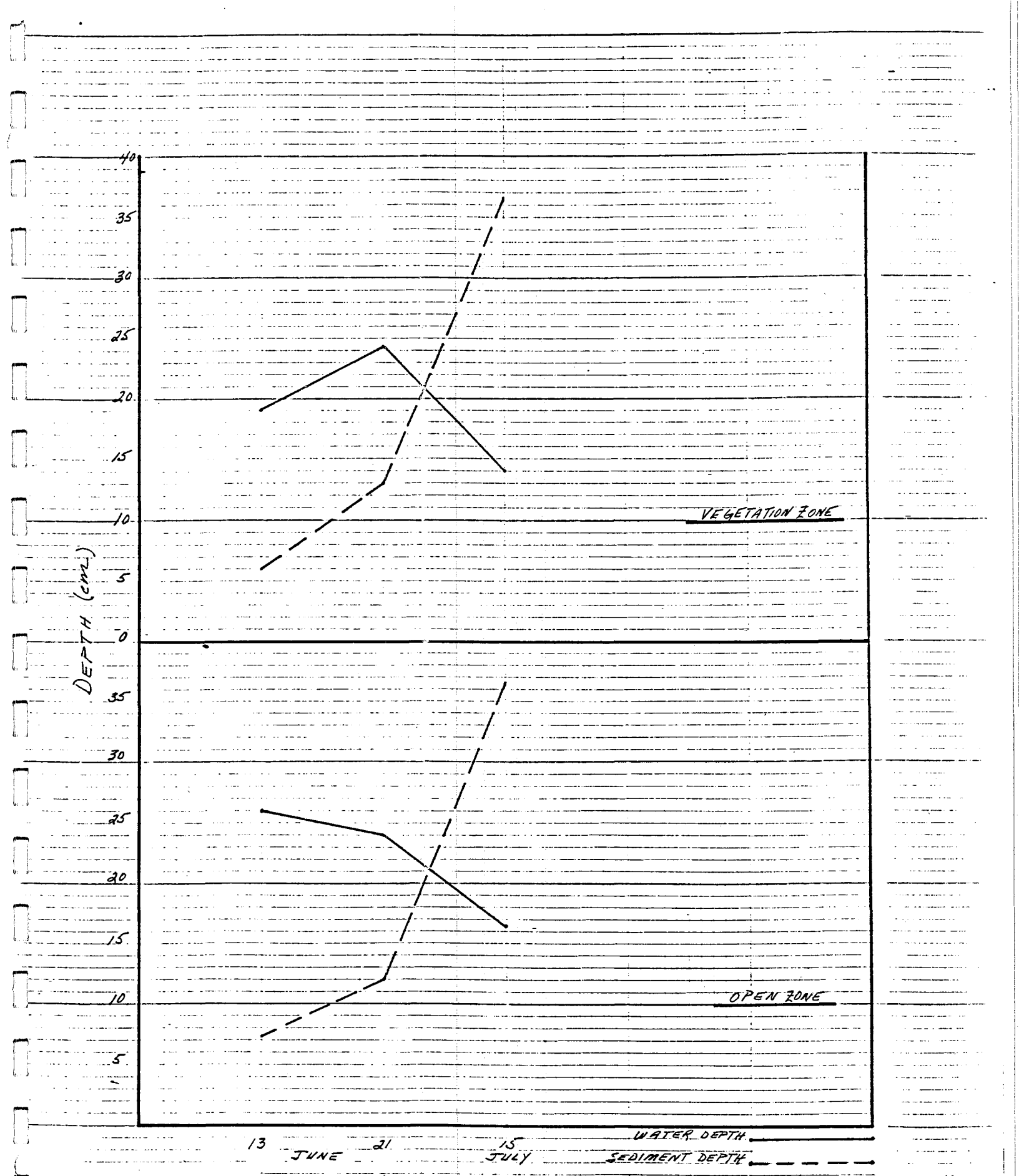

Figure 9. Water and sediment depth in vegetated and open zone of wetland C-II-2 on 13, 21, June and 15 July 1979.

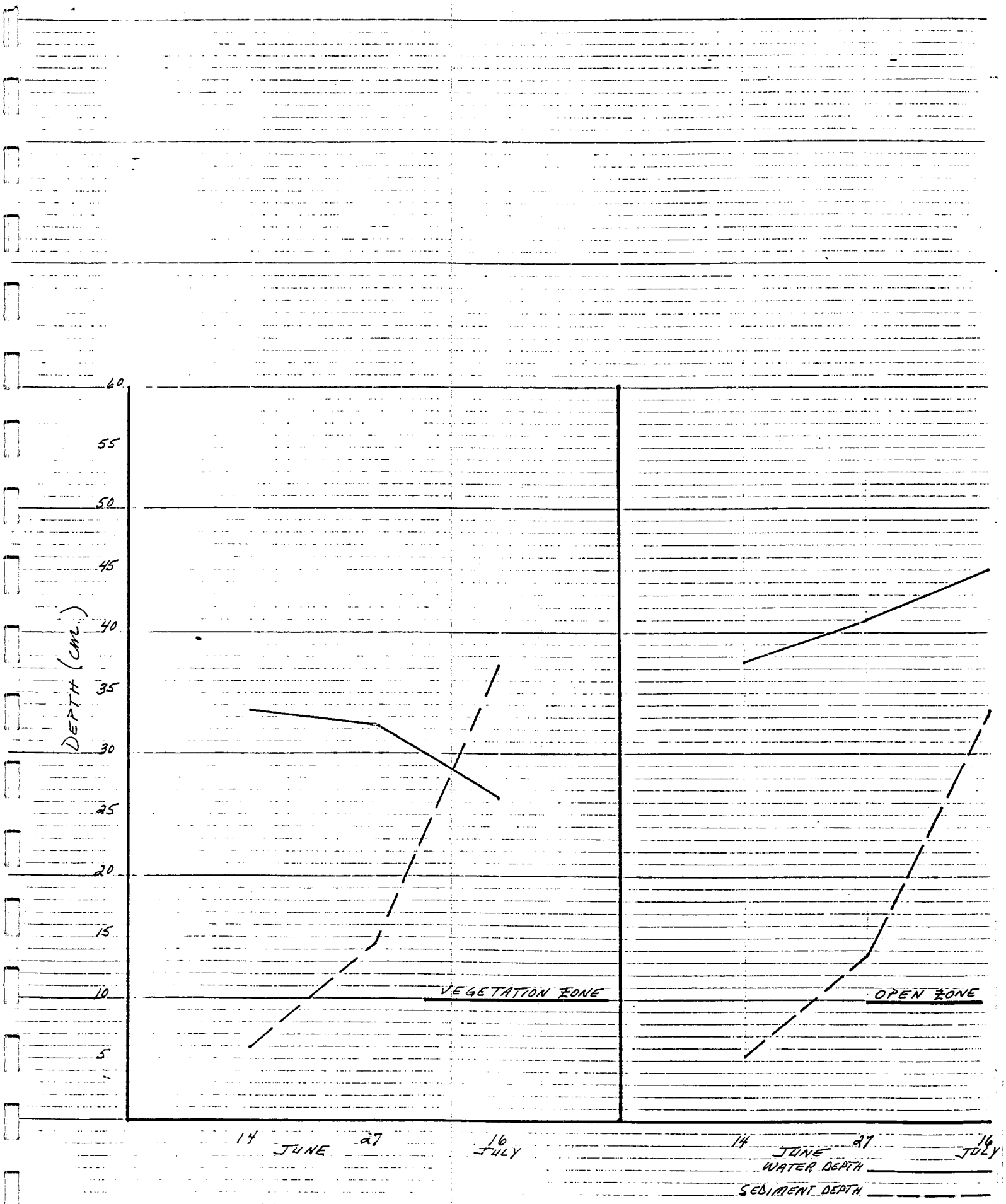

Figure 10. Water and sediment depth in vegetated and open zone of wetland C-III-1 on 14, 27, June and 16 July 1979.

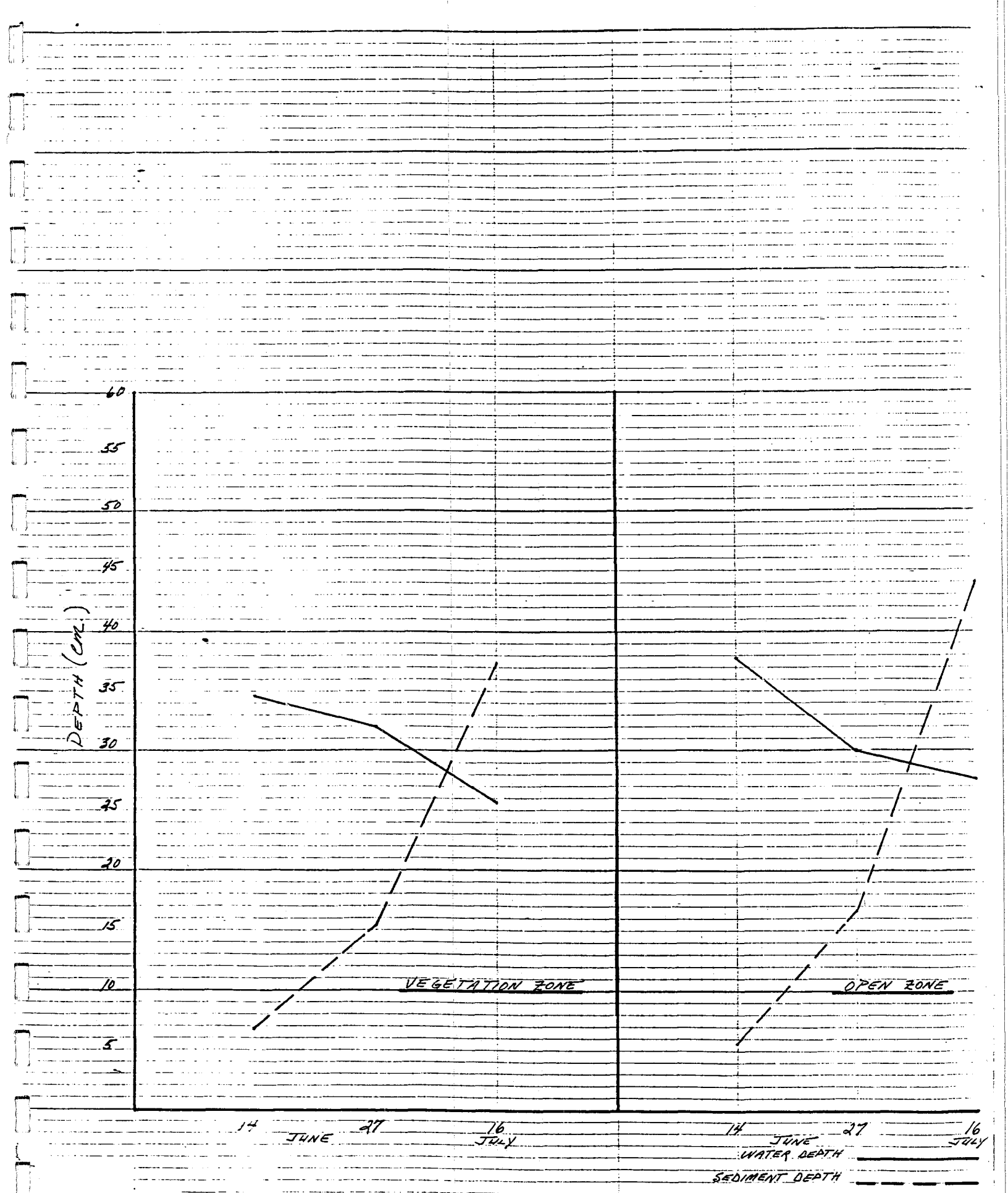

Figure 11. Water and sediment depth in vegetated and open zone of wetland C-III-2 on 14, 27, June and 16 July 1979.

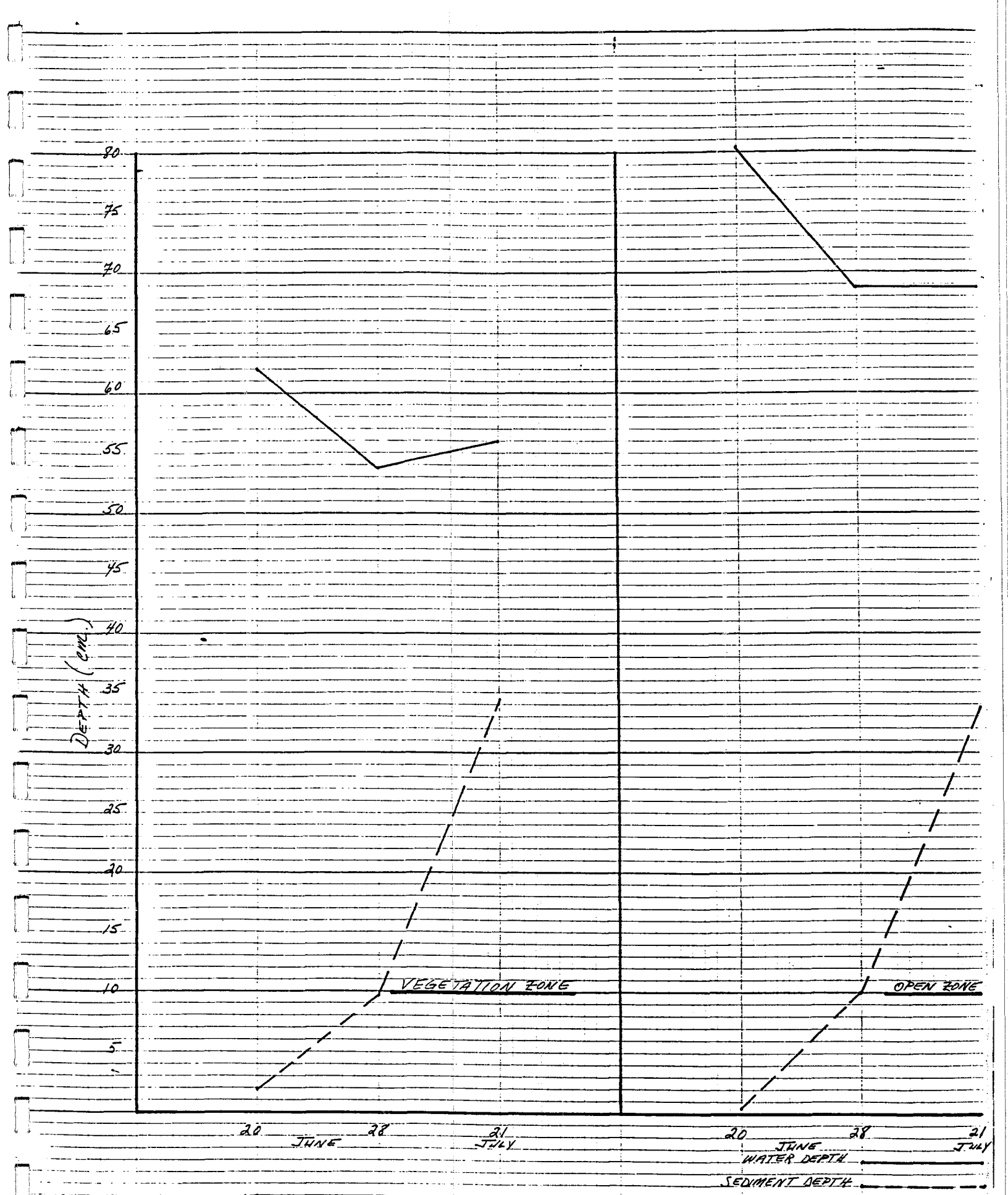

Figure 12. Water and sediment depth in vegetated and open zone of wetland C-IV-1 on 20, 28, June and 21 July 1979.

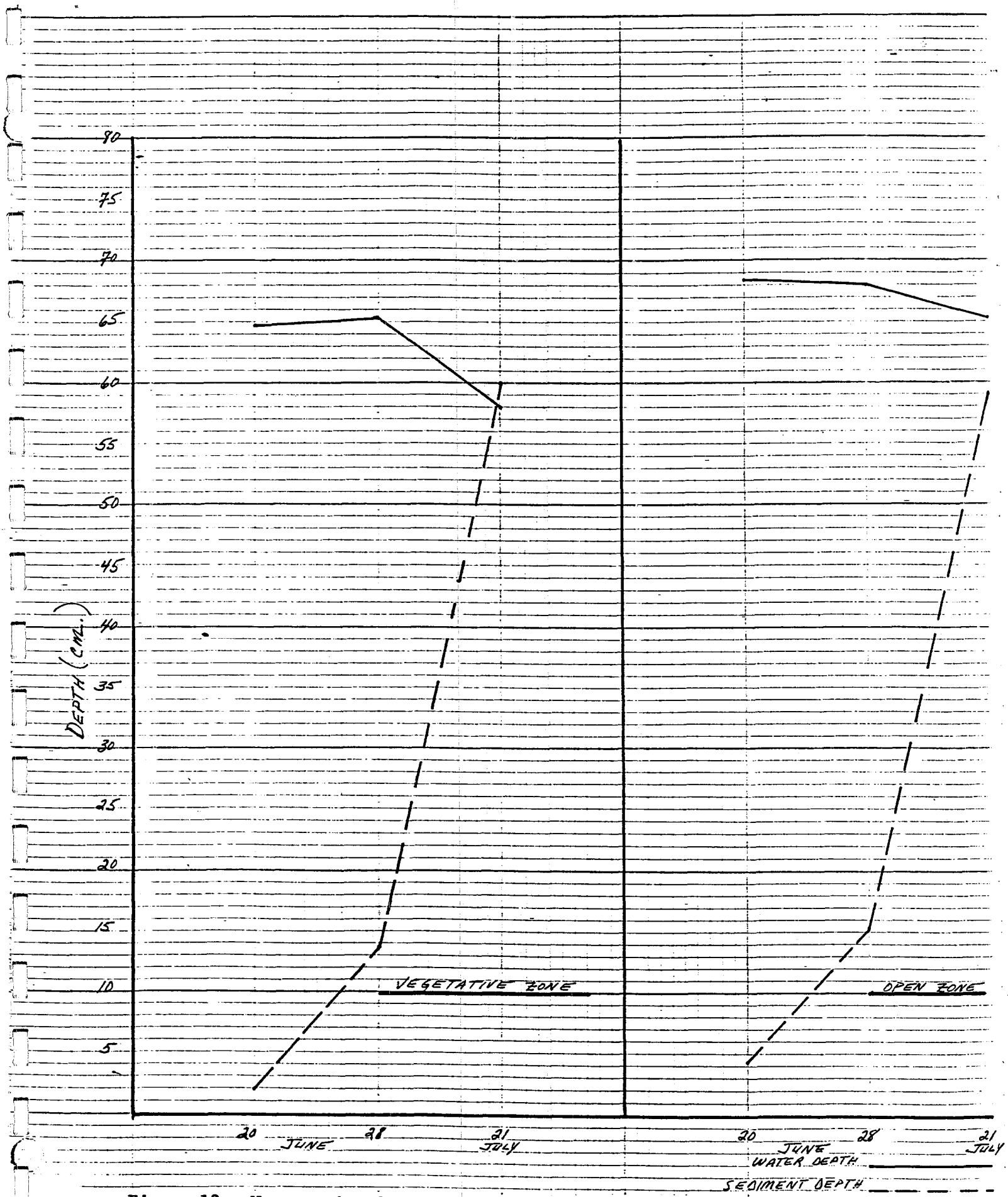

Figure 13. Water and sediment depth in vegetated and open zone of wetland C-IV-2 on 20, 28, June and 21 July 1979.

circled and resettled within minutes. On one occasion a pair of white-fronted geese did not flush when a single-engine plane flew over them at 1000 feet, although a pair of king eiders nearby did fly. In mid-July, a flock of 75 white-fronted geese near the shore of Goose Lake stopped feeding, assumed alert posture, then ran along the shoreline calling in response to a twin engine plane at an altitude of approximately 10,000 feet. The flock did not move to open water, and resumed feeding after two minutes.

Other birds observed when aircraft passed over included arctic loons, spectacled and king eiders, glaucous gulls and shorebirds (see Appendix 1). Ten of 23 observations of fixed-wing aircraft indicated no reaction of birds. Only 4 of 12 observations of helicopters involved no noted disturbance to birds. Observations of no response of birds to aircraft may have been due to: (1) no birds present in the flight path of the aircraft, (2) inability of molting waterfowl to fly, or (3) distance of observers from birds at time of disturbance. On at least three occasions, a single-engine plane flew over at less than 100 feet, but never over areas where waterfowl were present.

Caribou were observed running in response to Bell 205 helicopters on two occasions: once when the helicopter landed approximately 100 m from where the caribou had been grazing, and once when the helicopter passed over a bedded-down animal at an altitude of less than 300 feet. Only one fixed-wing aircraft, a single-engine plane between 500 feet and 700 feet, was observed causing caribou to run.

Aircraft disturbance data would be more meaningful if (1) all observations of aircraft were recorded, whether or not any birds were disturbed, or were even present, at least one or two days each week, and (2) disturbed birds were observed until they either resumed "normal" activity or flew out of sight.

Bird Census - Results

Weekly densities and seasonal mean densities of birds recorded on censuses are given in Tables 6 and 7.

White-fronted geese (4.20/km^2) were the most abundant large bird seen on the study area. They were followed in abundance by pintails (2.80/km^2), Canada geese (2.78/km^2) and oldsquaws (2.60/km^2). Geese were among the most frequent birds observed because of their use of the study area, and adjacent areas, during the molt period.

Pectoral sandpipers were the most abundant of the small birds, with a mean density of 56.25/km^2. Lapland longspurs (51.83/km^2) and red phalaropes (42.84/km^2) were next in abundance.

Chronology and Abundance

Resident birds nesting on the study area are listed in Table 8 . Birds seen on or near the study area, but not known to nest there, are listed in Table 9 . A brief discussion of seasonal abundance and chronology for major species follows:

Loons

Arctic and red-throated loons were both present on the study area by the second week in June. Courtship displays by arctic loons were first observed on 9 June and pairs had established territories by mid-June. A group of six arctic loons was observed flying west on 16 June.

Numbers of arctic loons remained fairly constant throughout the summer, though breeding birds tended to take cover in dense Arctophila fulva beds during late July and early August, and were not easily seen. Red-throated loons varied in number from week to week, but were consistently less abundant than arctic loons.

Table 6. Densities (per km^2) of large birds from weekly censuses on Goose Lake study area (15.6 km^2), 1979.

Species	16 June	17 June	25 June	1 July	10 July	18 July	24 July	2 August	Mean
Arctic loon	2.19	2.77	2.00	2.19	2.00	1.35	2.52	1.94	2.12
Red-throated loon	0.32	0.13	0.26	0.19	0	0.58	0.06	0.06	0.20
Whistling swan	0.32	0.13	0.13	0.13	0.19	0.26	0.26	0.26	0.21
Black brant	2.65	3.74	1.29	0.97	0.32	0.19	0	0.97	1.27
Canada goose	0	1.68	3.35	0.77	0	12.9	0.45	3.10	2.78
White-fronted goose	4.65	3.74	7.23	14.4	0	0.65	1.42	1.48	4.20
Pintail	3.55	4.90	4.58	2.32	0.39	0.26	0.58	5.80	2.80
King eider	1.10	0.84	0.32	0.13	0.06	0	0	0	0.31
Spectacled eider	2.65	1.42	0.52	0.32	0.32	0	0.32	0	0.69
Unidentified hen eider	0	0	0.26	0	1.42	0.19	0.90	0.26	0.38
Oldsquaw	5.42	3.29	3.48	2.97	2.39	0.65	0.90	1.68	2.60
Pomarine jaeger	0.39	0.13	0	0	0	0	0	0	0.07
Parasitic jaeger	0.52	0.58	0.65	0.65	0.32	0.52	0.77	0.84	0.61
Long-tailed jaeger	0.19	0	0	0	0.26	3.23	0	0	0.46
Glaucous gull	1.29	1.23	0.90	1.35	1.03	1.55	1.68	0.97	1.25
Sabine's gull	1.35	0.65	0.39	0.90	1.29	7.42	2.90	1.68	2.07
Arctic tern	0.84	1.55	1.94	2.45	0.65	1.03	1.48	1.87	1.48
Ptarmigan	0.32	0	0.26	0	0	0.19	0	0	0.10
Snowy owl	0.06	0	0	0	0	0	0	0	0.01

Dens./km^2

Table 7. Densities (per km^2) of small birds from weekly censuses on six plots (0.96 km^2) on Goose Lake study area, 1979.

Species	12 June	18 June[a]	26 June	2 July[b]	11 July[a]	19 July[a]	25 July	1 August	Mean
American golden plover	2.08	1.04	2.08	0	0	3.13	15.63	1.04	3.13
Black-bellied plover	4.17	0	3.13	0	0	2.08	35.42	8.33	6.64
Ruddy turnstone	0	0	1.04	1.04	0	0	0	0	0.26
Pectoral sandpiper	14.58	13.54	20.83	50.00	34.38	91.67	136.45	88.54	56.25
Dunlin	21.88	13.54	15.63	20.83	20.83	13.54	20.83	64.58	23.96
Long-billed dowitcher	10.42	4.17	9.38	4.17	19.79	15.63	6.25	17.71	10.94
Baird's sandpiper	7.29	6.25	5.21	6.25	13.54	6.25	1.04	0	5.73
Semipalmated sandpiper	2.08	4.17	5.21	7.29	6.25	0	5.21	47.92	9.77
Red phalarope	114.58	51.04	55.21	23.96	20.83	52.08	22.92	2.08	42.84
Northern phalarope	23.96	12.50	7.29	7.29	11.46	7.29	25.00	10.42	13.15
Lapland longspur	71.88	28.13	40.63	28.13	14.58	9.38	128.13	93.75	51.83
Snow bunting	0	0	0	0	0	0	1.04	0	0.13

[a] Only 2 observers

[b] 3 observers on 4 plots; 2 observers on 2 plots

Table 8. Breeding birds at Goose Lake, 1979.

Species	First Observation	Evidence of breeding	Number of days on which observed June[a]	July[b]	August[c]	Last Observation
Arctic loon (Gavia arctica)	3 June	Nest	25	25	12	12 August
Black brant (Branta bernicula)	2 June	Nest	25	17	7	12 August
White-fronted goose (Anser albifrons)	1 June	Nest	26	18	10	11 August
King eider (Somateria spectabilis)	2 June	Brood	17	6	3	12 August
Spectacled eider (S. fischeri)	3 June	Nest	22	9	2	8 August
Oldsquaw (Clangula hyemalis)	1 June	Nest	27	27	9	12 August
American golden plover (Pluvialis dominica)	3 June	Distraction display	21	20	5	12 August
Black-bellied plover (P. squatarola)	2 June	Distraction	20	18	11	12 August
Pectoral sandpiper (Calidris melanotes)	3 June	Brood	26	22	11	12 August
Dunlin (C. alpina)	1 June	Nest	30	25	10	12 August
Semipalmated sandpiper (C. pusilla)	3 June	Nest	22	19	5	9 August

Table 8 (con't.) Breeding birds at Goose Lake, 1979.

Species	First Observation	Evidence of breeding	Number of days on which observed June[a]	July[b]	August[c]	Last Observation
Baird's sandpiper (C. bairdii)	3 June	Nest	16	11	1	2 August
Red phalarope (Phalaropus fulicarius)	1 June	Nest	29	23	8	9 August
Northern phalarope (Lobipes lobatus)	3 June	Nest	20	21	8	12 August
Long-billed dowitcher (Limnodromus scolopaceus)	2 June	Nest	15	20	9	11 August
Parasitic jaeger (Stercorarius parasiticus)	8 June	Nest	18	19	11	12 August
Glaucous gull (Larus hyperboreus)	3 June	Nest	28	29	11	12 August
Sabine's gull (Xema sabini)	3 June	Nest	21	23	7	12 August
Arctic tern (Sterna paradisea)	1 June	Nest	27	24	10	12 August
Lapland longspur (Calcarius lapponicus)	1 June	Nest	30	31	11	12 August
Willow ptarmigan (Lagopus lagopus)	4 June	Brood	11	7	0	19 August

[a] 30 possible observation days

[b] 31 possible observation days

[c] 12 possible observation days

Table 9. Non-breeding birds at Goose Lake, 1979.

Species	First Observation	Status[a]	Number of days on which observed June[b]	July[c]	August[d]	Last Observation
Red-throated loon (Gavia stellata)	10 June	B	11	20	9	11 August
Whistling swan (Olor columbianus)	6 June	B	13	12	2	9 August
Canada goose (Branta candensis)	8 June	B (molting)	13	18	7	9 August
Lesser snow goose (Chen caerulescens)	22 June	C	2	1	0	23 July
Pintail (Anas acuta)	2 June	B	27	14	10	12 August
Ruddy turnstone (Arenaria interpres)	8 June	A	6	14	7	11 August
Bar-tailed godwit (Limosa lapponica)	5 July	C	0	1	1	2 August
Marbled godwit (L. fedoa)	8 July	C	Single observation			
Stilt sandpiper (Micropalama himantopus)	12 July	C	0	2	0	19 July
Pomarine jaeger (Stereorarius pomarinus)	1 June	C	14	0	0	23 June
Long-tailed jaeger (S. longicaudus)	6 June	B	11	14	2	5 August

Table 9 (con't.) Non-breeding birds at Goose Lake, 1979.

Species	First Observation	Status[a]	Number of days on which observed June[b]	July[c]	August[d]	Last Observation
Herring gull (Larus argentatus)	28 June	C	Single observation			
Sandhill crane (Grus canadensis)	12 June	C	4	0	0	26 June
Peregrine falcon (Falco peregrinus)	4 July	C	0	1	1	7 August
Rough-legged hawk (Buteo lagopus)	10 July	C	0	1	2	9 August
Snowy owl (Nyctea scandiaca)	8 June	C	5	0	0	21 June
Short-eared owl (Asio flammeus)	7 June	C	3	0	0	14 June
Snow bunting (Plectrophenax nivalis)	1 June	B	17	5	0	25 July

[a] After Bergman et al. (1977). A = visitor from nearby nesting or roosting sites; B = regular summer visitor; C = casual or accidental visitor.

[b] 30 possible observation days

[c] 31 possible observation days

[d] 12 possible observation days

Loons were among the last birds to nest, and arctic loons were still observed in pairs with broods by mid-August. On 8 August a red-throated loon was observed on a nest located off the study area. During the beginning of August, groups of 4-12 adult arctic loons were recorded flying, or feeding on Goose Lake and adjacent Class IV wetlands.

Geese

White-fronted geese were present on the study area when personnel arrived 1 June. During June white-fronted geese were usually observed in pairs or in small, presumably family (Barry 1966) groups containing both adults and yearlings (see Table 10). The yearling geese were observed in close proximity to their presumed parents even after the parent birds began nesting. Mean and maximum flock sizes increased through the sixth week of the season (Table 10), when the first flightless geese were observed. Molting white-fronted geese were observed in large flocks (up to 90 geese) during weeks 6 and 7. Small sample sizes during weeks 6 through 8 were due to the difficulty of approaching molting geese. Also, during weeks 7 and 8, presence and activities of a banding crew and two aircraft on the north end of Goose Lake precluded observations of undisturbed geese. White-fronted geese capable of flight were not observed again until week 9. Mean and maximum flock sizes did not decline to levels observed early in the season (Table 10).

Black brant were present on the study area 1 June. Most brant were observed in pairs during weeks 1 and 2 (Table 10). On 7 June, 27 pairs were observed on islands or on ice in a drained basin (VI) complex. Mean and maximum flock sizes of brant peaked later than those of white-fronted geese (Table 10). Flightless brant were not observed before week 8. By week 9 when 21 brant were captured for banding, approximately 25 percent were capable of flight.

Table 10. Mean and maximum flock sizes of White-fronted and Canada geese and Black brant, observed during summer, 1979, near Goose Lake.

Week	Species	Number of Observations	Number of Geese	Mean Flock Size	Maximum Flock Size
1	White-fronted geese	32	87	2.7	8
	Black brant	55	133	2.4	11
	Canada geese	0	0	-	-
2	White-fronted geese	50	157	3.1	12
	Black brant	19	45	2.4	6
	Canada geese	1	2	2.0	2
3	White-fronted geese	28	88	3.1	12
	Black brant	5	30	6.0	14
	Canada geese	13	115	8.8	17
4	White-fronted geese	32	211	6.6	22
	Black brant	12	64	5.3	13
	Canada geese	17	173	10.2	26
5	White-fronted geese	39	576	14.8	90
	Black brant	3	29	9.7	18
	Canada geese	8	31	3.9	6
6	White-fronted geese	2	140	70.0	90
	Black brant	17	139	8.2	16
	Canada geese	4	395	98.8	200?
7	White-fronted geese	-	-	-	-
	Black brant	4	18	4.5	9
	Canada geese	-	-	-	-
8	White-fronted geese	1	25	25.0	25
	Black brant	1	25	25.0	25
	Canada geese	4	106	25.0	75
9	White-fronted geese	8	143	17.9	50
	Black brant	7	194	27.7	110*
	Canada geese	12	129	10.8	30
10	White-fronted geese	10	71	7.1	20
	Black brant	8	66	8.2	20
	Canada geese	5	57	11.4	20

* Composite of smaller groups driven together during banding.

Canada geese were not observed on the study area until 8 June (week 2). During weeks 3 and 4, Canada geese were observed arriving on the study area in flocks ranging in size from 5 to 17 birds, usually coming from the east or southeast. Mean and maximum flock sizes for Canada geese peaked in week 6, when the first flightless Canada geese were observed on the study area. No Canada geese were observed in flight during week 7, but fliers were observed during week 8, and by week 9 all Canada geese observed were capable of flight.

Pintails were present on the study area by 2 June and remained numerous until the end of the month. Small feeding groups of 5-20 drakes were most often observed, though pairs and mixed groups were seen occasionally toward mid-June. From 8-14 June, flocks of 5-20 birds were observed flying northwest. Numbers decreased significantly in July, while birds apparently took cover during the molt period. Flying pintails were again seen, in eclipse plumage, during the last week in July. Numbers continued to increase through the first half of August, when densities reached a seasonal high.

Eiders were observed during the first week of June primarily as migrating mixed flocks of 2-6 birds. Both king and spectacled eiders were present on the study area, though spectacled eiders were consistently more numerous. Densities reached a high during the second week in June, and decreased throughout the summer. Numerous pairs, as well as single males and small groups of hens were observed on the study area through 25 June. After this date, eider observations decreased, probably due to male emigration and nesting by females. Males of both species had left the area by early July. Groups of 5-15 post-breeding females were observed frequently beginning the second week in July. By the beginning of August, most eiders had apparently left the area.

Oldsquaw pairs were common on the study area during June. Courtship and territorial behavior was observed from early to mid-June. Small groups of hens and single males were observed frequently in early July. Numbers of

males decreased in late July. During the last week of July, groups of several hundred birds, many flightless, were observed on Goose Lake and West Long Lake. Most oldsquaws left the study area by the second week of August.

Jaegers

Pomarine jaegers were common on the study area only during the first half of June. Several flocks of 3-8 birds were observed flying south on 7 and 8 June.

Observations of long-tailed jaegers were sporadic for most of the summer. Major migrations were observed on 16-18 July. Flocks of 35-65 birds were seen sitting on ice floes on Goose Lake or resting upland near the shore. The birds appeared to be feeding on recently hatched midges windrowed among the rotting ice. Small numbers of parasitic jaegers were observed with the larger flocks of long-tailed jaegers.

Parasitic jaegers were observed regularly, though not in large numbers, throughout the summer. At least one pair attempted to nest on the study area, though unsuccessfully.

Gulls and Terns

Glaucous and Sabine's gulls were present on the study area during the entire summer. Groups of 20-30 Sabine's gulls were observed feeding at the edge of the ice along the open moat in Goose Lake during the second week in July. Migrating flocks of 35-100 Sabine's gulls were seen using Class IV wetlands and flying west, from 16-18 July.

Arctic terns were present on the study area by 1 June and were common throughout the summer. Territories were established by mid-June. Terns reached a seasonal high around 1 June when 38 birds were seen feeding on a Class IV wetland. This coincided with a peak in the insect hatch.

One herring gull was seen on 28 July feeding on midges along the shore of a Class IV wetland.

Shorebirds

All species of shorebirds which nested on the study areas were present by the first week in June. Courtship displays and copulations were observed during the first half of June for most species. Pectoral sandpipers and dunlins continued displaying through the last week of June. Courtship activity was not observed after 1 July.

The bird survey of 18 June showed a marked decrease from the previous week for dunlins, long-billed dowitchers and phalaropes, probably due to nesting activities. No plovers were observed on the surveys of 2 and 11 July. A black-bellied plover was observed giving a distraction display on 17 June, and an American golden plover on 1 July.

Flocks of 5-50 migrating plovers and long-billed dowitchers were observed feeding or flying southeast from 12 July through the first half of August. Black-bellied plovers were the dominant species in most plover flocks. A few flocks contained up to 50 percent American golden plovers. Golden plovers were observed more often singly or in small groups of 2-10. Black-bellied plovers were consistently more numerous than Golden plovers throughout the summer. Both species were observed molting by 10 July and Golden plovers were in winter plumage by 10 August.

Post-breeding flocks of 200-500 phalaropes were frequently seen from 1-20 July feeding on insects in Class IV wetlands and along the west shore of Goose Lake. Flocks were mixed, but consisted primarily of red phalaropes, which were generally more numerous than northern phalaropes through mid-July. Red phalarope numbers decreased in late July, while numbers of northern phalaropes increased. The latter were seen in flocks from 20 July through early August.

Small flocks of pectoral sandpipers (5-20) and dunlins (5-100) were seen from the first week of July through the first week of August, feeding primarily in Class I low center polygons or flying southeast. Semipalmated sandpipers were observed feeding in flocks along the west shore of Goose Lake from 24 July through the end of the month. Baird's sandpipers were observed sporadically throughout the summer and small numbers were seen with flocks of pectoral sandpipers and dunlins.

Ruddy turnstones were observed occasionally throughout the summer. Eighteen birds were seen on 18 July. Small groups of 2-14 were observed along Goose Lake from 28 July to 12 August.

One stilt sandpiper was observed on 12 July and three on 19 July. All but one were in winter plumage and all were feeding along the west shore of Goose Lake.

Bar-tailed godwits were seen on 5 July and 2 August; and a marbled godwit was observed on 8 July. All birds were in Class I wetlands.

Raptors

Raptors were seen infrequently on the study area. Snowy owls were observed on 5 separate occasions between 8 and 21 June. The birds were either hunting over upland tundra or resting on the ice of Goose Lake. A short-eared owl was seen 3 times from 7-14 June. Rough-legged hawks were recorded on the study area 3 times between 10 July and 9 August.

A peregrine falcon was observed on 7 August in the goose exclosure area on the west side of Goose Lake arm. The bird was first observed sitting on a mound of sediment midway up the arm at the edge of Goose Lake head. It flew ahead at our approach, moving north, perching on sediment mounds at every few hundred yards. The falcon was last observed flying north from the point of Goose Lake arm.

A falcon was also observed on the evening of 4 July, perched on the radio antenna in camp. The bird flushed and flew south along Goose Lake. Positive identification could not be made due to weather conditions but the falcon was thought to be a peregrine due to its size. It appeared to be in poor condition, with damaged feathers, and may have been blown off course from the storm on that day.

Passerines and Upland Birds

Lapland longspurs were present on the study area by 1 June and remained numerous throughout the summer. Courtship displays were observed in early June, and longspurs were among the first birds to nest. Densities recorded on surveys decreased from mid-June through mid-July, though longspurs were still numerous. By 15 July, immatures had fledged and birds were flocking, especially near the lake. From 16-22 July, flocks of 20-30 longspurs were seen in camp perching on camp structures and feeding on insects. During this time the birds spent much time on the ground, seemed reluctant to fly, and were easily approached. A flock of 25 was seen flying south on 24 July. Smaller flocks were observed, mostly on the ground, through the first week of August. Numbers slowly decreased during this time, and few longspurs remained by 10 August.

Snow buntings were observed primarily during June. Generally, few birds were seen (1-4), though 12 were seen on 19 June. Most snow buntings were observed along the shore of Goose Lake.

Willow ptarmigan were observed sporadically through mid-July. On 19 July, 2 adults with 6 young were flushed during a small bird survey. Both adults performed distraction displays.

A pair of sandhill cranes was observed on 12 June and a single on 16 June, flying over the study area. Cranes were heard, but not seen, twice more.

Nests

Although no formal nest searches were conducted during the field season, 77 nests were located incidental to other field work. Number of nests, mean clutch size, and nest success information is summarized for each species (Table 11). Nesting and hatching chronology is given in Figure 14.

Large Birds

The first arctic loon nest was found 10 July, although 2 arctic loons appeared to be constructing nest mounds on 25 June. Arctic loons nested predominantly (n=10, 86 percent) on Deep-Arctophila (IV) wetlands. Nests were equally located on islands and shores. Approximately 50 percent of nests were adjacent to dense stands of Arctophila. Because glaucous gull nests were often located on the same wetland complex, loon nests were not disturbed in order to avoid possible predation by adult gulls. A single loon nest was found along the shore of a Class III (Shallow-Arctophila) and a Class II (Shallow-Carex) wetland.

On 6 June, 9 pairs of black brant were observed defending nesting territories on a large Class IV wetland which was 80-85 percent ice covered. The following day, 27 pairs and several single birds appeared to be defending portions of long islands and peninsulas. Brant began to leave the area the following week, as on 17 June only 10 pairs were observed, however several birds were on nests. On 25 June, 4 brant remained in the area and nests were deserted. Only 2 brant nests were positively located and both were on narrow islands in dense Arctophila of a Class III wetland. Both nests contained large amounts of down but no trace of eggs on 1 July.

Most white-fronted goose nests (n=5, 83 percent) found on the study area were on polygonal ridges adjacent to Shallow-Carex (II) wetlands. Nest material was sparse and consisted of dried moss, sedge, and a small amount of down. When disturbed from nests, white-fronts were very vociferous and would usually

Table 11. Clutch sizes, number of nests and success of nests located at Goose Lake study site, 1979.

Species	Clutch Size Mean (Range)	Nests Found	Nests Revisited	Percent Successful[a]
Arctic loon	1	12	2	0%
Black brant	-	2	2	0%
White-fronted goose	2.3 (2-4)	6	3	33%
Oldsquaw	6.5 (5-8)	2	2	0%
King eider	4	1	0	Unknown
Baird's sandpiper	3	1	0	Unknown
Dunlin	3.5 (3-4)	8	8	100%
Long-billed dowitcher	4	3	3	50%
Semipalmated sandpiper	3.8 (3-4)	7	2	Unknown
Red phalarope	3.7 (3-4)	11	9	100%
Northern phalarope	3 (2-4)	2	1	Unknown
Parasitic jaeger	2	1	1	Unknown
Glaucous gull	-	6	1	100%
Sabine's gull	-	1	0	0%
Arctic tern	1.7 (1-2)	4	2	0%
Lapland longspur	4.4 (2-6)	10	4	100%

[a] Percentage of relocated nests that hatched at least one chick.

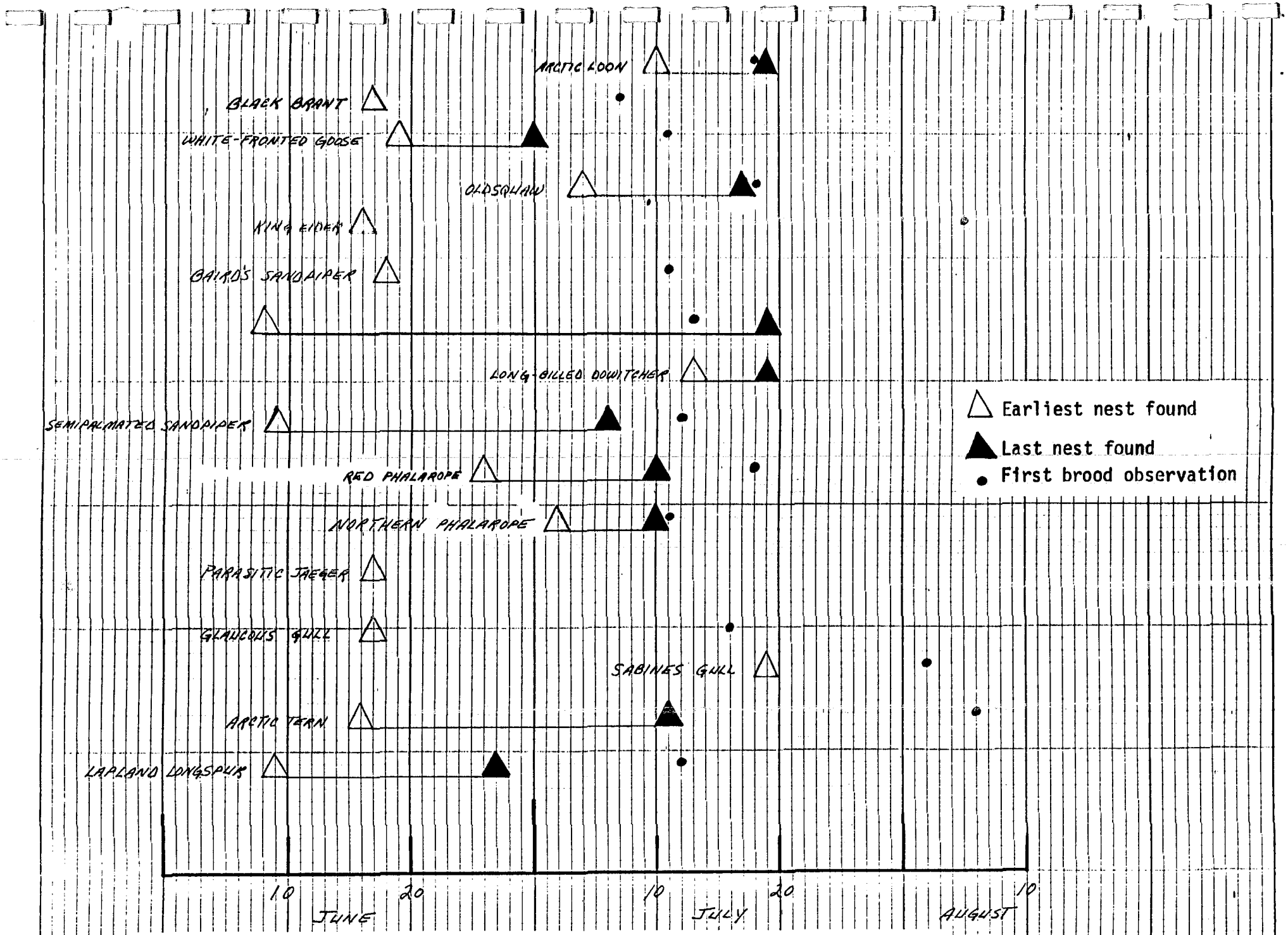

Figure 14. Nesting and hatching chronology at Goose Lake study site, 1979

Table 5. Mean chemical and physical parameters and mean number of organisms/sweep sample of wetland classes II-IV, Goose Lake, 1979.

Parameter	Wetland		13-20 June	21-28 June	15-21 July
pH	C-II-1		7.7	7.6	8.2
	C-II-2		7.5	7.6	8.2
	C-III-1		7.7	7.7	8.8
	C-III-2		7.7	7.9	8.2
	C-IV-1		7.5	7.6	8.7
	C-IV-2		7.7	7.6	7.9
Conductivity (mmhos/cm)	C-II-1		105	110	170
	C-II-2		102	115	190
	C-III-1		60	130	215
	C-III-2		85	130	230
	C-IV-1		65	100	150
	C-IV-2		75	103	155
Temperature (°C)	C-II-1		3.5	5.5	17.5
	C-II-2		3.8	6.5	18.5
	C-III-1		3.8	7	18
	C-III-2		6	10	19
	C-IV-1		3	8	10
	C-IV-2		4.5	9	10.5
Sediment thaw (cm)	C-II-1 vegt.	(5)[a]	6.9	15.1	35.0
	C-II-1 open	(5)	6.9	14.6	36.7
	C-II-1 all	(10)	6.9	14.8	35.8
	C-II-2 vegt.	(5)	6.2	13.1	36.6
	C-II-2 open	(5)	7.3	12.2	36.4
	C-II-2 all	(10)	6.7	12.7	36.5
	C-III-1 vegt.	(5)	6.0	14.5	37.2
	C-III-1 open	(5)	5.4	13.8	33.5
	C-III-1 all	(10)	5.7	14.1	35.4
	C-III-2 vegt.	(5)	6.6	15.4	37.5
	C-III-2 open	(5)	5.6	16.6	44.0
	C-III-2 all	(10)	6.1	16.0	40.8
	C-IV-1 vegt.	(5)	2.0	9.8	34.0
	C-IV-1 open	(5)	0.5	10.1	33.8

leave the nest uncovered, exposing the eggs. Of the 3 nests checked, 2 appeared destroyed by predators (1 by fox, 1 by gull or jaeger) and one nest appeared to be successful.

A king eider nest was found 16 June on a moss-Carex ridge between low center polygons. The nest contained large amounts of down and 4 greenish brown eggs.

Oldsquaw breeding pairs were frequently engaged in territory disputes from 1 June through early July, however only 2 nests were found. On 4 July, a nest located in upland tundra, contained 8 eggs and a large amount of down. Approximately 2 weeks later, no trace of eggs was found and only a fox scat remained. The second nest was found 17 July on a moss, sedge ridge between Shallow-Carex (II) wetlands. This nest was probably destroyed by an avian predator, as egg shell fragments were found across the wetland on 10 August.

Small Birds

A single Baird's sandpiper nest with three eggs was found 18 June on a moss hummock in flooded tundra (I). Nest success was not determined.

Nests of dunlins (6) and semipalmated sandpipers (7) were associated with dry upland tundra. Nest cover consisted predominantly of moss, sedge, and Cassiope. Because both semipalmated sandpiper nests relocated were empty, nest success could not be determined. Eighty-six percent of all dunlin nests checked were empty. One nest contained egg shell fragments and was considered successful.

Long-billed dowitchers preferred to nest along low center polygonal ridges. Of three nests which were checked, 1 contained 4 pipped eggs, 1 was empty, and 1 appeared to be destroyed by a gull or jaeger.

Red phalaropes nested in several habitat types including dry upland tundra, tussock ridge areas associated with Shallow-Carex (II) wetlands, and moss/Carex areas adjacent to large Deep-Arctophila (IV) wetlands.

The majority (64 percent) of red phalarope nests were empty. One nest which contained 4 eggs on 1 July, contained only 1 infertile egg on 2 August. Nests of northern phalaropes were found in wet and dry Class I ponds. Only one of these nests was relocated and success could not be determined.

One parasitic jaeger nest was found on a moss/sedge tussock in a dried Class I wetland. The adult pair consisted of a light and dark phase individual, and both were observed incubating. Both birds feigned injury when an observer approached the nest within approximately 200 meters. The nest, which was checked 18 July, contained a piece of shell with membrane however, success could not be determined.

Glaucous and Sabine's gull and arctic tern nests were mostly found on islands or peninsulas in Deep-Arctophila (IV) wetlands. A glaucous gull nest on a Shallow-Carex (II) island was successful and two young were still present 12 August.

Lapland longspur nests were found on dry upland sites along low center or high center polygons. Most (80 percent) of nests were found 9-27 June. Of four nests which were checked for nest success, 2 were empty and 2 contained young.

Broods

Arctic loon broods contained one (7 broods) or two (2 broods) young, and were usually found in Deep-Arctophila (IV) wetlands (six of nine broods). Two broods were observed using Shallow-Arctophila (III) wetlands, and one brood was observed in Goose Lake (V). The apparent preference of arctic loons for Deep-Arctophila wetlands may be due to (1) extensive beds of Arctophila for concealment of young, and (2) size, depth and productivity of the wetland for adequate food supply.

All observations of black brant broods occurred near or in Deep open lakes (V), between 7 July and 28 July (Table 12).

Table 13. Eider, gull and tern broods observed at Goose Lake during summer, 1979.

Species	Date	Number of Young	Wetland Type	Comments
King eider	5 August	3	Shallow-Carex (II) wetland	Feeding with hen
King eider	12 August	1	Shallow-Arctophila (III)	Hid in vegetation, with hen
Spectacled eider	24 July	2	Shallow-Carex (II)	Swimming with hen
Glaucous gull	16 July	2	Shallow-Carex (II)	Swimming with 2 adults
Glaucous gull	18 July	2	Deep Arctophila (IV)	Sitting on island with adult
Glaucous gull	28 July	2	Shallow-Arctophila (III)	Sitting on island with adult
Glaucous gull	7 August	1	Deep-Arctophila (IV)	Sitting on island with adult
Sabine's gull	2 August	1	Shallow-Carex (II)	Swimming with adult
Sabine's gull	2 August	3	Deep Arctophila (IV)	Rested on shore then flew with 2 adults
Arctic tern	5 August	1	Shallow-Carex (II)	Floating, bobbing
Arctic tern	12 August	1	Shallow-Carex (II)	Capable of flight

stands of Carex. A single brood of four downy Baird's sandpiper chicks and one adult were observed on 11 July in dry Carex.

Three northern phalarope chicks and one adult were observed at the shore of a Shallow-Carex (II) pond on 11 July. A single red phalarope chick accompanied by an adult male was sighted in moderately dense Carex in a nearly dry low-center polygon on 18 July. Two other single, unidentified phalarope chicks were noted; one in a dry low-center polygon (I), and the second was recorded swimming near the shore of a Deep-Arctophila (IV) wetland on 31 July.

Nestling lapland longspurs were first recorded on 20 June, when one of a clutch of five eggs was discovered to have hatched. Five nearly naked nestlings were found in a nest on 25 June. A nearly fully-fledged lapland longspur capable of short flights was observed on 13 July.

Wetland Use by Waterbirds

Observations of wetland use by waterbirds were made twice a week during bird surveys. Date, species, number and sex, wetland class, and behavior was recorded for each observation from 10 June through 2 August.

Loons

Arctic loons preferred Deep-Arctophila (IV) wetlands for nest sites (86 percent) and during all periods of the summer (Table 14). These results agree with those of Rothe et al. (1978). Arctic loons began to use Deep-Open lakes (V) in late July when ice break-up was occurring. Relative use of Class V wetlands increased during August. Although several broods were observed on Deep-Open lakes (V), the majority of arctic loons using this wetland class during August were probably failed or nonbreeding birds.

Red-throated loons were observed using both Shallow-Carex (II) and Shallow-Arctophila (III) wetlands during June (Table 15). In July, Shallow-

Table 14. Wetland use by Arctic Loons, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	0	22	10	47	0	79
Percent of total	0	27.8	12.7	59.5	0	
July						
Number of observations	0	24	13	98	17	152
Percent of total	0	46.1	8.6	64.5	11.2	
August						
Number of observations	0	0	15	29	7	51
Percent of total	0	0	29.4	56.8	13.7	
SEASONAL	0	46	38	174	24	282
TOTAL	0	16.3	13.5	61.7	8.5	

Table 15. Wetland use by Red-throated Loons, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	1	7	6	0	0	14
Percent of total	7.1	50.0	42.9	0	0	
July						
Number of observations	0	7	11	1	5	24
Percent of total	0	29.2	45.8	4.2	20.8	
August						
Number of observations	0	0	2	0	1	3
Percent of total	0	0	66.7	0	33.3	
SEASONAL	1	14	19	1	6	41
TOTAL	2.4	34.2	46.2	2.4	14.6	

Arctophila wetlands were preferred. Because red-throated loons were observed only 3 times during August, no conclusions on wetland preference can be made.

Competition between arctic and red-throated loons would seem to be greatest during June when both species are using Shallow-Carex (II) wetlands which have recently thawed. As the season progresses, arctic loons use Class IV wetlands predominantly as compared to red-throated loons which appear to prefer Class III ponds (Bergman and Derksen 1977, Rothe et al. 1978).

Waterfowl

A pair of whistling Swans were regularly observed using a Shallow-Arctophila (III) section of a large Deep-Arctophila (IV) wetland during June and July (Table 16). Water depth in this area was >80 cm and the area was almost completely covered with Arctophila fulva. Arctophila was moderately grazed upon in this particular area. During large bird surveys the pair would often flush from this wetland and fly to a large open Class IV located approximately 0.5 miles southeast. The pair would usually swim along the opposite shore of the observer or in the middle.

Brant were observed using a variety of wetland classes early in the season (Table 17). It should be noted that brant grazing along the shore of a Class V wetland were considered using that wetland class. Deeper wetlands were preferred as the season progressed although sample size is small.

White-fronted geese used open Class II wetlands in June but shifted to Class IV wetlands in July and August (Table 18). Although nests were located near Shallow-Carex (II) wetlands, broods and adults were most frequently observed on Deep-Arctophila (IV) lakes. Class IV wetlands provided greater protection for broods and molting adults.

Pintails were observed most frequently (>60 percent) on Shallow-Carex (II) wetlands during June (Table 19). However, during July and August, pintails

Table 16. Wetland use by Whistling Swans, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June[1]						
Number of observations	0	0	9	0	0	9
Percent of total	0	0	100	0	0	
July						
Number of observations	0	2	8	6	0	16
Percent of total	0	12.5	50	37.5	0	
August						
Number of observations	0	0	0	2	0	2
Percent of total	0	0	0	100	0	100
SEASONAL	0	2	17	8	0	27
TOTAL	0	7.4	63	29.6	0	

[1] Observations from field notes compiled throughout June.

Table 17. Wetland use by Brant, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	8	17	4	21	10	60
Percent of total	13.3	28.3	6.7	35	16.7	
July						
Number of observations	0	0	0	8	8	16
Percent of total	0	0	0	50	50	
August						
Number of observations	0	0	0	0	0	0
Percent of total	0	0	0	0	0	0
SEASONAL	8	17	4	29	18	76
TOTAL	10.5	22.4	5.3	38.2	23.7	

Table 18. Wetland use by White-fronted Geese, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	0	17	2	1	0	20
Percent of total	0	85	10	5	0	
July						
Number of observations	0	0	0	34	7	41
Percent of total	0	0	0	82.9	17.1	
August						
Number of observations	0	0	0	14	2	16
Percent of total	0	0	0	87.5	12.5	
SEASONAL	0	17	2	49	9	77
TOTAL	0	22.1	2.6	63.6	11.7	

Table 19. Wetland use by Pintails, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	44	7	10	6	3	70
Percent of total	62.9	10.0	14.3	8.6	4.3	
July						
Number of observations	1	1	6	31	0	39
Percent of total	2.6	2.6	15.4	79.5	0	
August						
Number of observations	3	17	34	58	0	112
Percent of total	2.7	15.2	30.3	51.8	0	
SEASONAL	48	25	50	95	3	221
TOTAL	21.7	11.3	22.6	43	1.4	

preferred Deep-Arctophila (IV) wetlands. This species used dense stands of Arctophila for cover during molt in July and early August.

Oldsquaws were observed mostly on Shallow-Carex wetlands throughout the summer, although Shallow and Deep-Arctophila wetlands were also important (Table 20).

Several pairs were observed defending portions of a large Class IV wetland during late June through mid-July. Oldsquaws began to concentrate near open pools of Goose Lake, a Class V wetland, in early July. Large groups of molting oldsquaws (>200) were observed regularly on this wetland from 24 July to 14 August. Deep-Open wetlands (Class V) appear to be extremely important to molting oldsquaws although wetland observations made during bird surveys did not reflect this.

Spectacled eiders were observed most frequently on Deep-Arctophila (IV) wetlands during June (Table 21). However, in July, birds appeared to prefer Shallow-Carex (II) wetlands, although sample size is small.

King eiders were observed mostly on Shallow-Carex wetlands during June and July, although as with spectacled eiders, no observations were made during August (Table 22). Small flocks of unidentified female eiders were frequently observed loafing along the shores of Class II and III wetlands during late July and August.

Charadriiformes

American golden plovers were most frequently associated with Flooded Tundra (I) ponds (Table 23). Birds were often observed along ridges of low-center polygons. In late July and August, small flocks were observed feeding in flooded Carex and mud zones of Class IV wetlands.

Flooded Tundra (I) was used extensively during June and July by black-bellied plovers (Table 24). Later in the season when most Class I wetlands

Table 20. Wetland use by Oldsquaws, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	4	59	16	30	0	109
Percent of total	3.7	54.1	14.7	27.5	0	
July						
Number of observations	1	63	22	55	16	157
Percent of total	0.64	40.1	14.0	35.0	10.2	
August						
Number of observations	0	20	6	5	0	31
Percent of total	0	64.5	19.4	16.1	0	
SEASONAL	5	142	44	90	16	297
TOTAL	1.7	47.8	14.8	30.3	5.4	

Table 21. Wetland use by Spectacled Eiders, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	13	18	0	26	0	57
Percent of total	22.8	31.6	0	45.6	0	
July						
Number of observations	0	10	1	3	0	14
Percent of total	0	71.4	7.1	21.4	0	
August						
Number of observations	0	0	0	0	0	0
Percent of total	0	0	0	0	0	
SEASONAL	13	28	1	29	0	71
TOTAL	18.3	39.4	1.4	40.8	0	

Table 22. Wetland use by King Eiders, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	0	17	2	2	0	21
Percent of total	0	81	9.5	9.5	0	
July						
Number of observations	0	11	4	2	0	17
Percent of total	0	64.7	23.5	11.8	0	
August						
Number of observations	0	0	0	0	0	0
Percent of total	0	0	0	0	0	
SEASONAL	0	28	6	4	0	38
TOTAL	0	73.7	15.8	10.5	0	

Table 13. Wetland use by American Golden Plovers, Goose Lake study site, 1979.

	Wetland Class I	II	III	IV	V	Total
June						
Number of observations	5	3	0	1	0	9
Percent of total	55.6	33.3	0	11.1	0	
July						
Number of observations	46	4	2	9	0	61
Percent of total	75.4	6.6	3.3	14.8	0	
August						
Number of observations	0	0	0	0	0	0
Percent of total	0	0	0	0	0	0
SEASONAL	51	7	2	10	0	70
TOTAL	72.9	10	2.9	14.3	0	

Table 24. Wetland use by Black-bellied Plovers, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	4	1	0	0	0	5
Percent of total	800	20.0	0	0	0	
July						
Number of observations	91	12	0	30	0	133
Percent of total	68.4	9.0	0	22.6	0	
August						
Number of observations	8	2	6	17	1	34
Percent of total	23.5	5.9	17.6	50.0	2.9	
SEASONAL	103	15	6	47	1	172
TOTAL	60	8.7	3.5	27.5	0.58	

were dry, flocks of black-bellied plovers were observed feeding along the flooded Carex zone of Class IV wetlands.

Long-billed dowitchers used Flooded Tundra (I) predominantly during June (Table 25). Shallow-Carex (II) wetlands were used more frequently during July and August.

Pectoral sandpipers preferred upland tundra and polygon ridges for feeding and loafing. This species was observed associated with Class I wetlands throughout the study period (Table 26).

Dunlins used Flooded tundra (I) wetlands predominantly during June and July (Table 27). Exposed mud and shallow flooded Carex zones of Deep-Arctophila (IV) wetlands were used more extensively during August, similar to both species of plovers.

In June, red phalaropes were primarily observed (80 percent) on Flooded Tundra (I) wetlands (Table 28). In late July, large numbers of red phalaropes (n=250) were observed swimming near the west shore of Goose Lake. Birds were partially in winter plumage and were feeding on floating organic debris brought toward shore by waves.

Northern phalarope wetland observations showed a similar pattern. Flooded tundra (I) was used heavily for feeding during early June (Table 29). As these wetlands became dry, Shallow-Carex (II) ponds were utilized to a greater extent. In July, large numbers of northern phalaropes congregated in shallow water along the west shore of Goose Lake (V) and fed on floating insects.

Glaucous gulls were most frequently observed on small islands and peninsulas in two large Deep-Arctophila (IV) wetlands during the study period (Table 30). Islands and peninsulas served as nest sites and brood loafing areas. Gulls were also observed on Class II and V wetlands, although no observations were made on Class III ponds.

Table 25. Wetland use by Long-billed Dowitchers, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	10	2	0	0	0	12
Percent of total	83.3	16.7	0	0	0	
July						
Number of observations	60	58	0	0	0	118
Percent of total	50.8	49.2	0	0	0	
August						
Number of observations	2	15	1	0	0	18
Percent of total	11.1	83.3	5.6	0	0	
SEASONAL	72	75	1	0	0	148
TOTAL	48.6	50.7	0.68	0	0	

Table 16. Wetland use by Pectoral Sandpipers, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	9	0	0	0	0	9
Percent of total	100	0	0	0	0	
July						
Number of observations	71	0	0	5	14	90
Percent of total	75.6	0	0	6.4	18.0	
August						
Number of observations	29	1	9	17	6	62
Percent of total	46.2	1.6	14.5	27.4	9.7	
SEASONAL	109	1	9	22	20	161
TOTAL	67.7	0.62	5.6	13.7	12.4	

Table 27. Wetland use by Dunlins, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	4	0	0	2	0	6
Percent of total	66.7	0	0	33.3	0	
July						
Number of observations	16	3	0	20	0	39
Percent of total	41.0	7.7	0	51.3	0	
August						
Number of observations	12	0	0	67	0	79
Percent of total	15.2	0	0	84.8	0	
SEASONAL	32	3	0	89	0	124
TOTAL	25.8	2.4	0	71.8	0	

Table 28. Wetland use by Red Phalaropes, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	173	18	5	13	0	209
Percent of total	82.8	8.6	2.4	6.2	0	
July						
Number of observations	86	19	24	118	436	683
Percent of total	12.6	2.8	3.5	17.3	63.8	
August						
Number of observations	1	0	0	0	0	1
Percent of total	100	0	0	0	0	
SEASONAL	260	37	29	131	436	893
TOTAL	29.1	4.1	3.2	14.7	48.8	

Table 29. Wetland use by Northern Phalaropes, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	30	7	12	3	0	52
Percent of total	57.7	13.5	23.1	5.8	0	
July						
Number of observations	11	32	7	68	438	556
Percent of total	2.0	5.8	1.2	12.2	78.8	
August						
Number of observations	1	10	1	4	0	16
Percent of total	6.2	62.5	6.2	2.5	0	
SEASONAL	42	49	20	75	438	624
TOTAL	6.7	7.8	3.2	12.0	70.2	

Table 30. Wetland use by Glaucous Gulls, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	0	1	0	13	2	16
Percent of total	0	6.2	0	81.2	12.5	
July						
Number of observations	0	4	0	46	3	53
Percent of total	0	7.6	0	86.8	5.7	
August						
Number of observations	0	2	0	5	0	7
Percent of total	0	28.6	0	71.4	0	
SEASONAL	0	7	0	64	5	76
TOTAL	0	9.2	0	84.2	6.6	

Sabine's gulls used both Shallow-Carex (II) and Deep-Arctophila (IV) wetlands during June and August (Table 31). In late July, approximately 80 Sabine's gulls was seen resting on islands on a Deep-Arctophila (IV) wetland. Birds were frequently observed on Shallow-Carex (II) wetlands, swimming in slow circles, feeding on organic matter brought toward the surface. Sabine's gulls were observed several times sitting on the edge of a central ice mound in Goose Lake. These birds were probably feeding on adult midges which had accumulated near the ice.

Arctic terns used Flooded tundra (I) and Shallow-Carex (II) wetlands during June (Table 32). In July and August, terns primarily used Deep-Arctophila wetlands.

A possible reason for this shift involves higher productivity, greater food diversity and larger numbers of small fish in Class IV wetlands as compared to Class II ponds.

During bird surveys, semipalmated sandpipers (Table 33) and ruddy turnstones (Table 34) were observed only 28 and 8 times, respectively. When all observations for semipalmated sandpipers were reviewed, it appears this species prefers upland tundra, including polygonal ridges, and sparsely vegetated and or mud shores of Deep-Arctophila (IV) and Deep Open (V) lakes. Ruddy turnstones were seen two times each on Class I and II wetlands and four times on Class IV wetlands. Turnstones in winter plumage were observed several times along the shore of a Deep Open (V) lake.

In summary, Flooded Tundra (I) wetlands are used primarily early in the season because of early thawing. In late June through July, this wetland class becomes dry, decreasing its attractiveness to most species as potential feeding sites. However, several species find these dry areas excellent nesting habitat. Shallow-Carex (II) wetlands are used by a large number of species

Table 31. Wetland use by Sabine's Gulls, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	0	6	1	6	0	13
Percent of total	0	46.2	7.7	46.2	0	
July						
Number of observations	0	30	4	120	0	154
Percent of total	0	19.5	2.6	77.9	0	
August						
Number of observations	0	8	1	7	0	16
Percent of total	0	50	6.2	43.8	0	
SEASONAL	0	44	6	133	0	183
TOTAL	0	24.0	3.3	72.7	0	

Table 32. Wetland use by Arctic Terns, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	20	13	0	3	0	36
Percent of total	55.6	36.1	0	2.3	0	
July						
Number of observations	1	3	2	36	10	52
Percent of total	1.9	5.8	3.8	69.2	19.2	
August						
Number of observations	0	3	1	13	1	18
Percent of total	0	16.7	5.6	72.2	5.6	
SEASONAL	21	19	3	52	11	106
TOTAL	19.8	17.9	2.8	49.0	10.4	

Table 33. Wetland use by Semipalmated Sandpipers, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	0	0	0	1	0	1
Percent of total	0	0	0	100	0	
July						
Number of observations	0	0	0	11	3	14
Percent of total	0	0	0	78.6	21.4	
August						
Number of observations	2	5	2	4	0	13
Percent of total	15.4	38.5	15.4	30.8	0	
SEASONAL	2	5	2	16	3	28
TOTAL	7.1	17.9	7.1	57.1	10.7	

Table 34. Wetland use by Ruddy Turnstones, Goose Lake study area, 1979.

	Wetland Class					
	I	II	III	IV	V	Total
June						
Number of observations	1	2	0	1	0	4
Percent of total	25	50	0	25	0	
July						
Number of observations	1	0	0	3	0	4
Percent of total	25	0	0	75	0	
August						
Number of observations	0	0	0	0	0	0
Percent of total	0	0	0	0	0	
SEASONAL	2	2	0	4	0	8
TOTAL	25	25	0	50	0	

because of their range of depths, shapes, and aquatic vegetation makeup (Rothe et al. 1978). Shallow-Arctophila zones of Class III and IV wetlands are extremely valuable because of nest cover and diverse feeding sites. Class V wetlands provide mud and sparsely vegetated shores which are attractive to several shorebird species. This wetland class is also very important to loons and several species of waterfowl, particularly oldsquaws.

Mammal Observations

Caribou (Rangifer tarandus)

Small herds of caribou (1-9), consisting mainly of cows and yearlings, were present on the study area during the first half of June. Only three calves were seen until 17 June. From 17-28 June, numerous cow/calf herds (7-39 animals) passed through the study area. From 29 June through 9 July no calves were observed.

Single bulls were seen occasionally until the end of June. Large numbers of bulls were not seen in a herd until 29 June, when they comprised the majority of a group of 70 animals moving north through the study area. All bull and bull/cow/yearling herds were then observed through 9 July. From this date through 26 July, larger mixed herds (3-482) with numerous calves were seen moving primarily north. On 12 July, a caribou with a blue radio collar was in a herd of 482 animals moving north. On 26 July, a herd of 28 bulls and six yearlings was observed travelling south.

From the last week in July through mid-August herd size and composition were quite variable. Single bulls and small groups (2-10) of yearlings or cows with calves were frequently seen feeding throughout the study area. In most cases, a definite direction of travel could not be determined for these groups. Four larger mixed herds (37-60) were also observed moving in more definite directions (north, south and west). Few bulls were seen in any of

these herds. On 3 August, a recently born calf was observed in a herd of 60 animals moving north.

A summary of caribou herd size and composition is given in Table 35, particulars in Appendix 3. A total of 1924 caribou were observed from 1 June through 12 August. Total numbers of caribou seen were recorded daily. However, due to a misunderstanding, only major movements of animals were recorded on prepared data forms describing herd size and composition. A large part of this information for smaller herds was retrieved from investigators' personal field notes, however herd composition data is lacking for 402 animals over 35 days. Therefore, the data summarized in Table 35 may be slightly biased against small herds. The majority of large herds (20 animals) observed is represented in the summary. The number of small herds included is probably representative, though a smaller percentage of total herds with under 20 animals.

Arctic fox (Alopex lagopus)

Arctic fox were seen on the study area on 22 days during June. An average of 1.6 fox/day (49 total) was observed throughout this month, with a maximum of seven sightings in one day. Only 12 fox were observed over ten days from 1 July through 12 August. Arctic fox may have depleted the food base on the study area by July due to: 1) an apparently low small mammal population; 2) movement of flightless molting geese to lakes further from the study area and; 3) hatching or previous destruction of most nests by this date. Since pups were most likely able to travel by this time, fox probably moved to nearby areas in search of food. Sixty-one total Arctic fox sightings were recorded.

At least 16 Arctic fox dens were found on the study area (Figure 15). Only five of these were large, with numerous tunnels, and probably served as

Table 35. Caribou herd size and composition at Goose Lake, 1979.

Date	Number of herds	Mean herd size (min., max.)	Mean number adults/herd	Mean number calves/herd	Percent herds with calves	Direction of travel	
1 June-30 June	33	8.8 (1, 70)	7	1.8	36	North	9%
						South	9%
						West	6%
						Undetermined	76%
1 July-31 July	29	35.4 (1, 482)	32.1	3.3	41	North	24%
						South	17%
						Undetermined	59%
1 August 12 August	12	16.9 (1, 60)	12.4	4.5	83	North	8%
						West	8%
						Undetermined	83%

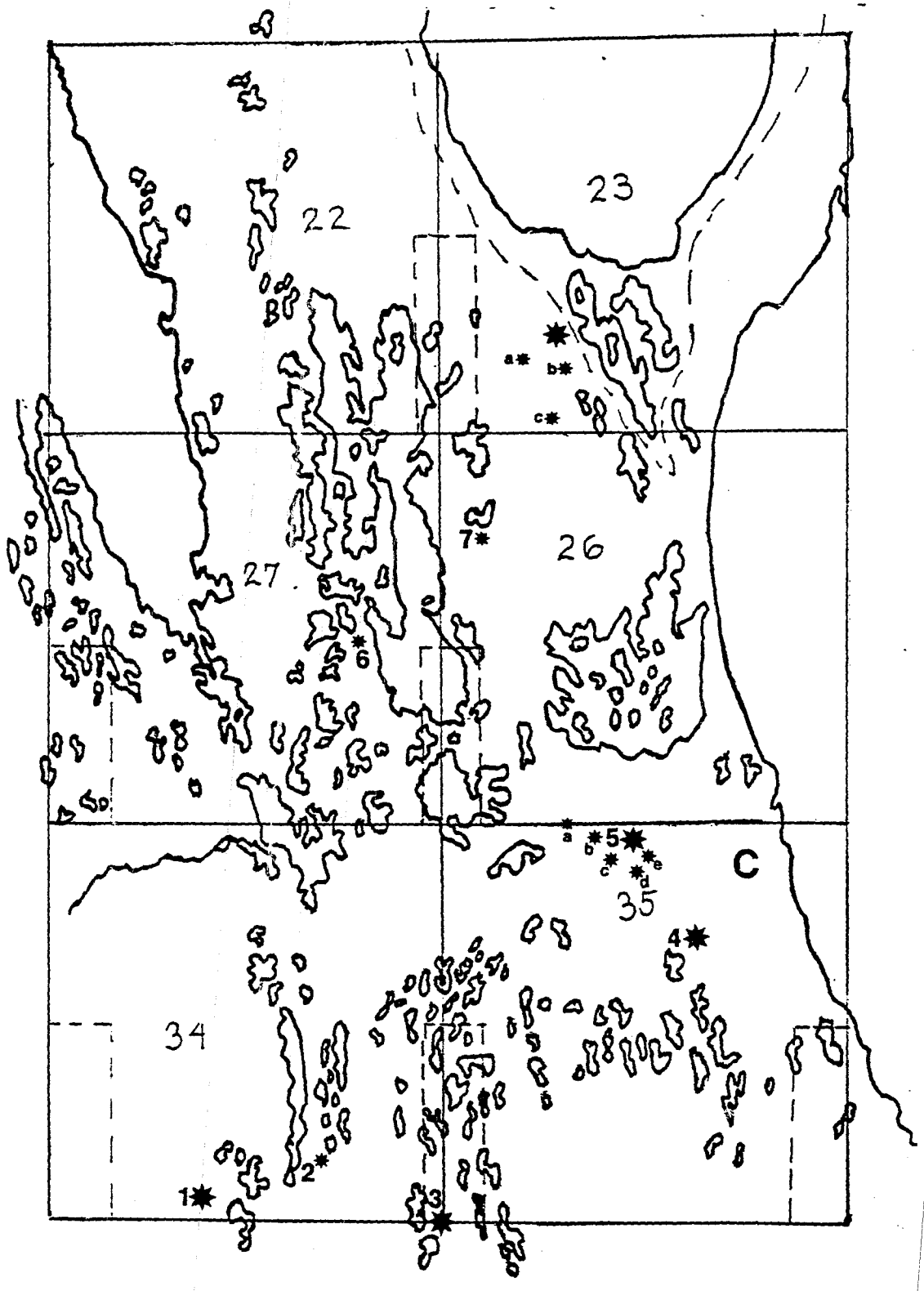

Figure 15. Arctic fox dens on Goose Lake study area, 1979

✸ - major dens - evidence of use in 1979
* - small dens - no evidence of extensive use in 1979.
C - Goose Lake camp.

APPENDIX 3

Size and composition of individual caribou herds

Date	Herd Size	Number of Adults	Number of Calves	Direction	Bulls
June					
1	6	6	0		
2	1	1	0		
3	2	2	0		
4	9	8	1	N	No
4	3	2	1		
6	1	1	0		
7	2	2	0		
10	1	1	0		
10	2	2	0		
10	3	3	0		
10	1	1	0		
12	1	1	0		Yes
12	2	1	1		No
13	4	4	0		
14	1	1	0		
14	1	1	0		
14	1	1	0		
17	12	10	2	S	
17	8	5	3		
18	11	5	6	W	No
19	7	7	0		
20	12	9	3		

APPENDIX 3 (con't.)

Size and composition of individual caribou herds

Date	Herd Size	Number of Adults	Number of Calves	Direction	Bulls
June					
21	1	1	0		
23	27	20	7	W	No
25	39	22	17	S	No
25	4	2	2		
25	1	1	0		Yes
26	4	4	0		
26	1	1	0		
26	5	5	0		
27	15	10	5	S	
28	34	22	12	N	
29	70	70	0	N	Mainly
July					
1	2	2	0	N	Yes (2)
1	4	4	0	N	Yes (2)
1	1	1	0		
2	1	1	0		
2	1	1	0		
6	1	1	0		
7	1	1	0		
8	5	5	0	S	Yes (5)
9	23	23	0		Yes
10	63	59	4	S	Yes (33)

APPENDIX 3 (con't.)

Size and composition of individual caribou herds

Date	Herd Size	Number of Adults	Number of Calves	Direction	Bulls
July					
10	6	6	0		Yes (6)
10	1	1	0		
11	67	55	12		Yes (15)
12	482	475	7	N	Yes
13	1	1	0		
14	1	1	0		
18	8	8	0		
21	175	129	46	N	Yes (15)
21	5	3	2	N	No
26	34	34	0	S	Yes (28)
26	9	7	2	N	No
26	39	26	13	N	Yes (5)
27	13	10	3		No
27	7	5	2		No
27	3	2	1		No
28	15	small groups, singles			No
30	60	60	0	S	
30	8	5	3	S	No
30	2	2	0		Yes (2)
30	4	3	1		No

APPENDIX 3 (con't.)

Size and composition of individual caribou herds

Date	Herd Size	Number of Adults	Number of Calves	Direction	Bulls
August					
1	24	small groups cow/calf, yearlings-single bulls			
2	15	11	4		
2	2	2	0		
2	54	38	16	W	No
2	6	4	2		Yes (1)
2	1	1	0		Yes
2	4	2	2		No
3	60	44	16	N	Yes (4)
3	37	30	7		Yes (2)
4	14	small mixed groups (6-8)			
6	4	3	1		No
7	2	1	1		No
7	3	2	1		No
8	15	11	4		No

natal dens. The others were small, with one to three entrances, and did not appear well used. Dens 5 and 8 were surrounded by several of these smaller, probably day use dens, within 100 yards. Fur around the entrances and presence of scats at dens 1, 4, 5 and 8 indicated probable use this season.

Three pups were observed only at den 1, on 30 June. They were heard barking from the den on 2 July, but were not seen after that date. Two adults were observed leaving the immediate vicinity of the den 8 on 10 July. Two pups and one adult were observed on 16 July on the east shore of West Long Lake, near the site of the 1978 camp.

Food items were scarce outside all dens. A few shorebird bones and feathers, a lemming skull, and caribou bones were the only remains found. Scats and a few food items were collected from dens 1, 5 and 8. The remains of one white-fronted goose and one brant were found on 8 July in the goose exclosure area. The remains of a dunlin and a willow ptarmigan were found near camp and assumed to be fox kills.

On 12 June, a fox was observed swimming across a Class II wetland, apparently being chased off a territory by a pair of foxes.

Lemmings

One Greenland-collared lemming (Dicrostonyx groenlandicus) and four unidentified lemmings were observed on the study area.

Plants

Plants were collected from the study plot and adjacent area (Table 36). Specimens were tentatively identified in the field. Verification of collected specimens was not available at the time of this report.

Records were kept on the phenology of collected plants on the study area (Table 37). Dates of flowering are only approximate. For example, Pedicularis

Table 36. Plants collected at Goose Lake camp and surrounding area - 1979.

Saxifraga oppositifolia L.

Petasites frigidus (L.) Franch.

Dryas integrifolia M. Vahl.

Caltha palustris L.

Saxifraga hieracifolia Waldst. & Kit.

Salix pulchra Cham.

Senecio congestus (R. Br.) DC.

Pedicularis sudetica Willb.

Ledum palustre L.

Saxifraga hirculus L.

Eriophorum Scheuchzeri Hoppe

Arctophila fulva (Trin.) Anderss.

Polemonium acutiflorum Willb.

Cerastium jenisejense Hult.

Saxifraga foliolosa R. Br.

Ranunculus pallasii Schlecht

Rumex arcticus Trautv.

Eriophorum russeolum E. Fries

Carex aquatilis Wahlenb.

Polygonum bistorta L.

Cardamine pratensis L.

Salix arctica Pall.

Papaver Hultenii Knaben

Valeriana capitata Pall.

Senecio atropurpureus (Ledeb.) Fedtsch.

Stellaria longipes Goldie

Table 36 (con't.) Plants collected at Goose Lake camp and surrounding area - 1979.

Melandrium apetalum (L.) Fenzl
Salix reticulata L.
Pyrola grandiflora Radius
Ranunculus Gmelini DC.
Hippuris vulgaris
Cardamine hyperborea O.E. Schulz
Saussurea americana DC.
Taraxacum sp.
Trisetum spicatum (L.) Richter
Arctagrostis latifolia (R. Br.) Griseb.
Chrysanthemum integrifolium Richards
Saxifraga rivularis L.
Braya purpurascens (R. Br.) Bunge
Polygonum viviparum L.
Potentilla palustris (L.) Scop.
Vaccinium vitis-idaea L.
Cassiope tetragona (L.) D. Don
Andromeda polifolia L.
Pedicularis capitata Adams
Saxifraga cernua L.

Nomenclature from Flora of Alaska and Neighboring Territories by Eric Hulten.

Table 37. Phenology of plants at Goose Lake camp and surrounding area - 1979.

Date	Species	Remarks
4 June 1979	Salix sp.	Buds
4 June 1979	Moss	Greening
10 June 1979	Hippuris vulgaris	Shoots appearing
10 June 1979	Eriophorum sp.	Blooming
10 June 1979	Salix sp.	Blooming
12 June 1979	Cassiope tetragona	Greening
12 June 1979	Carex sp.	Blooming
17 June 1979	Saxifraga oppositifolia	Blooming
17 June 1979	Caltha palustris	Blooming
2 July 1979	Ledum palustre	Blooming
2 July 1979	Ranunculus Pallasii	Blooming
3 July 1979	Petasites frigidus	Blooming
3 July 1979	Dryas integrifolia	Blooming
3 July 1979	Saxifraga hieracifolia	Blooming
3 July 1979	Salix pulchra	Blooming
4 July 1979	Senecio congestus	Blooming
6 July 1979	Pedicularis sudetica	Blooming
10 July 1979	Pedicularis capitata	Blooming
10 July 1979	Polemonium acutiflorum	Blooming
13 July 1979	Saxifraga hirculus	Blooming
13 July 1979	Eriophorum Scheuchzeri	Blooming
13 July 1979	Arctophila fulva	Blooming
13 July 1979	Cerastium jenisejense	Blooming
13 July 1979	Saxifraga foliolosa	Blooming
13 July 1979	Rumex arcticus	Blooming
14 July 1979	Eriophorum russeolum	Blooming

Table 37 (con't.) Phenology of plants at Goose Lake camp and surrounding area - 1979.

Date	Species	Remarks	
14 July 1979	Carex aquatilus	Blooming	
14 July 1979	Polygonum bistorta	Blooming	
16 July 1979	Cardamine pratensis	Blooming	
16 July 1979	Salix arctica	Blooming	
16 July 1979	Andromeda polifolia	Blooming	
16 July 1979	Melandrium apetalum	Blooming	
18 July 1979	Papaver Hultenii	Blooming	
21 July 1979	Valeriana capitata	Blooming	
24 July 1979	Senecio atropurpureus	Blooming	
24 July 1979	Saxifraga cernua	Blooming	
24 July 1979	Stellaria longipes	Blooming	
24 July 1979	Saussurea angustifolia	Blooming	
25 July 1979	Pyrola grandiflora	Blooming	
26 July 1979	Salix reticulata	Blooming	
29 July 1979	Ranunculus Gmelini	Blooming	
1 August 1979	Cardamine hyperborea	Blooming	
5 August 1979	Taraxacum sp.	Blooming	Teshekpuk Lake
5 August 1979	Trisetum spicatum	Blooming	Teshekpuk Lake
5 August 1979	Arctagrostis latifolia	Blooming	Teshekpuk Lake
5 August 1979	Chrysanthemum integrifolium	Blooming	Teshekpuk Lake
5 August 1979	Oxyria digyna	Blooming	Teshekpuk Lake
5 August 1979	Braya purpurascens	Blooming	Teshekpuk Lake
6 August 1979	Polygonum viviparum	Blooming	Teshekpuk Lake
6 August 1979	Potentilla palustris	Blooming	Teshekpuk Lake

capitata was first noticed flowering on 10 July. This date is only an approximation due to several reasons: oversight, delayed collection (collection of the species several days or weeks after it was first noticed), and environmental differences - the species may flower earlier in more favorable habitat.

Several species were collected on 5 August near Teshekpuk Lake (Table 37). Taraxacum sp., Trioisetum spicatum, Chrysanthemum integrifolia, Oxyrea digyna and Braya purpurascens were not found in the study area. It appeared that several species such as Dryas integrifolia and Saussurea americana were flowering later or retained their flowers longer as compared to plants on the study area.

Recommendations include a more extensive plant collection from study areas. Wetlands should be described floristically by aquatic and terrestrial vegetation. Plants growing adjacent to wetlands could be sampled by a series of sample plots running perpendicular or parallel to the shore.

Recommendations

Due to increasing oil-related activities on the North Slope, it is necessary to obtain sufficient baseline data to determine possible future impacts of these activities on the environment. It is therefore recommended that studies of waterfowl and wetland habitats be continued in the NPR-A, in particular in the goose molting area of Teshekpuk Lake.

Specific studies which might be pursued include: 1) more detailed and comprehensive information on use of various wetlands by major groups or species of birds, especially as related to seasonal chronology of avain activities. Particular attention might be paid to the possible differences in use caused by variations of wetlands within a particular class; 2) comparisons of productivity, success and especially behavior of loons nesting in relatively undisturbed areas with loons nesting in developed areas (e.g. near the haul road); 3) comparisons of areas used by molting geese with similar-appearing

areas not used; 4) comparisons of success of nests located on bird survey routes with nests not regularly disturbed; 5) more detailed information on aircraft disturbance (see Results and Discussion).

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APPENDIX I

Aircraft Disturbance

Date	Time	Location and Direction	Type of Aircraft	Number	Altitude	Species Response
9 June 79	1600	sxn35 - N	C-130 Hercules	-	-	4 White-fronted geese flew, circled
10 June 79	0845	sxn26 - N	Twin Otter	N8085N	1500'	No reaction
12 June 79	1200	sxn34 - N	Single engine	-	<1000'	Spectacled eiders became alert
14 June 79	1130	sxn27 - N	Single engine	N7331U	<1000'	No reaction
15 June 79	1200	sxn35 - N	Single engine	-	>1000'	6 White-fronted geese flew
16 June 79	1900	sxn35 - N	Bell 206 helicopter	-	"low"	No reaction
17 June 79	1200	snx26	Helicopter	-	"low"	Birds flushed
19 June 79	1500	sxn35 - NW	Single engine	-	1000'	2 King eiders flew, 1 White-fronted goose alert, did not fly
19 June 79	1530	sxn35 - N	Single engine	N7331U	1500'	2 White-fronted geese flew 100m, resettled
20 June 79	-	- - N	Single engine	N7331U	-	-
25 June 79	1445	sxn34 - NW	Single engine	N7331U	300'	No reaction
26 June 79	1135	sxn33 - NW	Bell 206 helicopter	-	1000'	Geese flushed
26 June 79	1140	sxn33 - NW	Single engine Cessna	-	1000'	No reaction
26 June 79	1330	sxn34 - NW	Bell 205 helicopter	-	"low"	Birds flushed
2 July 79	1135	sxn34 - NW	Single engine	-	<100'	No reaction
3 July 79	1930	sxn35-26	Single engine	N7331U	"very low"	No reaction
5 July 79	1800	sxn23 - N	Bell 206 helicopter	-	300'	White-fronted and Canada geese and Black Brant flushed, calling
10 July 79	1140	sxn21	Bell 205 helicopter		300-500'	Black Brant within 1/4 mile did not fly
11 July 79	0930	sxn34 - S	Bell helicopter	-	200'	No reaction
11 July 79	1130	sxn27 - NW	Single engine	-	<100'	No reaction
11 July 79	1145	sxn27 - NW	Single engine	N7083K	500-700'	Caribou got up and ran
12 July 79	1630	sxn26 - W	Single engine	-	300'	No reaction from birds on point
12 July 79	1645	sxn23	Bell 205 helicopter	-	landed	Black Brant flew when aircraft was 3 miles away. 4 observers 1/4 mile away
13 July 79	1030	sxn25 - E	Twin engine	-	10,000'	75 White-fronted geese alert, calling, ran along shore. Resumed feeding in 2 minutes
13 July 79	1042	S. of area - E	Cessna Skywagon	-	8,000-10,000'	11 Black Brant - no reaction
13 July 79	1900	sxn34 - W	Single engine	N7331U	<200'	No reaction
21 July 79	1300	sxn27 - S	Turbine Beaver	N754B	<200'	Arctic loon on nest - no reaction
24 July 79	1440	sxn34 - NW	Single engine	-	200'	No reaction
26 July 79	1430	sxn35 - NW	Single engine	-	200'	3 eiders flushed; 1 glaucous gull flushed off nest; caribou ran
30 July 79	0915	sxn26-35	Bell 205 helicopter	-	landed	12 Canada geese flushed 1/8 mile off. Glaucous gulls flushed
30 July 79	0950	sxn26-35	Bell 205 helicopter	-	landed	2 bull caribou at 100m reared and ran; large flocks of shorebirds flushed
30 July 79	1035	sxn23	Bell 205 helicopter	-	300'	Black brant stopped eating; yearling caribou got up and ran
6 August 79	-	sxn35	Helicopter	-	150'	Caribou - no reaction
8 August 79	-	sxn23 - N	Helicopter	-	100-200'	7 White-fronted geese flushed, flew NE
12 August 79	-	sxn35	Single engine	-	200'	Arctic loons flushed and called; geese flushed and circled

Appendix 2

Chronology and migration records

Date =	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Yellow-billed loon ✓																		–								
Arctic loon ✓				1			2	3	7	3	34	2	41		5	1	19	43	9	12	6	1	16	14	3	31
Red-throated loon ✓											D.?		2				2	2	2		2			1		4
Whistling swan							3	2		5	5	2	4				2	2	3		2					2
Canada goose									2							22	18	18	12	22	29	6	50	47		
Lesser snow goose		Lonely 2																					2			52
Black brant			2	18	6	4	28	79	32	2	41	1	13	4	2		9	58	26		6		44	26	3	20
White-fronted goose		2		5	33	6	15	22	10	17	72	8	37	6	37	6	32	58	18	21	24	5		18		
Pintail		Lonely 6	1	57	11	3	7	17	24	2	X	8	31	3	9	1	6	76	12	2	6	2	25	9		112
Mallard																										
American wigeon																										
Common eider																										
King eider			6	13	4			4		4	17	2	6				2	11	9	4	3		1	1		6
Spectacled eider				2	10		12	2	4	10	40	2	12	2	4	3	10	19	7	1	5		11	1		11
Oldsquaw		2		5	6		16	12	9	14	X	5	25	5	13	4	12	51	10	19	14	1	4	6		54
Black scoter																										
Surf scoter																										
Red-breasted merganser																										
Amer. golden plover				2	3	1	1	4	2	1			3		1		1	6	3		1	2	6	4		1
Black-bellied plover			2	4	2	1	1	1	2				4				1	10	3	3	2			1		2
Ruddy turnstone									8	1								3					4	3		
Buff-breasted sandp.																										
Pectoral sandpiper				3	8		5	6	3	5	X	4	14	4	10	6	X	X	X	5	X	X	X	X		X
Dunlin		X	X	X	X	X	X	X	N*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Baird's sandpiper				2			2	2					7	2	2		1		6	3		2	5	2		2
Semipalmated sandpiper				1	1			3	2	2			3	1	1			4	3	3	5	3	1	4	5	7
Red phalarope		6		3	8	4	11	13	X	X	X	X	X	X	X	3	X	X	X	X	X	X	X	X	X	X
Northern phalarope		Lonely 41		2	6		4	2	2	1		1	X	1	2		3	8	12	2	3		3			20
Pomarine jaeger		3	2	8	5	2	4	9	6	2	6	3	7					2	–					1		
Parasitic jaeger									2	-	8	4	1	1			2	7	2	1	2	1	1	1		12
Long-tailed jaeger							3			-	3		2				1			2	1	1	1			
Glaucous gull		Lonely 37		X	X	X	X	X	X	X	20	2	X	X	X	5	X	X	X	X	X	X	X	X	3	14
Sabine's gull				2	3		3	5	6	2	21		13		6	1	3	10	-		4		10	7		6
Arctic tern		1	1	2			7	2	X	2	13	1	10	5	4	1	2	24	6	2	1	1	6	4	1	30

*3 eggs

*Adj to study area on 5 days in 25

Status: N=nest, E=egg, B=breeding behavior, Y=young

JUNE

	Status	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ivy owl									/		/				/					/		/				
Short-eared owl								/			/				/											
Common raven																										
Lapland longspur		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Snow bunting		4	X	2	2											/	/		2	12	9	2	1	1	2	2
Low billed Dowitcher			2					2			2	/	12				2	13	4	3	3					4
Wilson's phalarope					1		2	/		2?	5?						2		2	2		1		1		5
Steners Eiders											4															
Sandhill cranes													2				1							heard		
Lemming																				1	J			1		
Arctic fox				1			2	1	2	2	2		5		1	1	2	7	2	2	1	1	1	1		5
Caribou		6	(1)	9	12	3	1	4	4	2	7	4	7	8	3	2	5	20	11	11	12		10	27		57
Caribou calves					2								1					5	5		3		3	7		20
		✓	X	+7	✓	+3	X	+2	11	2	+1	4	4	+4	✓	+2	5	✓	✓	+4	✓	X	10	✓		19
		✓	X				X				X												✓			

CARIBOU:
4 JUNE 1979 - 2 cylinders of 1 calf
12 JUNE 1979 - 1 cow w/ calf -
17 JUNE 1979 - 5 cows - w/ 3 calves
- 10 misc animals w/ 2 calves
18 June 1979 - 5 cows w/ calves, 1 extra unborn.
25 JUNE 1979 - herd 22 animals
17 calves
39
2 animals
2 calves
4
14 on west horizon

226

Info	Status	26	27	26	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Yellow-billed loon																										4
Arctic loon		12	31	5	7	16		12	8	5	5	7	1	3		31	12		7			8		21	24	2
Red-throated loon			4		1	2	3	1	1			1		2		2	2		3			2		9	4	
Whistling swan			2			3		3	3		2					4	4							2	4	
Canada goose			23	9	12		12		3		6	5		200		35									5	
Lesser snow goose																										
Black brant		5	3	5	4		15		7		18	12	18	49		5		93	31					73	9	
White-fronted goose		60	21	42	92	100	223	58	15	6	100	90		50		8	4		78					10		371
Pintail		15		4	7	32	36	15	12	1		2		7		9								5	5	
Mallard											2															
American wigeon																										
Common eider																										
King eider		2					2	1				4				1	7	22			3			23	14	
Spectacled eider					3	8	5									5	3								22	
Oldsquaw		12	2	5	22	18	41	11	11	10	2	7	2	2		37	16	4	8			1	4	18	28	20
Black scoter																										
Surf scoter																										
Red-breasted merganser																										
Amer. golden plover		2		6	4	2	6	4		1	1	2	5	5		2	1	7	4		3			44	20	
Black-bellied plover		3	3	6	6	3	7	1		2		2				5	4	25			2			68	50	
Ruddy turnstone		1						2	1	1				2			1	4						18	5	
Buff-breasted sandp.																										
Pectoral sandpiper		20	1	2	7	?	X	X	X	X	6	3		1		7	35	15	X		16			X	90	
Dunlin		15	X	X	X	X	X	X	X	X	X	2	X	X		X	20	X	X	1	X	X	X	X	30	
Baird's sandpiper		5			3	2	7	X	X	2						1	14	X							6	
Semipalmated sandpiper		6	3	3	2	X	XY	X	X			4	2	2		X	6	5	X					7	5	
Red phalarope		53	X	X	X	X	X	X	X	X	1	40	X	2		X	23	X	X		X	X	X	X	550	
Northern phalarope		7			9	6	X	X	X		1	4				X	16	X	X					10	7	
Pomarine jaeger																								1		
Parasitic jaeger		3		1	2	2	10	5	2		3	1	1			6	2	1	2	1				8	14	
Long-tailed jaeger		1			2	1		2						1		7	1	2			9	100	2	50	1	
Glaucous gull		X	7	3	4	X	21	4	X	6	X	8	2	3	1	15	8	5	6	1	3		4	37	25	2
Sabine's gull		3	1	5	6	2	11		5	1	25	26	4	2		20	5	25	1			5	1	115	42	
Arctic tern		X		11	7	7	38	2	4		10	3	6	3		10	7	12	3				1	17	9	

Status: N=nest, E=egg, B=breeding behavior, Y=young
H= heard

	Status	26	27	28	29	30	July 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Snowy owl																										
Short-eared owl																										
Common raven																										
Lapland longspur		39	X	X	X	X	XY	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Snow bunting			3	1	2										1	1									1	
Sandhill Crane		H																								
Long Billed Dowitcher			3	1	7	20	45	14	7	5		2				5	19	27	1	4	16	1		187	77	
Lesser yell				1																						
Peregrine falcon ?										1'																
Bar. Tailed godwit											1															
Marbeled godwit														1												
Stilt SANDPIPER																		1							3	
Long billed																1										
Pterodactyl																		2	1		1	3	1	3	2+ 6 yng	
Lemming									1					1							1					
Arctic fox		#	2	1	2	5#	1	H	–		1				1	3	1/h		1		1					
Caribou		10	15	50	160		7	1	6			1	1	22	23	81	67	482	1	1				20		20
Caribou calves		0	5	19	4				–		6					4	12	7								
		✓	✓	×16	90		✓	X	16			X	X	11	✓	11	✓	✓	X	X				12		✓
								X				X	X						X	X						

1174

H – heard

29/6 - Mosquitoes out!

30/6 Mosquitoes really out!!

* 3 pups

1 ON 4 July - falcon perched on radio antenna - positive identification NOT possible due to weather conditions + probably a peregrine

H = heard

Site	Status	21	[illegible]	23	24	25	[illegible]	27	28 *	29	30	31	1	[illegible]	3	4	5	6	7	8	9	10	11	12	
Yellow-billed loon																									
Arctic loon		5			39	24	9	9	8	12	2	16	18	[illegible]	9	2	30	6	27	6	17	8	4	14	
Red-throated loon		2		1	3	6	[illegible]	5			1	1	4	1	1	1	3		2	5	3		2		
Whistling swan				9	2	1								[illegible]							2				
Canada goose		25		86	7*	7	17	30	30		12	8	14	18	3		15	4		20	20				
Lesser snow goose				2																					
Black brant		25		1				10	100	4	45			15	12			22	25	5	2			8	
White-fronted goose				297	24	5		70		30		6	15	[illegible]	23	7	10	3	6	27	6		4		
Pintail				5	9/F	7				20		10	60	[illegible]	6		27	4	8	6	54		6	15	
Mallard																									
American wigeon																									
Common eider																									
King eider		37		42	148	15	3	9	7					11	1		4 4			2				2	
Spectacled eider					5																				
Oldsquaw		1		50	14	15	15	93	200	2	3	8	12	26	2		4		145*	110*	11*		3	46	
Black scoter																									
Surf scoter																									
Red-breasted merganser																									
Amer. golden plover		4			45	17	3				7	4	3	7			1						3	1	
Black-bellied plover					79	46	20	38	4	10	31	69	18	45	25	3	15	3	13	X	5		2	15	
Ruddy turnstone		1			4		2		8	6	2			3	1	5	8		5	14			6		
Buff-breasted sandp.																									
Pectoral sandpiper		5	20		X	131	5			22	11	12	100	X	14	16	30	8	X	X	~20+		12	35	
Dunlin		5			X	24	12			100	8	6	62	X	4/20	7	55		X	X	X		6	3	
Baird's sandpiper					10	1	3							9											
Semipalmated sandpiper					X	5	X	13		XXX	XXX	12	4/5	32					X	X	X				
Red phalarope		200	15		X	22	X				1		2	1	25	1	50		2	2	~?				
Northern phalarope		400	4		X	34	X	1	X	X	X	12	10	30		1	2		8	X	~100			3	
Pomarine jaeger																									
Parasitic jaeger				1	12	3		1		4	2		1	14	2	2	6		1	5	4	2	5	7	
Long-tailed jaeger		2					1			2		1	1				1								
Glaucous gull		4	2	1	26	3	[illegible]		6	16	13	14	4	15	13	4	9	5	9	11	16		1	6	
Sabine's gull		4			43	4	1		30	2	5	5	4	26		2	1				11		6	1	
Arctic tern		5	1	1	23	8	2		3	3	6	8	6	29	6		10	6	10	7	11		1	3	

Status: N=nest, E=egg, B=breeding behavior, Y=young

F= flier

* Flock of ~250 on [illegible], + another small group out in water.

* W shore, W. Long + Goose L.

*+100 Goose L.

23rd [illegible] flier near Goose Lake

* [illegible]

Snowy owl																										
Short-eared owl																										
Common raven																										
Lapland longspur		X	X	X	X	123	X	X	X	X	X	X	90	X	X	X	X	X	X	X	X	X	15			
Snow bunting		H				1																				
Lon. billed dowitcher		4			19	10				2	2	3	20	20	2	1	1		3	6	7		1			
Rough-legged hawk													1								1					
[illegible] gyrfalcon														1												
Peregrine falcon																			1							
Lemming																										
Arctic fox					1		H*		1													1				
Caribou		180		4			84	23	15	2	77	2	24	85	97	14	50	~40	6	21	12		5	8		
Caribou calves							15	6			4		3	24	23	4	5	5	3	4						
Snow snake		✓		+4			+c.	✓	+15	+2	+3	+2	24	x3	✓	14	+50	36	XX	+10	12		+5	+0		

7/21 - herd ~ 20% calves.

* 7/26 - [illegible] from den - [illegible] no fox seen.

F = flier W. Long + Goose L. 23rd [illegible]

BIRD MIGRATION DATA 1983

Simpson Firestine

STUDY AREA: Goose Lake

DATE/TIME	SPECIES	FLOCK SIZE	DIRECTION	ACTIVITY
6/7 : 11:00AM	Black Brant	11	southwest	flying
6/7 : 9:45pm	Pomarine jaeger	8	Southeast	"
6/8 : 10 am	—"—	3	South	"
6/10 11AM	PINTAIL	20	northwest	
6/10 3pm	PINTAIL	15	Northwest	
6/12 10 AM	Pintail	15	Northwest	
6/14 1200	PINTAIL	5	EAST	FLYING
6/15 1345	Canada geese	17	NW	"
6/15 1410	—"—	5	NW	"
6/16 1100	—"—	5	NW	"
6/16 1400	—"—	11	WNW	"
6/16 1630	Arctic loons	6	E	"
6/18 11:30	King eiders	7(3♂, 4♀)	S	Flying
6/18 11:30	Canada geese	12	NW	flying past SEP 4
6/18 1445	Brant	14	East	flying over goose L.
6/19 1300	Canada geese	11	N-NW	flying along Goose L
6/19 1400	Canada geese	6	N-NW	" " " "
6/20 1100	Canada geese	5	N-NW	"
6/20 1600	Canada geese	17	N-NW	flying
6/21 2200	" "	6	N-NW	"
6/22	Canada geese	11	N-NW	"
	"	11	N-NW	"
	"	8	N-NW	"
↓	"	2	N-NW	"
6/25 -	Canada geese	26	SW	flying along Goose Lake
↓	" "	7	SW	flying
6/27	Canada geese	13	NW	from E of Goose Lake

TAYLOR
SIMPSON
FIERSTINE

BIRD MIGRATION DATA 2 of 2

AREA: Goose Lake

DATE/TIME	SPECIES	FLOCK SIZE	DIRECTION	ACTIVITY
29/6 2300-2400	White Fronts	16 mostly adults	No.	flying over Goose L
15/7 1000	Pectoral Sandpiper	16 ?	SE sxn 35	flying
16/7	long-tailed jaegers	65 ?	sxn 26 sitting on ground, flyi	
16/7 0100	"	35	sxn 35	" feeding
18/7 1100	long-tailed jaegers mothers [illegible]	~50	S. 35	resting in rain + [illegible]
18/7	Black bellied plovers	20	S. 26	feeding. Cl I
18/7	"	23	S. 23	"
12/7	L. B. dowitchers	40	S. 26	circling
12/7	Black bellied plovers	10		
18/7	Sabine's gulls	101	S 26, Cl III → W	resting on [illegible]
18/7	L B dowitchers	60 (UN + 20)	Cl I - III S. 23	circling
18/7	[illegible]	40	S. 23 Cl III	circling
18/7	L B. dowitchers	13	S. 26	circling
12/7	"	15	S. 35 → S	"
19/7	l. billed dowitchers	55		upl. edge of II sxn
"	dunlin	17		low center polygons sxn 27
"	Am. golden + bl. bellied plovers	32		feeding at N end of Goose L.
"	dunlin, pectorals etc. phalaropes 90%	500+		along shore of Goo and along shore [illegible]
"	bl. bellied 90% and Am golden plovers	~50		upl + I's betw II's sxn 26
"	pectoral 90% + Baird's sandpipers	flocks of 8-20	→ E, feeding	SBP 6 upl. ridges be
18/7	SABINES GULLS	38	flying west 7:45 pm	section 35
21/7	mostly (75%) Northern phalaropes	580	feeding, swimming	SECTION 26
16/7	SABINES gulls	38	NEAR end of C-III of SECTION 23	
24/7-79	Red + northern phalaropes, plus	>500, 50/50	streams out along shore of Goose L. sxn	
"	semipalmated sandps.	5 to 16	"	
"	and pectoral sandps.	threes--5's, 6's	"	
"	"	16 sitting edge of	I sxn 26. → E	
"	Am. golden + bl. bell. plovers	35 - landed in dense	Arctophila W of	II-2. sxn 22

Taylor
Simpson
Fieratine

BIRD MIGRATION DATA

STUDY AREA: Goose Lake

DATE/TIME	SPECIES	FLOCK SIZE	DIRECTION	ACTIVITY
24/7-79	dunlin	30-20-10-10 20	in tpl. tundra	no. end sxn 26.
" 0100	oldsquaws	~200	on Goose L. toward W. Long L.	Swimming.
"	lapland longspurs	20	→ S in sxn 35	flying.
"	mixed 50/50 plovers	22	sparse Carex mud Nof IV in sxn 26.	
"	pectoral s.	5	→ E sxn 35	
25/7-79	UNIDENTIFIED PLOVERS	9	flying E section 27	
25/7-79	BLK-BELLIES plovers	16	section 34	circling
26/7-79	UNID. PLOVERS	20	S - 23	Feeding - ↓ar
26/7-79	semi-palms	15	S - 26	Feeding : shor gen. L.
27/7-79	Black-bellied plovers	34	SE over sxn 35 over Goose L.	flying hi, callin
29/7-79	Dunlin	100	feeding on I's on point, Goose L.	
"	Pectorals	15	S, sxn 34	flying fast
30/7-79	Black-bellied plovers	25	feeding on clI; goose L.	
31/7-79	— " —	90	S hi in V over sx27.	Flying
— " —	— " —	24	E low sxn 27	flying
1 August 79	Long-billed dowitchers	16	circling section 34 over S&L 3	
"	DUNLIN	10	S&L 6 - resting on ridges of low center poly	
2 Aug 79	Black-bellied plovers	25-30	East - flying fast in V,	
"	"	25	East - same	
"	"	2-10	East - same	
"	Long-billed dowitchers		circling or W. S. 23	
3 August 1979	BLACK-BELLIED plover	~5, 4 additional small flocks	feeding area of Goose Lake & dunlins	
3 August 1979	DUNLIN	75 ~15, 20, 10 10	birds were using Goose Lake un feeding in wet clear I all	
5 August 79	Peeps sandpipers	8	shoreline of Goose L. - S. 35 - turning to SE / in wind	
"	phalaropes unidentified northern	50	cl to S. of study area - feeding	
12 August 79	Black-bellied plover	8	V headed southeast - h	