STATUS AND BREEDING BIOLOGY

OF THE PIPING PLOVER

IN LAKE OF THE WOODS COUNTY, MINNESOTA

A PROGRESS REPORT SUBMITTED TO:
NONGAME PROGRAM
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INTRODUCTION

The Piping Plover (Charadrius melodus) population on Pine/Curry Island in Lake of the Woods is presently the largest known concentration of breeding plovers in Minnesota, and perhaps is the largest in the Upper Midwestern United States (Minnesota Department of Natural Resources, pers. comm.)

Recognizing the rarity of this species and its potential rapid extirpation from a substantial portion of its range, the Nongame Program of the Minnesota Department of Natural Resources contracted with F. Cuthbert to collect data on the status, size, and breeding biology of plovers in Lake of the Woods. In April 1982, we initiated a study of the Piping Plover population nesting on Pine/Curry Island and searched for other pairs of breeding plovers in the surrounding area. This report summarizes our results.

METHODS

The project goals were realized through performance of the following tasks. From late April through mid-August 1982, T. Wiens collected data on the following aspects of the biology of plovers: 1) breeding chronology, 2) total number of plovers present throughout the season (non-breeding individuals and breeding pairs), 3) nesting success, 4) factors causing reproductive failure, 5) size of nest territories and distribution of nests, 6) diet and feeding habitat, and 7) major characteristics of the nest habitat.

To determine breeding chronology, factors causing reproductive failure, size of territories, and feeding habits, plovers were observed daily (weather permitting) from 1 May to 14 August 1982. Additional checks were made on 24 April and 23-24 August. Most observations were made from a small land-based

blind or boat anchored near the shoreline.

Population size, distribution of nests, and nesting success were monitored throughout the season by direct observation of adults, nests, and nest contents. Juveniles were considered to have fledged once they were capable of flight.

To facilitate recognition of individual plovers, 71 individuals (37 adults, 34 juveniles) were captured and banded with U.S. Fish and Wildlife Service aluminum leg bands and unique combinations of colored leg bands. Adults were captured with mist nets or wire mesh drop traps; juveniles were captured by hand.

Characteristics of the nesting habitat were determined from substrate and vegetation samples and measurements taken on major habitat features (e.g. distance from nearest shoreline, beach pool, piece of vegetation, object, vegetation line.) In addition, open beach width and slope of ground at the nest site were recorded.

Finally, the occurrence and distribution of additional nesting pairs in the vicinity of Pine/Curry Island was determined during reconnaissance trips by boat and plane to sites within and surrounding the lake where plovers were observed in the past (e.g. Stony Point, Zippel Bay) or where suitable plover nesting habitat was identified.

RESULTS

Breeding Chronology

Chronology of the breeding cycle is summarized in Figure 1. Individual nest histories from egg laying through hatching are presented in Table 1.

FIGURE 1

CHRONOLOGY OF THE BREEDING CYCLE OF PIPING PLOVERS ON PINE/CURRY ISLAND IN 1982

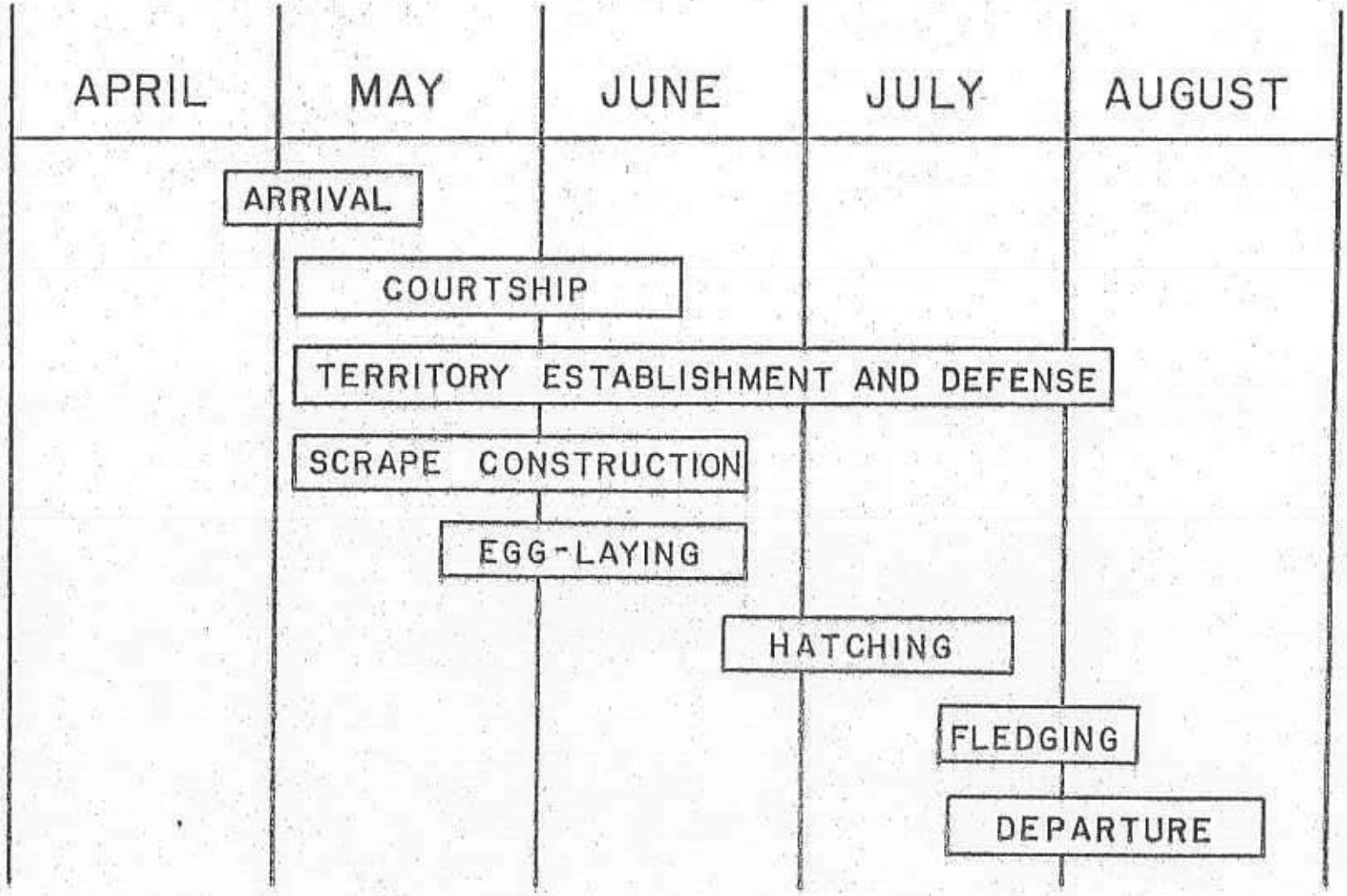


Table I. Individual Nest Histories

NEST[1]	DATE FIRST[2] EGG LAYED	NUMBER OF[3] EGGS LAYED	DATE OF[3] HATCHING	NUMBER OF EGGS HATCHED	NUMBER OF CHICKS FLEDGED
1	20 May	4	*	0	0
2 (Morris Point)	22-24 May	1*	*	0	0
3	-	4	20 June	3	3
4	22 May	4	25 June	4	2
5 (Morris Point)	24-25 May	2*	*	0	0
6	-	4	*	0	0
7	25-26 May	3*	*	0	0
8	28 May	4	*	0	0
9	25-26 May	4	*	0	0
10	-	4	22 June	3	3
11	-	4	26 June	4	4
12 (Morris Point)	2-3 June	4	4 July	4	4
13 (Morris Point)	-	4	*	0	0
14	2-3 June	4	4 July	3	3
15	29 May	4	27 June	1	1
16	4-6 June	2*	*	0	0
17	5 June	4	8 July	4	2
18 (Morris Point)	11-12 June	4	14 July	2	1
19	9 June	4	*	0	0
20	12 June	4	*	0	0
21	17 June	3	*	0	0
22	23 June	4	24 July	3	0
23 (Rocky Point)	-	4	6-19 July	4	3
24	-	3	18 July	3	0
TOTAL		86		38	26

[1] Nest located on Pine/Curry Island unless otherwise indicated.
[2] - indicates lack of information.
[3] * indicates that the nest failed either before the clutch was completed, or before the nest hatched.

Arrival. — Four Plovers were present on Pine/Curry Island when we made our initial visit on 24 April. Ice conditions on the lake and flocking behavior of these birds indicated they probably had arrived in the preceding 1 to 2 days. Most of the plovers arrived by the first week in May.

Courtship and territory establishment. — Courtship and territory establishment began soon after arrival. Horizontal threat displays (used by males to defend territories) and butterfly flights (used by males to attract females) were seen on 2 May. Most plovers were paired by mid- to late May. Butterfly flights were last observed on 15 June. Vertical displays and tatoos (used by males to maintain pair bonds with females) were performed until the first egg was laid. Territorial defense was observed with varying intensity until juveniles fledged.

Nest construction. — Males made many nest scrapes as part of courtship. The first scrapes were constructed on 2 May and this behavior continued until the first egg was laid. Scrape making was recorded as late as the third week in June.

Egg-laying. — Eggs were laid from 18 May to 23 June; the peak laying period was from late May to early June. Mean clutch size was 3.9 eggs/nest. Eggs were laid every other day, and incubation usually began after the last egg was laid.

Renesting. — Eight pairs renested at least once during the season. Renesting was common in pairs that lost their nests before mid-June. Re-nesting was documented in one instance, and circumstantial evidence indicated that six other pairs renested once and that one pair renested twice. In all cases, the

original clutch either disappeared or was destroyed by high waves. The first egg of each renesting attempt was laid approximately 5 days after the original clutch failed. The latest renesting occurred on 23 June after a nest failed on 18 June.

Hatching. — Most hatching (75%) occurred from 20 June to early July. The last nest hatched on 24 July.

Fledging. — Young were considered to have fledged once they were able to fly. This occurred approximately 24 days after hatching. Fledging was observed from 14 July to 7 August (one young may have fledged as late as 17 August).

Departure from Pine/Curry Island. — Adults began leaving by mid-July and most (89%) had disappeared by early August. When daily observations were concluded on 14 August only one adult was still present. Juveniles stayed later than adults; about half (48%) departed by mid-August. Only two juveniles were present during the last visit to the island on 23-24 August.

Population Size

Breeding plovers were found on Pine/Curry Island, Morris Point, and Rocky Point (Fig. 2). No evidence of nesting was found at previously reported sites at Zippel Bay or Stony Point.

Breeding pairs. — This category includes any pair known to have laid at least 1 egg. A total of 15 pairs of Piping Plovers produced eggs in Lake of the Woods, Minnesota. Twelve pairs nested on Pine/Curry Island, 2 pairs on Morris Point, and 1 pair on Rocky Point.

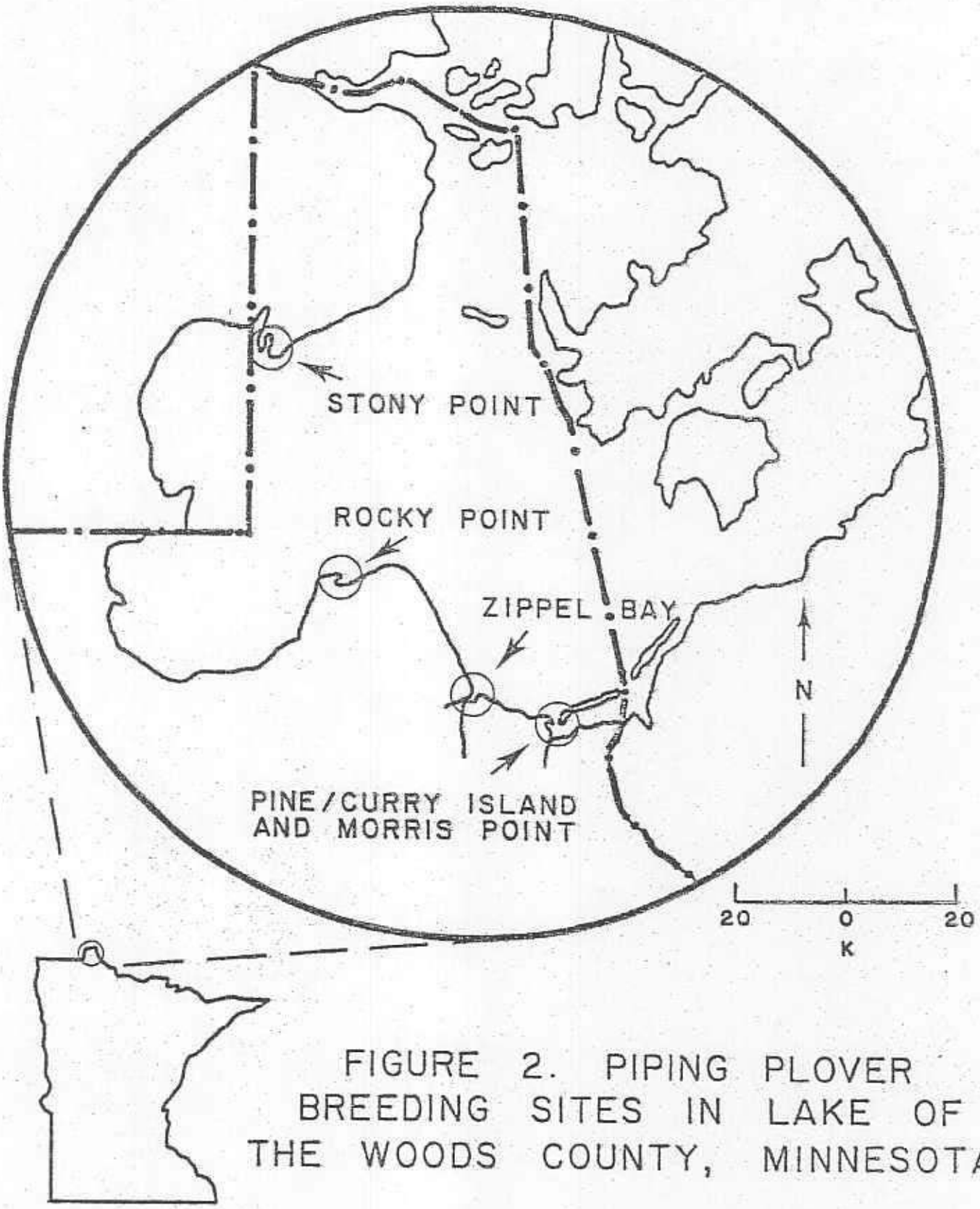


FIGURE 2. PIPING PLOVER BREEDING SITES IN LAKE OF THE WOODS COUNTY, MINNESOTA

Non-breeding individuals. — Approximately 14 non-breeding plovers were observed in the study area. These included single individuals that were seen once or twice during the summer and birds that initially were paired but later were observed as single individuals in the vicinity of the nesting sites.

Based on these observations, we estimate that there was a total of 44 Piping Plovers present in the area. All but one individual possessed a complete breast band and relatively dark markings which are characteristics of the race C. m. circumcinctus. The one exception had an incomplete breast band and relatively light markings, indicating it was of the race C. m. melodus. This individual was present for 3 to 4 weeks but did not reproduce.

Nesting Success

In determining nesting success, we considered only the 15 pairs that were known to have produced eggs. This group of birds produced a total of 24 nests with eggs. Nine clutches were renesting attempts. Of the 24 nests, 18 were located on Pine/Curry Island, 5 on Morris Point, and 1 on Rocky Point. The clutch size was typically 4 eggs ($\bar{x} = 3.9$).

A total of 86 eggs was laid and 38 (44.2%) hatched. Of the 38 chicks that hatched, 25/38 (66%) were known to have fledged, and left the island. This represents a mean of 1.7 chicks/pair. One of these juveniles was found dead on 12 September at Apalachicola Estuary, Florida. These data indicate that, during the 1982 breeding season, the mortality rate was much higher during incubation than in the period between hatching and fledging.

Factors Causing Reproductive Failure

Egg mortality. — A total of 48/86 eggs (56%) failed to hatch. We

attribute egg mortality to the following causes: predation (67%), storm damage (21%), human disturbance (8%), and unknown (4%).

Chick mortality. — A total of 38/86 chicks (44%) hatched. Thirteen (34%) died between hatching and departure from the island. Of those that died, nine (69%) disappeared and we believe they were eaten by predators. The other 4 (31%) were found dead from no apparent cause.

Adult mortality. — No adults were found dead during the study period.

Cause of mortality was difficult to determine. Ten eggs were washed out of nests by storm generated waves, and four eggs (entire clutch) were stepped on by vacationers visiting Pine/Curry Island. Young found dead may have been victims of exposure, starvation, or disease. The disappearance of entire clutches or partial clutches probably was due to avian predators. Although acts of predation were not observed, Herring Gulls (Larus argentatus), Ring-billed Gulls (L. delawarensis), Common Ravens (Corvus corax), and American Crows (C. brachyrhynchos) often were seen near or within Piping Plover nesting areas. Additional potential predators, especially of chicks and adults, included Merlins (Falco columbarius) and Great Horned Owls (Bubo virginianus,). One potential mammalian predator, a weasel (Mustela sp.), was observed on a single occasion on Pine/Curry Island. Mammals such as striped skunk (Mephitis mephitis), raccoon (Procyon lotor), and red fox (Vulpes vulpes) were not observed on Pine/Curry Island but may have been present at the mainland sites (Morris and Rocky points).

Size of Nest Territories and Distribution of Nests

All but three of the nests on Pine/Curry Island were located within 500 m

of the southwest end of the island (Fig. 3). All of the nests on Morris Point (Fig. 4), as well as the single nest on Rocky Point, were within 150 m of the tip of their respective points. Mean distance between the 15 nests located on the southwestern point of Pine/Curry Island was 58 m (SD = ±50 m).

Diet and Feeding Habitat

Both young and adult plovers fed by pecking at the sand of the beaches or dunes. Although the open beach near the shoreline seemed to be preferred, plovers also were observed to feed on the higher vegetated ground that characterized their nesting habitat. Most of the open beaches on Pine/Curry Island and Morris Point were utilized by Piping Plovers, but areas where tall vegetation encroached upon the beach rarely were used. Adults did not feed exclusively within their territories. Often they flew to and fed on nearby portions of undefended beach. Occasionally they flew as far as 7 km away from their nesting territory. After hatching, chicks fed almost exclusively within the territories of their parents. They moved into adjacent territories only if the sites were not defended. As the chicks grew, their foraging range increased, and after fledging they fed on any undefended portion of beach.

Substrate samples were collected from selected feeding sites along the shoreline for analysis of potential prey species composition and density. These samples will be analyzed this winter.

Major Characteristics of the Nest Habitat

Piping Plover nesting habitat is best described as beach community. It was characterized by relatively sparse vegetation that rarely exceeded 1 m in height The dominant vegetation was sandbar willow (Salix interior), tail-wormwood

FIGURE 3

THE DISTRIBUTION OF PIPING PLOVER NESTS ON PINE/CURRY ISLAND IN 1982

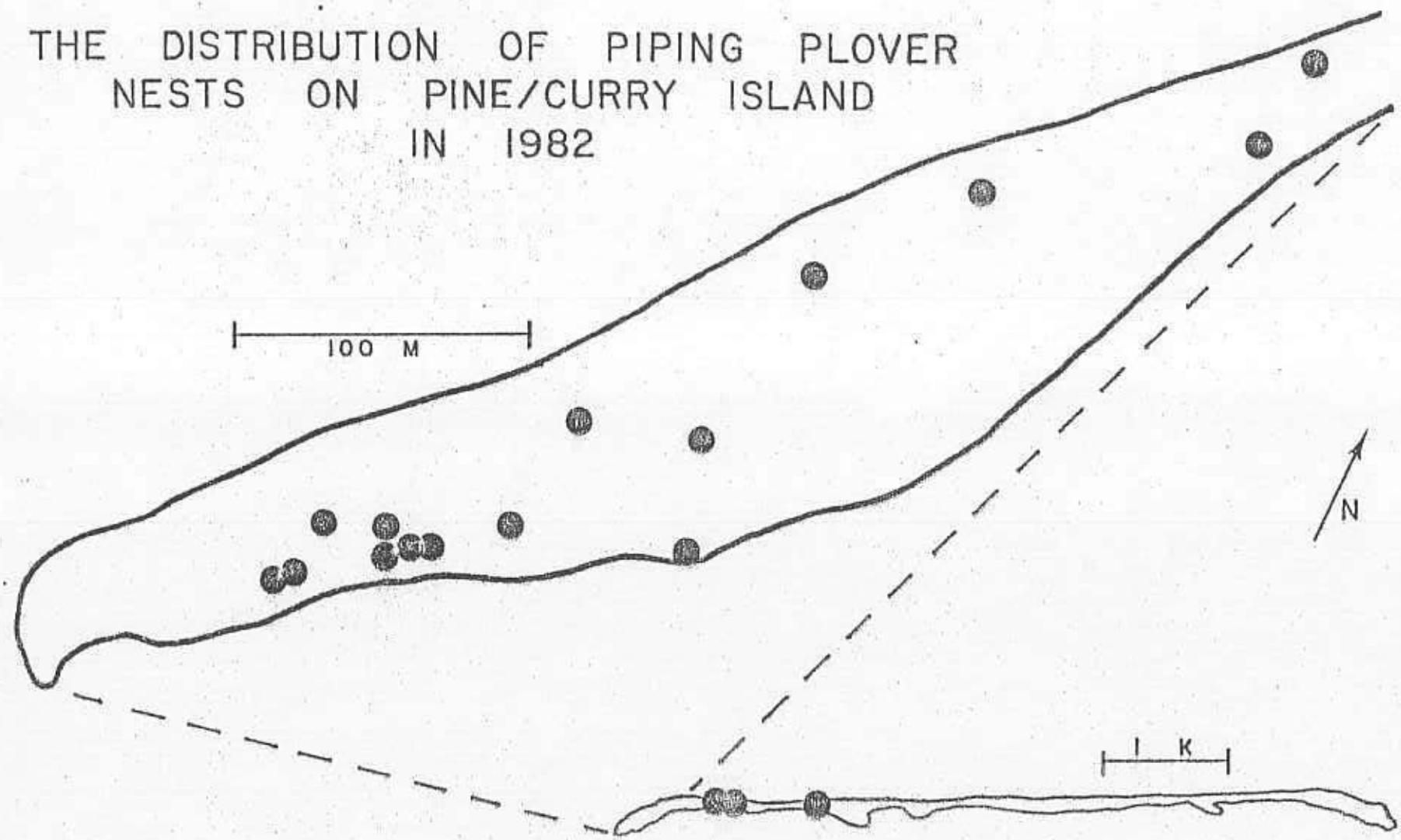
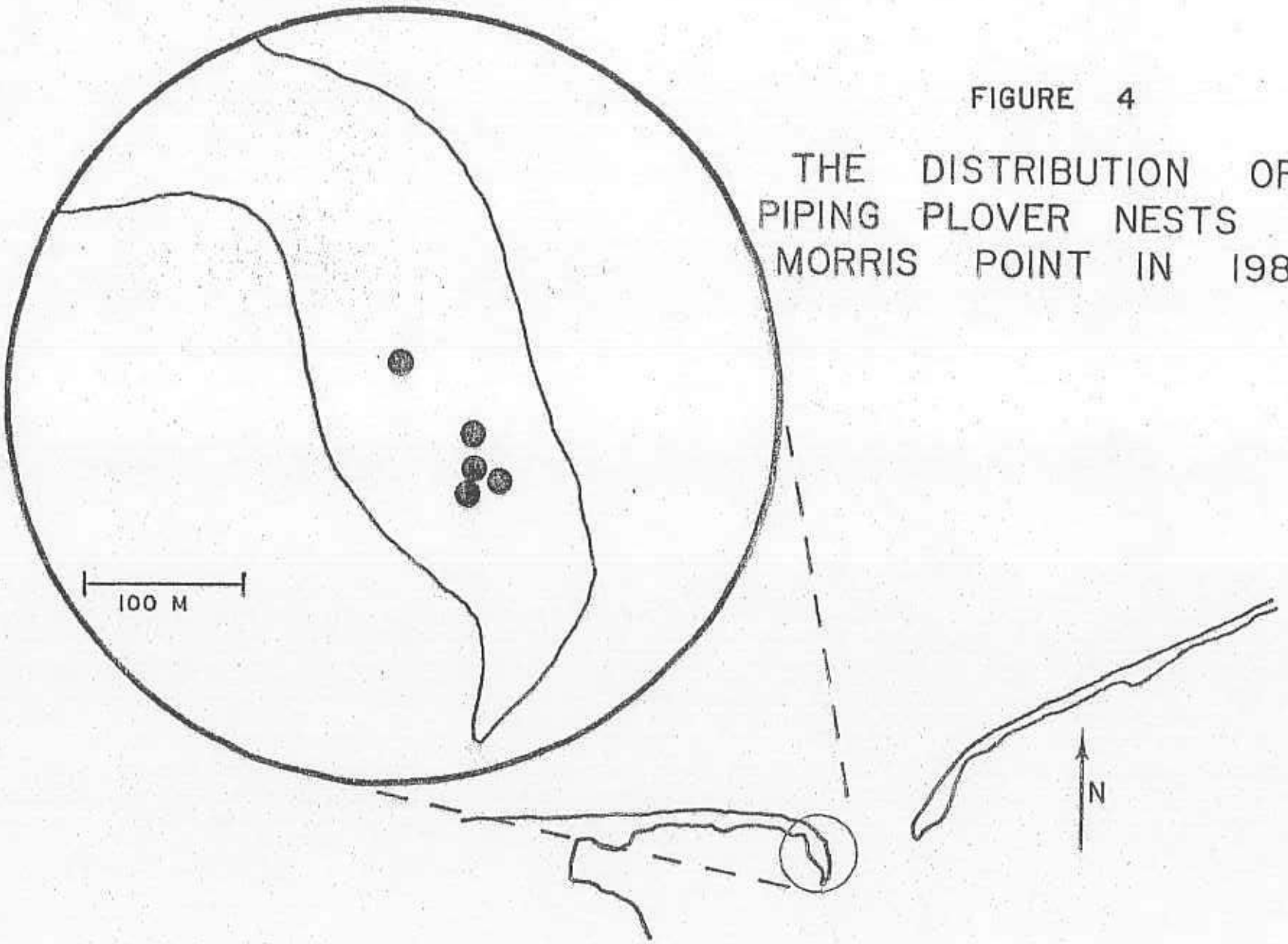


FIGURE 4

THE DISTRIBUTION OF PIPING PLOVER NESTS ON MORRIS POINT IN 1982



(Artemisia caudata), and beach pea (Lathyrus japonicus). Early in the season the vegetation was almost exclusively willow and standing dead wormwood. Later in the season, all three of these species were abundant. Grasses (Poaceae) and sedges (Cyperaceae) also were present in moderate densities. Other vegetation included cocklebur (Xanthium sp.), balsam poplar (Populus balsamifera), knotweed (Polygonum sp.), and evening primrose (Oenothera sp.).

To characterize nesting habitat, data were collected on 8 variables associated with the 24 active plover nests (Table 2). The results are summarized below. To minimize disturbance to nesting birds, the measurements were made over a period of one month (11 July to 10 August). This resulted in some unwanted variability because the amount of vegetation present, as well as the contour of the shoreline, changed during this time.

Distance from nest to shoreline. — Mean distance from nest to shoreline was 21.8 m. The shoreline chosen for measurement was not necessarily the closest; rather, it was the shoreline used by foraging juveniles. These distances were somewhat variable, depending on wave height and water level.

Distance from nest to nearest beach pool. — No beach pool was present within 100 m of four nests. The mean distance from 20 nests to the closest beach pool was 26.3 m. These distances varied depending on rainfall; in some cases the beach pools were only temporary.

Distance from nest to nearest piece of vegetation. — Mean distance was 0.2 m. Closest species included Artemisia (10 nests), Salix (6), Poaceae (4), Lathyrus (3), and Populus (1). The amount of vegetation increased rapidly as the season progressed so that some nests originally placed in open sites were relatively well camouflaged by the time hatching occurred.

Table 2. Characteristics of Piping Plover Nest Habitat

Variable	X	S.D.	Range
Nest to shoreline distance	21.8 m	13.7 m	3.2 – 49.6 m
Nest to beach pool distance	26.3 m	23.1 m	4.0 – over 100 m
Nest to nearest vegetation distance	0.2 m	0.3 m	0.04 – 1.3 m
Nest to nearest object distance	1.7 m	1.9 m	0.2 – over 10 m
Nest to vegetation line distance	12.4 m	8.4 m	0.2 – 36.5 m
Beach width	9.6 m	8.9 m	0.2 – 28.4 m
Slope at nest site	2.1°	2.3°	0° – 10.2°

Distance from nest to nearest object. — All of the objects were driftwood. No large rocks were present in the habitat and there was very little human litter. Most nests (92%) were positioned within 10 m of driftwood ($\bar{x}$ = 1.7 m). One nest was partially hidden under a piece of driftwood.

Distance from nest to vegetation line. — The vegetation line was the point where open beach ended and vegetation began. A total of 21 nests was located within the vegetation zone; mean distance to the vegetation line = 14.1 m. Only three nests were located on open beach and all were within 1 m of the vegetation line.

Slope of ground at nest site. — Mean slope at the nest sites was 2.1°.

Open beach width. — The mean distance from shoreline to the vegetation line was 9.6 m. These measurements were taken in July and August; earlier in the season the open beach was much more extensive.

Substrate. — Samples of the substrate surrounding each nest were collected, and they will be characterized this winter.

MANAGEMENT RECOMMENDATIONS

We suggest that these management strategies be considered for the Lake of the Woods, Minnesota, Piping Plover breeding population: 1) minimization of human disturbance on Morris Point and Pine/Curry Island, 2) predator control on Pine/Curry Island, and 3) habitat manipulation on Pine/Curry Island. The first should be implemented prior to the 1983 breeding season, the others need further study.

Minimization of human disturbance. — We recommend this be initiated prior to the 1983 breeding season and that it be done by 1) communicating with major resort owners about changes in ownership of Morris Point and Pine/Curry Island and state and federal concern for this rare species, 2) educating vacationers (through brochures and bulletin boards at launching ramps) about the Piping Plovers, and 3) posting Morris Point and the southwestern point of Pine/Curry Island with signs that request cooperation (i.e. Please Do Not Go Ashore Within 500 Feet Of This Sign) as opposed to signs that forbid landing (i.e. Do Not Enter). We believe that maximum effectiveness in minimizing human disturbance will be achieved by educating and gaining the cooperation of permanent residents who use Morris Point and Pine/Curry Island as a place for recreation or source of income.

Predator Control on Pine/Curry Island. — Disappearance of eggs and chicks accounted for 67% of all mortality. We believe that most or all of these disappearances were the result of predator activity. Although we attempted to identify a number of potential predators in an earlier section of this report, confirmation of species involved, as well as their actual or potential impact needs

to be documented before more specific recommendations can be made regarding minimization of their activities.

Habitat manipulation. -- In many parts of their range, Piping Plovers appear to prefer stretches of open beach. In the future, the Minnesota DNR may wish to consider elimination of beach vegetation on specific portions of Morris Point and/or Pine/Curry Island. Because plover reproduction was successful at both of these sites in 1982, we do not recommend any habitat alteration be undertaken in 1983.