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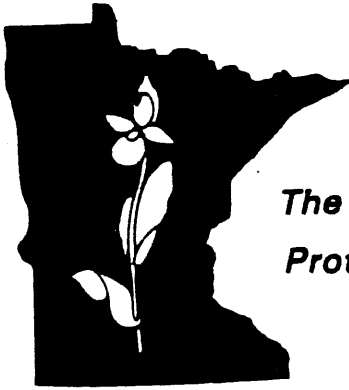
PINE AND CURRY ISLAND
SCIENTIFIC AND NATURAL AREA

MANAGEMENT PLAN
AND
RESOURCE INVENTORY

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***The Scientific and Natural Areas Program . . .
Protecting and Managing
the Best of Minnesota's
Natural World***

PINE AND CURRY ISLAND
SCIENTIFIC AND NATURAL AREA

MANAGEMENT PLAN
AND
RESOURCE INVENTORY

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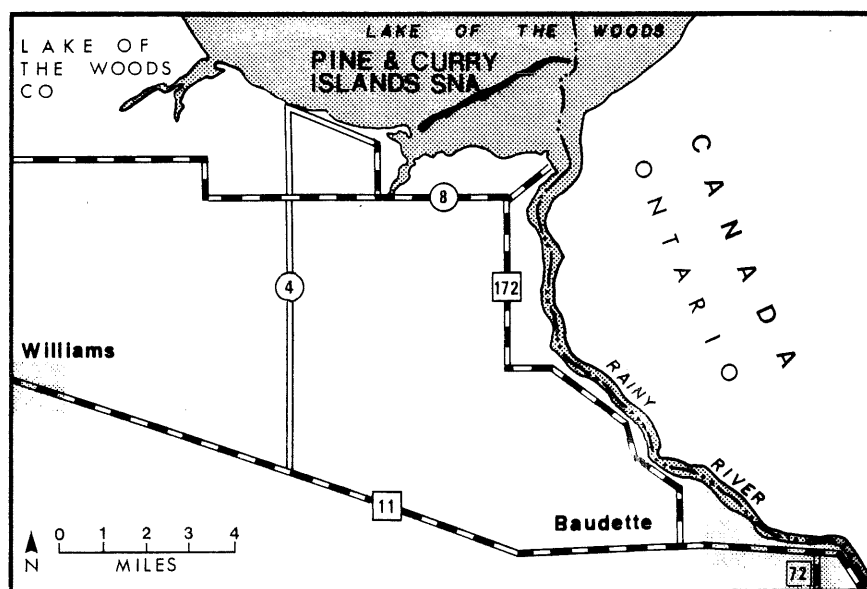
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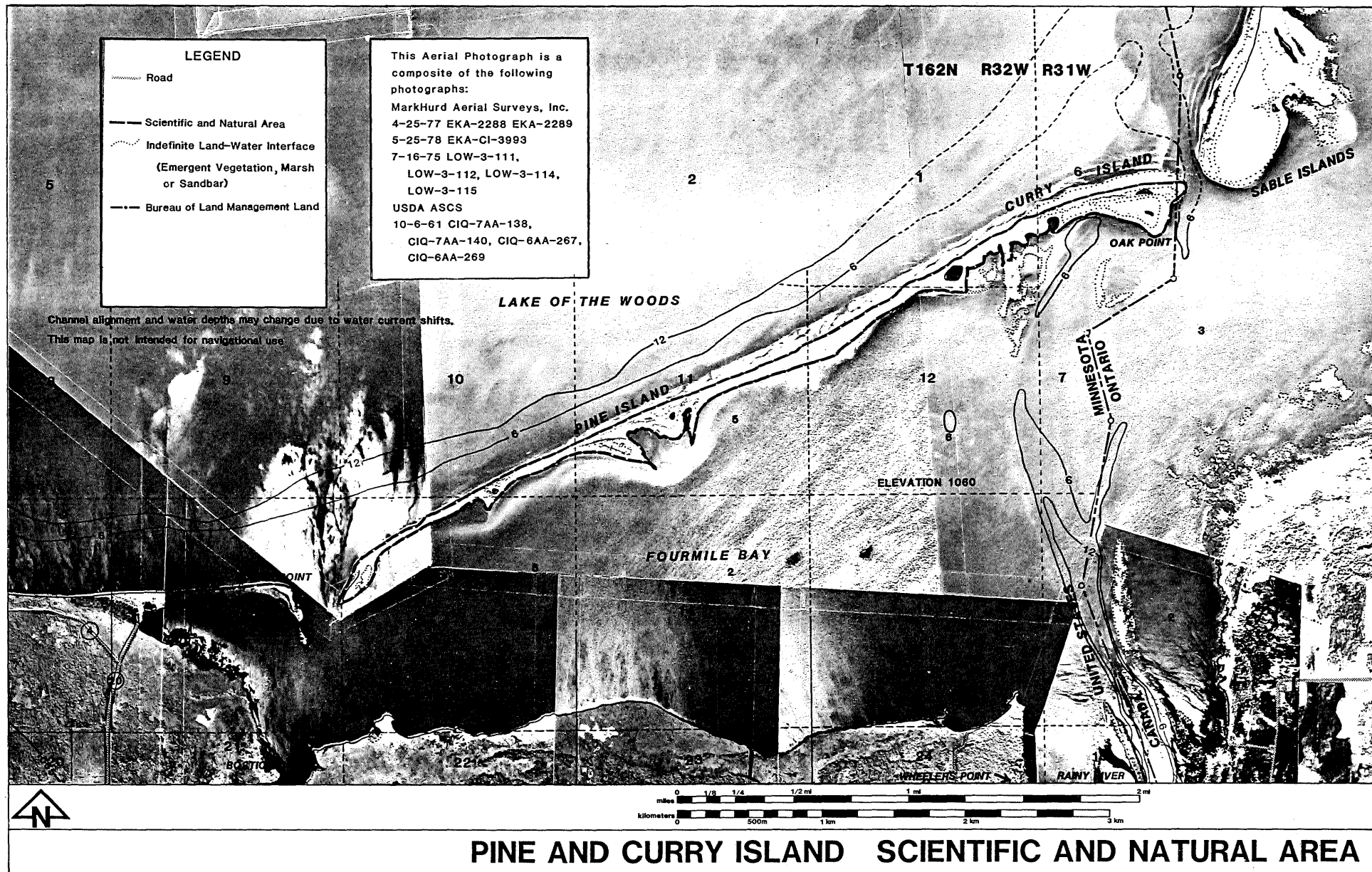
MANAGEMENT PLAN
FOR
PINE AND CURRY ISLAND SCIENTIFIC AND NATURAL AREA

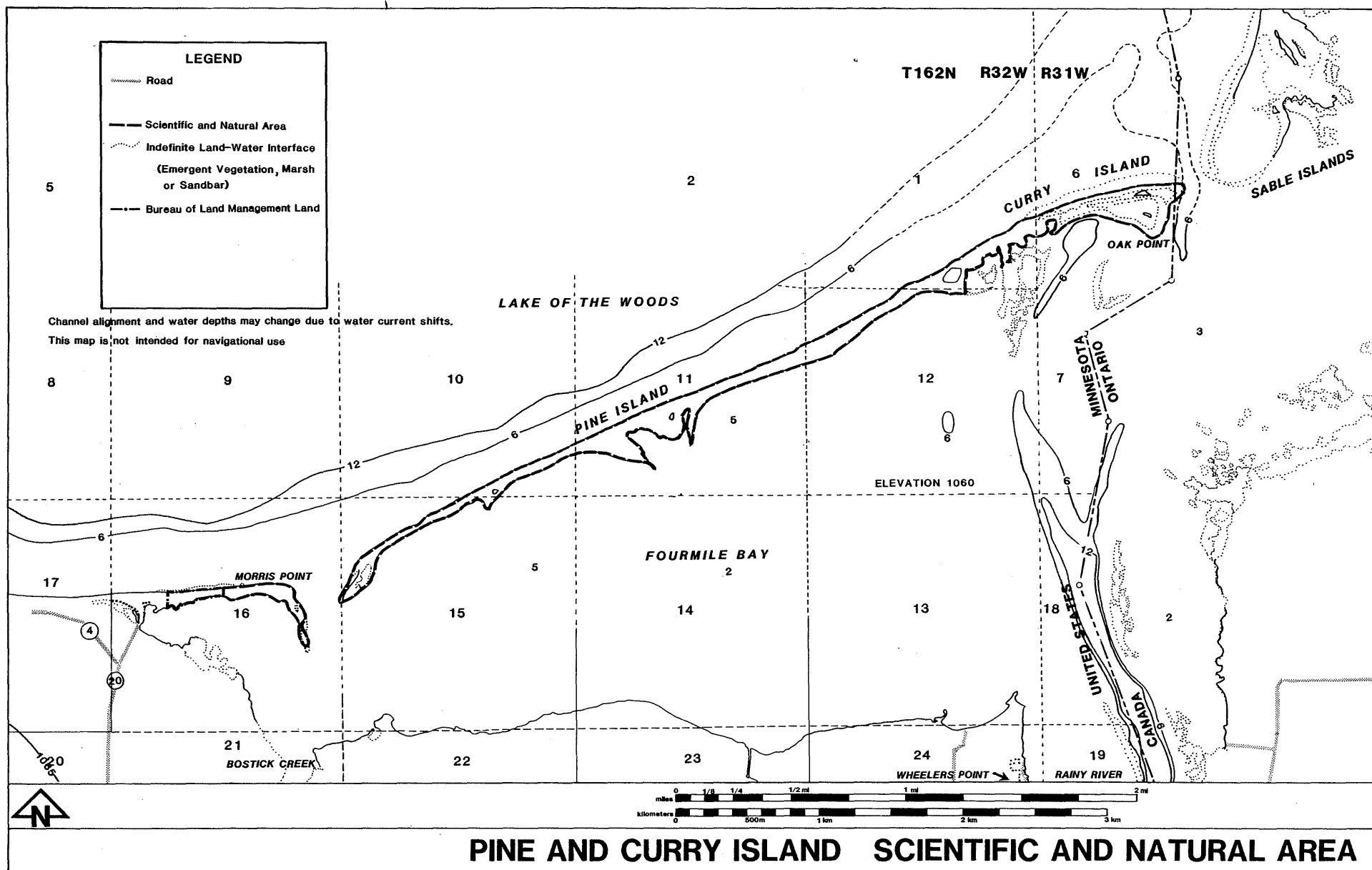
Portions of
Sections 1, 10, 11, 12, 15, 16
Township 162 North, Range 32 West,
and Section 6
Township 162 North, Range 31 West
William SE, and Wheeler's Point Quadrangles (C10d, C11a)
Lake of the Woods County
Minnesota

Prepared by
Scientific and Natural Areas Program
Section of Wildlife
Minnesota Department of Natural Resources

January 1986







This SCIENTIFIC and NATURAL AREA was established to protect and perpetuate Minnesota's rare and unique natural resources for nature observation, education, and research.

Principal activities which are UNLAWFUL in the use of this area are listed below. Further information is available at Department of Natural Resources Offices.

- *Collecting plants, animals, rocks, or fossils.
- *Camping, picnicking, and swimming.
- *Horses, dogs, and other pets.
- *Snowmobiles and other motorized vehicles except at designated crossings.
- *Trapping and fishing.
- *Entry into restricted areas and sanctuaries.

PREFACE

Scientific and Natural Areas are established to protect and perpetuate natural features which possess exceptional scientific or educational value. Nominated areas must substantially satisfy a set of rigorously drawn criteria to qualify for designation. Scientific and Natural Areas serve many purposes. They are places for the quiet appreciation and study of nature and serve as outdoor classrooms for teachers. They are areas against which the effectiveness of resources management techniques employed elsewhere can be evaluated. Scientific and Natural Areas often protect the last few remaining occurrences of a rare species or plant community. They also serve as control areas for scientists engaged in furthering our knowledge of natural processes.

However, land control alone does not assure long term preservation of natural areas and their endangered species. Many natural areas will decline in quality if they are not properly managed. Management of vegetation, control of foreign species, and management of visitors are important concerns.

Comprehensive planning is the key to effective and successful management. In 1975, the Minnesota legislature passed the Outdoor Recreation Act (86A), establishing the Outdoor Recreation System. This act directed managing agencies to prepare master plans for units of the system. This document is part of a planning effort to satisfy the mandates of that act. The goal of this plan is to coordinate a strategy for stewardship that addresses biological management, obligations of ownership, and visitor management.

This plan was prepared by the Department of Natural Resources, Scientific and Natural Areas Program with the assistance of the Commissioner's Advisory Committee on Scientific and Natural Areas. It was based on a resource inventory prepared by the Scientific and Natural Areas Program and the Natural Heritage Program. Funding was provided by the Legislative Commission on Minnesota Resources.

SUMMARY OF MANAGEMENT PROGRAMS

General Management Considerations

DNR Wildlife, Fisheries, Forestry and Enforcement Offices are located in Baudette, approximately 15 miles from Pine and Curry Island SNA. Enforcement will be increased to improve compliance in the 3 wildlife sanctuaries. These small sanctuaries are on the tips of the island and Morris Point, and are closed to all public use from April 15 through September 1. The sanctuary boundary on the southwest end of Pine and Curry Island should be enlarged. The Commissioner's Order for the SNA will be amended to provide greater flexibility in changing sanctuary boundaries to accommodate changes in shorebird habitat use. The Commissioner's Order will also be amended to permit motorized vehicle crossings in the winter and to provide an additional shorelunch area.

Piping Plovers are endangered in Minnesota and have been proposed for listing under the Endangered Species Act by the U.S. Department of the Interior. Piping Plovers are endangered in Ontario, Canada. Lake of the Woods is a reservoir and lake levels are controlled by the Canadian Lake of the Woods Control Board and the International Lake of the Woods Control Board. Pertinent census and research results will be sent to these boards. Public information and education efforts will be coordinated with DNR Parks through the Nongame Program, and will include distributing brochures and maintaining Attention Boater signs at water accesses and resorts. The 6 acre tract on Morris Point owned by The Nature Conservancy is leased by the DNR and will be managed as part of the SNA.

Structures and Facilities

Access to the SNA is by boat only. The wildlife sanctuaries will continue to be signed annually. Wood routed "No Landing" signs will be placed at the tips of each sanctuary. Wood-routed SNA unit signs will be posted at the designated shorelunch areas near the north and south ends of the island. An additional board will be added to the unit sign identifying this as the shorelunch area. Rules and regulation signs will be posted at the west edge of Morris Point, and the boundary of the two shorelunch areas on the island. The delapidated trailer house and other debris on Oak Point will be removed. The U.S. Coast Guard maintains a navigation beacon in the wildlife sanctuary on Oak Point.

The management goal for Piping Plovers in the SNA is to maintain a naturally regulating population of Piping Plovers in suitable habitat. The population will be monitored annually to determine total population size, breeding population size, and fledging success. The color banding program will be continued tentatively until a statewide recovery plan is completed. The Common Tern colony will also be annually censused.

Predation and high water levels are the primary factors affecting reproductive success in Piping Plovers on the SNA. The presence of mammalian predators will ^{be} monitored using transects or scent post stations. Avian predators are also important but they are difficult to monitor or manage. Avian predator exclosures will be tested and a study of avian predation will be conducted.

Coordination with the water level control authorities will be undertaken to attempt to protect the areas nesting habitat.

Vegetation Management

Vegetation monitoring will be initiated in shorebird nesting areas to identify trends or patterns of development. Monitoring will use ASCS aerial photography and complimentary ground photo/sampling stations.

Additional Inventory Needs

A bird census of the SNA will be conducted every 10 years. A floral inventory will be conducted and the fauna will be systematically surveyed with priority given to herpetofauna, small mammals or invertebrates that might be dependent on environmental conditions or host plants restricted to the SNA.

Adjacent Lands

BLM Unit 011 (5.9 acres) borders the west edge of the Morris Point tract. The DNR has submitted an application requesting the Bureau of Land Management to convey this parcel to the state for inclusion in the SNA.

Sable Island, in Ontario, is a continuation of the sandspit-barrier island complex that includes Morris Point, Pine and Curry Island, and Sable Island. The Canadians have recently designated Sable Island as a Nature Reserve in the Provincial Park system. SNA will initiate a cooperative shorebird census and monitoring program with Ontario.

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OVERVIEW

A. Description

Pine and Curry Island Scientific and Natural Area (SNA) is a long, narrow sand spit, barrier island complex located near the southern edge of Lake of the Woods, in Lake of the Woods County. The SNA stretches over 4 miles in a southwest-northeast direction, from Morris Point to Oak Point, respectively. A few hundred yards across the mouth of the Rainy River, the island complex continues for several more miles in the Canadian Province of Ontario (Sable Island). Habitat includes open beach, sparsely vegetated dunes, patches of mixed and deciduous forest, and marsh.

Pine and Curry Island SNA is an excellent place to observe birds, especially waterbirds or shorebirds. A total of 170 species have been reported from the area. A large variety of shorebirds use the extensive beaches to rest and feed during migration. Migrating raptors and passerines, following the lake edge, often pass over the island. The SNA also provides nesting sites for two rare shorebirds -- the Piping Plover and the Common Tern.

Pine and Curry Island was designated a state scientific and natural area in 1982.

B. Preservation Value

Pine and Curry Island SNA is situated in the Agassiz Lowlands Landscape Region. Several highly significant natural features have been identified on the SNA by the DNR's Natural Heritage Program. The Natural Heritage Program maintains the most comprehensive data base available on Minnesota's rare plant and animal species and natural communities. These biological entities (species and communities) are known as "elements" and are ranked according to their endangerment in the state. Pine and Curry Island SNA contains at least 2 rare bird species protected under the Minnesota Endangered Species Act (97.488), and one rare natural community.

Animals

1. Piping Plover (Charadrius melodus) - state endangered.

Pine and Curry Island SNA harbors the largest breeding population of Piping Plovers in Minnesota (15-22 pairs). Piping plovers were first reported to nest on the island in 1932. An intensive study of the breeding biology of these birds was initiated in 1982. At present, this is one of the most thoroughly studied populations of Piping Plovers in North America.

Piping Plovers have undergone a general decline throughout their range. They are listed as endangered under Minnesota law, and have been proposed for federal listing under the federal Endangered Species Act. Given their legal status and the level of research conducted in the SNA, this population of Piping Plovers is of national significance.

2. Common Tern (Sterna hirundo) - special concern.

The Lake of the Woods population of Common Terns is one of only four nesting areas in the state. Within Lake of the Woods there are three tern colonies including the one in the SNA (approx. 140 pairs). This colony was selected as a control for a study of environmental contaminants in Common Terns. The other two colonies on the lake have less than 10 pairs. The number of Common Terns in the Great Lakes has declined in the last decade to where this species is classified as endangered in Wisconsin, Illinois and Ohio, and threatened in Michigan.

Natural Communities

1. Sand Beach - state threatened

The Sand Beach natural community is limited in extent in Minnesota. It occurs along the shorelines of Lake Superior and along larger inland lakes. This community develops on loose sand with no true soils, and supports unusual assemblages of plant species adapted to highly stressed environments. The vegetation forms somewhat distinct zones moving landward to seaward. The Sand Beach community is a dynamic environment. The form and position of the beach may change abruptly or gradually in response to waves, winds, waterlevels and ice scouring. The Pine and Curry Island SNA displays a good spectrum of beach vegetation types ranging from dry open sand to closed forest and marsh.

C. ORA Classification

The Pine and Curry Island SNA fully meets the designation criteria for a scientific and natural area as outlined in the Outdoor Recreation Act of 1975 (86A.05 Subd. 5). The preserve includes (1) natural features which significantly illustrate an undisturbed plant community, (2) habitat supporting the following rare, endangered, or restricted species: Piping Plover (Charadrius melodus) and Common Tern (Sterna hirundo), (3) seasonal haven for concentrations of birds and a vantage point for observing concentrated populations during migration, and (4) embraces an area large enough to permit effective research or educational functions and to preserve the inherent natural values of the area.

D. Management Philosophy

The most important known attributes of Pine and Curry Island SNA are the breeding colonies of Piping Plovers and Common Terns. The primary management goal is to maintain naturally regulating populations of Piping Plovers and Common Terns in the SNA. Habitat management, predator control or other manipulative activities will only be initiated when there is an imminent threat to the populations or when based on comprehensive population studies.

Section 1.

GENERAL MANAGEMENT CONSIDERATIONS

A. Management Resources

The amount of management that takes place in an SNA is dependent on both need, and the availability of management resources. Some important considerations in this regard are presented below:

1. DNR offices or facilities

The closest DNR Fisheries, Wildlife, Forestry, and Enforcement offices are in Baudette, 15 miles from Pine and Curry Island SNA. The regional nongame specialist is in Bemidji, approximately 120 miles away. St. Paul based SNA staff are 330 miles from the site. Zippel Bay State Park is 5 miles west of the SNA.

2. Proximity to University or College Campuses

Bemidji State University is the closest major campus. There are also community colleges in Thief River Falls and International Falls. The University of North Dakota has a research program in shorebird ecology and has done research in the SNA. The SNA Program should be able to solicit some research attention from these and other educational institutions.

B. Surveillance and Enforcement

Inappropriate uses or overuse can damage natural conditions or features in natural areas. Because of the fragility of these preserves, continued protection requires systematic surveillance and enforcement.

Enforcement is the responsibility of the DNR Conservation Officer along with other DNR staff. Additional protection can be provided if local residents and visitors are made aware of an SNA's value and permitted uses. People wishing to report problems or who have questions relating to the SNA should contact the DNR Conservation Officer or Wildlife Manager in Baudette, the DNR Nongame Specialist in Bemidji, SNA staff in St. Paul, or other DNR officials.

The most common violation which repeatedly occurs in the SNA is trespassing into the posted Wildlife Sanctuaries. A researcher on the island reported 35 trespass instances in 1983 and 40 in 1984. Boaters stop in the sanctuaries to stretch, relieve themselves or have a shorelunch. Boat landing is not permitted in the posted Wildlife Sanctuaries, but it is allowed elsewhere in the SNA.

Action 1.1 Increase enforcement effort in Wildlife Sanctuaries

Considerations:

Timing - The greatest number of infractions occur on weekends and holidays.

Boat License - Boat license numbers provide a useful tool to monitor or contact persons who may have knowingly, or unknowingly violated SNA rules and regulations.

C. State Wildlife Sanctuary Areas

The Commissioner's Order designating Pine and Curry Island SNA established 3 sanctuary areas prohibiting all public use for the period April 15 - September 1. These are (1) the last 400 meters of Morris Point, (2) the first 600 meters of the southwest end of Pine and Curry Island, and (3) the last 500 meters on the lakeside, and last 100 meters on the bayside of the northeast end of Pine and Curry Island SNA (Oak Point). These sanctuary areas roughly included the known breeding habitat for Piping Plovers and Common Terns.

In general these sanctuary areas have been satisfactory. Area #2 on the southwest end of the island could be made larger to include a few Piping Plover nests outside the existing sanctuary, and provide additional buffer for several Piping Plovers that nest close to the northwest boundary of that sanctuary. A more practical alternative is to eliminate the specific size specifications in the Commissioner's Order since the location and availability of suitable nesting habitat is subject to abrupt change.

Action 1.2 Amend Commissioner's Order specifying wildlife sanctuary boundaries.

Considerations:

New Language - prohibit all public use in those parts of the SNA posted as Wildlife Sanctuary - No Trespassing, for the purpose of ensuring the protection of Piping Plover and Common Tern breeding habitat.

Implementation - In general, sanctuary boundaries will be at least 100 meters from the closest Piping Plover or Common Tern nest. The present boundaries are adequate except for the area on the southwest end of the island. This sanctuary should be extended an additional 300 meters to the northeast. One plover nest has been reported east of this point. Changes will be made if the birds move to new locations.

D. Public Use

The south shore of Lake of the Woods is a major resort and recreational area. Fishing has historically been the area's primary attraction. In recent years resorts have been promoting a wider range of activities to accommodate changing trends in tourist markets.

Pine and Curry Island SNA had been used for a variety of recreational activities prior to designation. Most of these activities are prohibited by SNA rules and regulations and were not authorized by the former landowner. On the biological side of the issue, plovers and terns are especially vulnerable to disturbance from recreational use or malicious acts directed against them in their nesting habitat. Up to 14% mortality of Piping Plovers in the SNA was attributed to human disturbance between 1982-1984. On the social side of the issue, many local resort owners perceive SNA use restrictions as directly threatening their financial security. This perception is also supported by many locals who have also historically used the island for swimming, picnicking, hunting, trapping, camping, and winter vehicle crossing. The local community actually initiated the supported public ownership of the island to provide for these uses. This was before the natural values of the site were recognized and SNA designation was pursued.

In the Commissioner's Order establishing Pine and Curry Island SNA, a rule change was made providing an area for shorelunches on the south shore of Oak Point. This was requested by the Resort Owners Association. It was permitted in order to limit the impacts of this use to a small, controllable area. A second shorelunch area has been suggested nearer the southwestern end of the island. During the preparation of this plan, several other existing, longstanding recreational uses of the island were evaluated. A few of these uses (1) do not occur during the period shorebirds are on the island, (2) do not pose future threats should the level of these activities increase, and (3) are also very important to the local community. These are waterfowl hunting, and winter crossing of the SNA with motorized vehicles to reach ice fishing areas north of the island. Recommendations regarding these uses are presented below. The remaining activities -- picnicking in undesignated areas, swimming, and camping -- occur while the birds are present and will continue to be prohibited.

1. Waterfowl hunting

The Fourmile Bay area, which includes Pine and Curry Island SNA, has a history of waterfowl hunting. Because there are few other waterfowling opportunities nearby, this area is quite important to both local hunters and the resorts' waterfowl hunting clientele. The season is generally between late September and mid-November. Hunters typically set up in emergent marsh vegetation or in shrubby on-land sites.

Piping plovers depart by late August and the majority of other migrating shorebirds have passed through by mid-September. Because no direct conflict exists between waterfowl hunting and management objectives for this SNA, hunting will be allowed on land areas as well as in adjacent emergent vegetation beds.

Action 1.3 Publicize information acknowledging that Pine and Curry Island is open to waterfowl hunting.

2. Motorized Vehicles -- Winter Use

A large amount of ice fishing traditionally occurs north of Pine and Curry Island and Morris Point. One hundred to 200 icehouses are typically located immediately north of the island, with an estimated weekend occupancy rate approaching 100%. Many of these houses are operated by local resorts. Ice fishing is the primary winter activity for the resorts' guests. Open water or unsafe ice conditions are common between Morris Point and Pine Island, and Oak Point and Sable Island. To avoid these, ice roads to the fishing areas have historically crossed Morris Point and Pine and Curry Island. These crossings are fairly consistent, however, changing ice conditions often require relocating the crossing site.

Winter crossings do cause some limited site disturbance. Crossing sites often have reduced vegetative cover the following growing season. Because of the high level of natural disturbance (ice scour, storms, etc.) it is doubtful that site disturbance from winter crossings results in long term habitat alteration.

Action 1.4 Amend designation order to allow snowmobile and motorized vehicle crossing of the SNA at specific locations during the winter.

Considerations:

Allowable Use -- Determine current use patterns. Vehicle use will be limited to the minimal route necessary for safe crossing and the minimum number of crossing sites.

Monitoring -- Permission for the crossings should be conditional on a periodic assessment of site alteration. If significant site damage is occurring, the crossing will be closed or moved.

3. Shore Lunch Areas

Pine and Curry Island SNA has traditionally been used by fishermen and boaters for shorelunches. This activity occurs along the entire shoreline, but in particular, areas with deeper nearshore water receive more constant use. In general, the lake is very shallow around Pine and Curry Island and there are numerous deadheads. Because of its size, Lake of the Woods frequently has large waves. Relatively deep-bodied boats are commonly used by both the resorts and individuals.

One shorelunch area on Oak Point was provided when the SNA was established. The purpose of designating shorelunch areas is to minimize the potential conflicts of this activity with shorebirds, vegetation, and other resources, by concentrating it in a limited area. An additional shorelunch area has been suggested nearer the southwestern end of the island to further minimize intrusions into the sanctuary area and to curtail unauthorized shorelunches from occurring elsewhere. Most of the boat use occurs off the NE and SW ends of the island. It is about 4 miles from the SW end of the island to the existing shorelunch area on Oak Point (8 miles round trip) making use of the shorelunch area on Oak Point by boaters off the SW end of the island impractical.

Action 1.5 Amend designation order to designate 1 additional shorelunch area.

Considerations:

Location - Adjacent to the large wooded area, approximately on the section line between Sections 11 and 12. There are relatively deep water depths on the north side of the island here and also just a short distance to the west on the south shore. The wooded area is a natural landmark and relatively close to the SW end of the island.

Identification - The area will be properly posted to identify the area for visitors (See Action 2.4).

E. Endangered Species Classification

The Piping Plover is designated as an endangered species under Minnesota Law (M.S. 97.488). It was proposed for listing under the Endangered Species Act by the U.S. Dept. of the Interior in November, 1984. If listed, this would give additional federal protection to the species and make it eligible to receive federal funds for a variety of conservation activities such as survey and research, land acquisition, and law enforcement. The U.S. Fish and Wildlife Service's Regional Resource Plan (1984) supports continued research on piping plovers at Pine and Curry Island SNA.

Piping Plovers are listed as endangered under Ontario's Endangered Species Act of 1971.

F. Lake Level Control

Lake of the Woods is a reservoir. Water levels have been controlled since the late 1800's and are 2-4 feet above natural levels. There are two dams on the lake, one at Kenora and one at Keewatin (in Ontario, Canada). Both are operated by Boise Cascade for power generation. The U.S. Government has a perpetual flowage easement on the island up to the 1064' contour.

The Canadian Lake of the Woods Control Board (LWCB) regulates dam operation when lake levels are within normal operating limits (1056-1061). This board has 4 members: one representative from the Canadian federal government, two representatives from the Ontario provincial government and one representative from the Manitoba provincial government. The LWCB meets quarterly at various locations in Canada and is the primary administering agency for the lake.

When lake levels either exceed or fall short of the normal limits, dam operation is overseen by the International Lake of the Woods Control Board. This is a 2 member board with one Canadian and one American representative:

Director, Inland Waters Directorate, Environment Canada; and District Engineer, St. Paul District - U.S. Army Corps of Engineers, respectively. Both the LWCB and the International Control Board report to the International Joint Commission.

Lake levels are typically lowest in late March to early April and reach their peak in June or July. The average difference between annual maximum and minimum lake levels from 1974-1984 was 3.11 feet. The average difference in lake levels between May 5 and July 15 (approximately the beginning of territory establishment and the end of hatching for piping plovers) is 0.86 feet, with a range of 0.2 feet to 1.9 feet. Models of natural lake levels follow similar patterns. Studies conducted by the Lake of the Woods Secretariat (within the Inland Waters Directorate of Environment Canada) indicate the primary factor contributing to high lake levels is June rainfall. There are apparently no good correlations between flood peaks and snow packs.

Action 1.6 Contact the International and Canadian Lake of the Woods Control Boards.

Considerations:

Initial contact -- Provide both boards with information about the SNA and Piping Plovers, including: maps, status, management objectives, and possible impacts of water levels on the SNA.

Ongoing - Send both boards research reports and census results done on the SNA which would be useful to them in carrying out their responsibilities.

DNR Waters -- Send copies of all correspondence with the control boards to the division director for Waters. Waters is the primary DNR division which interfaces with the control boards.

G. Information/Education

Local community support is essential for the long-term protections of Piping Plover and Common Tern populations at Pine and Curry Island. Both species are extremely vulnerable to human disturbance in their nesting areas. To assure compliance, the public must be aware of and understand the need and reasonableness of use restrictions imposed in the SNA. Information materials are necessary to explain the significance of the SNA and to inform visitors of appropriate use.

Pine and Curry Island does not have any natural, high visitor contact areas where information about the site could be effectively presented. Visitor orientation materials (brochures and Attention Boater signs) are currently being distributed at public water access sites and resorts.

Zipple Bay State Park also has had some nesting pairs of Piping Plovers in recent years. Coordinating public information relating to plovers between the park and SNA is important.

Action 1.7 Continue distributing brochures.

Considerations:

Distribution - Annually contact resorts and other distributors and provide them with additional brochures if desired.

Action 1.8 Maintain 'Attention Boater' signs

Considerations:

Frequency - check and replace as necessary (approx. 3-5 years)

Message - the sign calls attention to Pine and Curry Island and solicits boaters to observe restrictions.

Action 1.9 Participate with Parks and Nongame in coordinating programs and information on plovers.

Considerations:

Purpose - to provide the public with consistent, coordinated information on Piping Plovers in Lake of the Woods.

Approach - adopt consistent standards for the size of sanctuaries and dates of restrictions. Materials will explain the significance and appropriate use, but will not promote high levels of visitor use.

Mechanism - Coordinate all information materials and management programs through the Regional Nongame Specialist.

H. The Nature Conservancy (TNC)

Approximately 6 acres on the end of Morris Point is owned by TNC and leased to DNR as part of the SNA. TNC has dedicated this parcel as the Malvin and Josephine Herz Bird Sanctuary. The SNA program will have the primary management responsibility for this parcel, based on the approved management plan.

Section 2.

STRUCTURES AND FACILITIES

A. Access

Access to Pine and Curry Island SNA is by boat only. There is no public land access to Morris Point. The closest public water access site is at Wheeler's Point at the end of Hwy. 172. Lake access is also available through the resorts at Morris Point, along Bostick Creek, and along the Rainy River. A launching fee is generally charged at the resorts.

B. Signing

The purposes of signing are (1) to identify the unit, (2) provide basic visitor information, and (3) identify any special use areas. Ice heaving, storms, and the loose sandy soil cause a continual sign maintenance problem in the SNA. Boundary signs have been posted above the forebeach to minimize maintenance. Wildlife sanctuary signs are posted on the beach each spring and removed each fall.

Additional signing is necessary which informs boaters not to land in the sanctuary areas. Wood routed unit signs are also needed.

Action 2.1 Continue annual sanctuary signing

Considerations:

Signs - use the new standard wildlife sanctuary signs (with 1 3/4" letters for DO NOT TRESPASS). The old sanctuary signs have smaller letters and are not as visible from a boat.

Schedule - put up as soon as possible after ice-out and take down after September 1.

Action 2.2 Post wood routed "no landing" signs in each sanctuary.

Considerations:

Locations - Post sign at most visible point in each sanctuary.

Message - WILDLIFE SANCTUARY
Shorebird Nesting Area
NO LANDING
in posted area

Construction - portable enough to be erected and taken down each spring and fall.

Action 2.3 Post Rule and Regulations.

Considerations:

Locations - .western boundary of Morris Point
 .in designated shorelunch area on Oak Point
 .in proposed shorelunch area on SW end of island

Action 2.4 Post woodrouted SNA Unit signs.

Considerations:

Locations - .one sign in designated shorelunch area on Oak Point
 .one sign near SW end, in the vicinity of the large
 wooded area (proposed shorelunch area - See Action
 1.5).

Visibility - southwestern sign should display unit name both
to the north and south of island, or use two signs.

Shorelunch Area - an extra board must be added below the SNA
unit sign that says "SHORELUNCH AREA".

Action 2.5 Post interpretive sign.

Considerations:

Location - on same post as rules and regulations signs.

C. Clean-up.

A burned-out trailer home, concrete bait tank, and other debris is
located on the south shore of Oak Point. This is within the designated
shore lunch-landing area.

Action 2.6 Remove trailerhouse and other debris on Oak Point.

D. Lighthouse

A lighthouse has been maintained on Oak Point by the U.S. Coast Guard
since the mid 1900's. The old, wooden structure was replaced in 1983 with
an all steel, lazer beacon. The beacon is within the wildlife sanctuary and

the Coast Guard has agreed to make every effort to comply with those restrictions. The area lamplighter for the Coast Guard will contact the Area Wildlife Manager whenever he is required to service the aid.

Action 2.7 Regularly contact Area Lamplighter.

Section 3

SHOREBIRD MANAGEMENT

A. Piping Plover

The Piping Plover population in Lake of the Woods has been the focus of a breeding biology study since 1982 (See Appendix I - Resources). As a result, there are more extensive data on this population than on nearly any other in North America. Data have been collected on the following aspects of plover biology: (1) breeding chronology, (2) total number of plovers present throughout the season, (3) philopatry, nest-site tenacity, and mate retention, (4) nesting success, (5) factors causing reproductive failure, and (6) nest density and distribution of nests.

The plover population size is estimated at 44 to 50 adults (15-22 breeding pairs). Chick productivity ranged from 0.6 to 2.1 chicks fledged per breeding pair. The three primary mortality factors were predation, storms, and to a considerably lesser degree, human disturbance. The southwest end of Pine and Curry Island was the most important breeding habitat with 13-15 nests. Morris Point had 3-8 nests and the northwest end of Pine and Curry Island (Oak Point) had 0-6 nests. 0-1 nests were also recorded at Zippel Bay State Park and Rocky Point.

No long term trends or imminent threats to the stability of the Piping Plover population in the SNA have been identified. Preliminary banding data suggest immigration is an important factor for the stability of this population. If so, the continentwide decline of Piping Plovers may have a significant impact on this population, even if reproductive success in the SNA is high. Several more years of banding and reproductive data spanning a few cohorts of birds will provide a more complete description of the Lake of the Woods Piping Plover population. In the interim, management activities will be guided by the following goals and objectives:

Goal - Maintain a naturally regulating population of Piping Plovers in suitable habitat in the SNA.

Justification: The SNA seems to consistently provide the largest amount of suitable nesting habitat in Lake of the Woods. There are no indications, from the limited information available, that the plovers have nested in comparable numbers at any of the other known breeding areas in Lake of the Woods.

Interim Objectives - To maintain at least 15 breeding pairs distributed over Pine and Curry Island, and Morris Point; with an average annual productivity greater than 1.0 fledged chick per pair.

Justification: The SNA is known to have sufficient habitat for 15 breeding pairs. Productivity rates reported in other Piping Plover studies are all greater than 1.0 except in heavily disturbed situations. An average annual productivity rate of 1.0 is considered the point where corrective action could be taken, and not the minimum necessary to sustain the population. Such action will also take into account population data from the preceding breeding seasons. Revised objectives will be established when additional data are available.

Overall, the basic minimum information necessary to monitor the Piping Plover population is the number of nesting pairs and reproductive success. The next most important item is to band all fledgling birds. A statewide recovery plan for Piping Plovers will be prepared by the DNR Nongame Program in the next 2-3 years. The issue of whether to continue an intensive research project requiring full-time staff or University personnel, or to scale down to a low-level monitoring effort handled by existing staff will be addressed in that plan. The unique value of what has been accomplished by past research in the SNA is that there is a large, localized population of plovers that are individually marked. So as not to lose ground, new individuals will continue to be banded, at least until the recovery plan is complete.

Action 3.1 Annually monitor the Piping Plover population in the SNA.

Considerations:

Objectives - 1. to determine population size
2. to determine breeding population size
3. to determine fledgling success

Recommended Schedule -

Late April, early May
(2-5 days)

*census entire population size
(not all birds may subsequently nest)
*Read bands (color bands are most visible
when birds first arrive and are displaying)

Mid June
(2-5 days)

*Census the number of nesting pairs

Early-mid July

*Estimate reproductive success (the chicks
are fledglings now)

Action 3.2 Tentatively continue Piping Plover banding program

Considerations:

Banding - use color bands and USFWS numbered aluminum bands.

1st priority is to band all fledglings (early-mid July).
2nd priority is to band unmarked adults (mid June).

Continuation - Continuation of the banding program will be based on the recommendations of a statewide recovery plan for Piping Plovers, to be completed by December 1988.

Action 3.3 Census other Lake of the Woods nesting locations of Piping Plovers.

Considerations:

Purpose - Because of the mobility of this species and the dynamic nature of its habitat, SNA population data should be evaluated relative to other Lake of the Woods nesting locations.

Frequency - At least once per year to census nesting pairs at all locations. This will be further evaluated in the statewide recovery plan.

B. Common Terns

A major colony of Common Terns nest on the southwest end of Pine and Curry Island. Between 1982 and 1984, the colony ranged from approximately 120-140 nests. A few nests also occur on Morris Point. The terns have similar nesting habitat requirements as Piping Plovers and both co-occur in the SNA.

Productivity rates reported for Common Terns in other studies **are** variable. In 1984, chick productivity was 0.17 fledglings per breeding pair in the SNA. This low success was attributed to higher than normal water levels and fox predation. At a minimum, the size of the breeding population of Common Terns in the SNA should be annually monitored. It is felt, at this time, the Common Tern colony in the SNA is relatively stable. Until further census data are available, management actions to increase productivity (e.g. predator removal) will not be taken unless there is a consistent decline in fledgling success or dramatic change in the number of nesting pairs.

Action 3.4 Annually monitor the Common Tern colony in the SNA.

Considerations:

Schedule - census breeding population in mid-June.
estimate fledgling success in mid-July.

Assessment - evaluate the relative role and importance of the SNA colony to other Minnesota colonies (Nongame Colonial Waterbird data base program).

C. Predator Management

Predation is the dominant factor affecting reproductive success of Piping Plovers on Pine and Curry Island. It accounted for 50-100% of egg and chick mortality from 1982-1984. Chick productivity was 1.7, 2.1, and 0.6 chicks

fledged per breeding pair for 1982, 1983, and 1984 respectively. Egg mortality accounted for the majority of this variability, ranging from 25-81% of eggs laid. Chick survival (those chicks which hatch and survive to fledge) remained constant at approximately 68%. In addition, predation resulted in the complete loss of Common Tern reproduction in 1984.

The most likely egg and chick predators are Herring Gulls, Ring-billed Gulls, Common Ravens, and American Crows. Possible mammalian predators are red fox, mink, ground squirrel, and otter. The key management problem is determining if certain levels of predation are unacceptable. Management options include controlling predator abundance, or reducing predator success.

Predator removal will be considered where predation has severely reduced the reproductive success of Piping Plovers and/or Common Terns, and threatens the long-term survival of these species in Minnesota (or other appropriate management region). A decision to implement predator removal will be consistent with department policy on predator control (in preparation), and should assess the following:

1. Is there a documented occurrence of significant predation and the likelihood that significant predation losses will continue to occur, from a specific predator or group of predators?
2. Have all management alternatives been evaluated and predator removal determined to be the most effective solution?
3. Will the increase in reproductive success of Piping Plover and Common Tern, resulting from the targeted predator removal, cause a significant improvement in the long-term stability and survival of those species' populations?

Avian Predators/Competitors

Present Status

Gulls, crows, and ravens were often seen in or near plover nesting areas. Corvids nest on both Morris Point and Pine and Curry Island. Gulls nest on several islands in the north half of Lake of the Woods. It is not known whether gull populations are increasing in the lake, but this has been the recent trend in the Great Lakes. The gulls on the SNA have been thought to be flocks of non-breeders. However, in June of 1985 approximately 30 pairs of Ring-billed Gulls were found nesting in the Common Tern colony on Pine island.

Threat

Other studies have found gull, owl and corvid predation to be a major cause of mortality in Piping Plover and Common Tern populations. Gulls and/or corvid tracks were found at several Piping Plover nests in the SNA which lost clutches. Other studies have shown that Ring-billed Gull colonies rapidly expand after initial establishment. In addition to predation, the direct loss of habitat necessary for Piping Plover and Common Terns from Ring-billed Gulls has been documented to be a significant threat in the Great Lakes. Exploding Ring-billed Gull populations on sites where terns historically have nested has eliminated those species from these sites due to loss of habitat.

Management Options

1. Avian predator exclosures -- A prototype was used and accepted on one Piping Plover nest in 1984 at Pine and Curry Island. A similar device was not accepted by a pair of plovers in Connecticut. One possible complication of using nest exclosures is that corvids and mammalian predators may learn to associate the structure with the nests, making the nests more vulnerable. Use of the devices needs further testing.
2. Avian predator control/removal -- There are no known alternatives to disperse or remove loafing gulls, which would not also disturb plovers and terns. Corvid, owl, or other avian predators might be controlled at their nest sites with minimal disturbance to the shorebirds. Nest site control is the only method which has been successful in other situations.
3. Avian predator monitoring -- Even during intensive field studies, predation events are rarely observed. It is difficult to determine which predator species, or group of species should be targeted to achieve successful results. Decoy nests, photographic techniques, radio tracking, nest searches and other techniques could provide more substantial information.

Action 3.5A Implement nest site control on any Ring-billed Gull nesting attempt which is considered to be a long term threat.

Considerations:

Site - this activity should be conducted immediately when Ring-billed Gulls have established nest sites on the SNA. Consultation with knowledgeable people and review of study results from Action 3.6 will influence such a decision.

Action 3.5 Solicit testing of predator exclosures.

Considerations:

Site - this activity should not be conducted in the SNA. Other similar sites with a similar complement of predators should be selected.

Predator recognition - test predator recognition of exclosures by using decoy nests (i.e., artificial nests with quail eggs). Using "dummy" exclosures (with no nests/eggs) along with active ones could be tested to determine if this discourages predators.

Plover acceptance - test predator effectiveness before determining plover acceptance.

Action 3.6 Solicit a study of avian predator/competition on Piping Plovers and Common Terns.

Considerations:

Scope: A study of Ring-billed Gulls as a competitor and/or predator on the island will be initiated in 1986.

Mammalian Predators

Present Status

A red fox and 3 pups were trapped off the SNA in 1984 after heavy predation losses occurred in the common tern colony. It is not known how frequently fox

den on the island. It is reasonable to assume, however, that the SNA is within the breeding territory of some individual in most years. The channels off either end of the island are not effective dispersal barriers to fox or other more aquatic mammalian predators like mink, otter and other mustelids. All of these species have been seen on the SNA. Some fox hunting is known to have occurred prior to SNA designation.

Threat

Mammalian predation has been reported as an important mortality factor in several shorebird studies. Predation is considered one of the major problems for Piping Plovers and Common Terns by most agencies and conservation organizations responsible for their management. Others include interference from recreational activity and artificial water level manipulations. Common Tern chicks experienced heavy mortality from fox predation in 1984. Common Terns are relatively long-lived species and may be able to tolerate heavy reproduction losses periodically. Piping Plovers are shorter lived and may be more sensitive to high predation losses. Terns do not seem to have effective defense mechanisms against nocturnal predators. Indirect predator impacts (e.g. egg or chick exposure to cold or inclement night weather due to disturbance of adults) is known to cause substantial losses. Fox and some mustelids are known to "surplus kill" and cache food causing a relatively high per animal impact. It may be important to differentiate between family groups or individual animals when gathering census information.

Management Options

1. Predator removal - Two general alternatives for predator removal are 1) contracting with an individual for removal of known animals, and 2) removal by the general public during legal seasons for targeted species. Contract removal of red fox was used in 1984 and 1985. Public hunting and trapping will be considered when this would provide an adequate level of control or significantly reduce the need for contract removal, and where regulated hunting and trapping is not inconsistent with the purposes for which Pine and Curry Island SNA was established.
2. Predator exclusion - Electric fences have been used in several situations to protect nesting birds from mammalian predators. The dynamic nature of the island habitat, and semi-aquatic nature of some of the predators makes fencing the sanctuary areas impractical.
3. Predator monitoring - Tract censusing or use of scent posts could identify the presence/absence of individual animals or family groups. More information is needed on the presence of mammalian predators during critical plover and tern breeding periods, their actual contribution to total predation losses.

Action 3.7 Census mammalian predators in the SNA

Considerations:

Methodology - use permanent transects or scent post stations to determine presence/absence.

Schedule - Minimum; early spring to determine presence after ice out, and in mid summer to determine presence of family groups or individuals. Optimum; once per month to determine annual use patterns.

Action 3.8 Evaluate the need for removing problem predators

Considerations:

Evaluation - evaluate the need for predator removal after 3-5 more years of census data have been obtained on mammalian predators (Action 3.7) and on plovers and terns (Actions 3.1, 3.2, 3.3, 3.4). This evaluation will also take into account the role of these plover and tern colonies in statewide or regional management goals.

Removal Program - Amend this plan to include an action providing for predator removal if deemed necessary following the evaluation period. Removal will be consistent with department policy on predator control (in preparation).

Exception - Predator removal, as done in 1984 and 1985, will not be continued during the evaluation period. An exception to this policy may be made if minimum population objectives for Piping Plovers and/or Common Terns are consistently not being met, and earlier stated considerations regarding predator control are followed.

Section 4

VEGETATION MANAGEMENT

The Sand Beach natural community type is among the most dynamic natural environments. Both the physical configuration and structure of the island and vegetation may change abruptly in response to waves, wind, water levels and ice scouring. Piping Plovers and Common Terns are adapted to using these dynamic habitats. If an area stabilizes it becomes more heavily vegetated and less suitable for nesting.

The points on both ends of the island and Morris Point appear to be active enough to provide suitable, open nesting habitat for plovers and terns. Vegetation monitoring of these areas will better identify trends or patterns of vegetation development.

Habitat manipulation to create more open nesting area has been successful for these shorebirds elsewhere. No such activity has been shown to be necessary at Pine and Curry Island SNA. Monitoring data will allow for proper evaluation of habitat management needs.

Action 4.1 Monitor vegetation change.

Considerations:

Priorities - Plover and tern nesting areas.

Objective - to determine general trends or patterns of vegetative change.

Aerial Photography - ASCS will fly the SNA as part of its annual aerial photography program. These photos should be complemented by photo and sampling stations on the ground.

Section 5

ADDITIONAL INVENTORY NEEDS

A. Birds

Terry Wiens established solid baseline data documenting the abundance of all birds on the island in 1982 and 1983 (published in The Loon, 1984, V. 56, No. 2). His qualitative observations can serve as a benchmark for future similar surveys.

Action 5.1 Conduct a bird census of the SNA every 10 years.

B. Flora and Fauna

The floral inventory of Pine and Curry Island SNA is not complete. In addition, no systematic inventory of the SNA's faunal groups has been done other than birds.

Action 5.2 Complete the floral inventory.

Action 5.3 Systematically survey the fauna.

Considerations:

Priorities - Herpetofauna, small mammals or invertebrate groups that might be dependent on environmental conditions or host plants restricted to the SNA.

Section 6.

ADJACENT LANDS

Some lands adjacent or near an SNA can be important factors in the management and protection of that unit. These lands have one or more of the following characteristics:

- 1) they contain portions or additional occurrences of natural features being protected on the SNA.
- 2) they contain additional significant natural features.
- 3) certain activities occurring on these lands may affect management and protection of natural features within the SNA.
- 4) they may encumber certain management activities.
- 5) they may limit enforcement capabilities.

In the following section, each surrounding land parcel with important protection or management features is discussed. Actions recommended contribute to a more complete preserve design package for the SNA.

A. BLM Unit 011 - 5.9 acres

Resources: This unit borders the west end of the Morris Point tract. Like Morris Point, the sandy beach or BLM unit 011 also provides important habitat for gulls, terns, Piping Plovers, and a myriad of other shorebirds.

Status: The DNR has submitted an "Application for Land for Recreation for Public Purposes" requesting conveyance of BLM unit 011 to the state under the Federal Land Management Planning Act.

SNA Factors: Managed together, the SNA and BLM unit protects the largest breeding population of Piping Plovers in the Upper Midwest.

Action 6.1 Include the BLM Unit 011 in the SNA.

B. Sable Island - Ontario

Resources: Sable Island is a continuation of the sandspit-barrier island complex that includes Morris Point, Pine and Curry Island, and Sable Island. The vegetation is quite similar to the SNA but also includes larger, more stabilized dunes.

Status: Sable Island was recently established as an Ontario Provincial Park - Nature Reserve. No physical development is allowed in a Nature Reserve. Public uses which might cause resource degradation are prohibited.

SNA Factors: The accuracy of shorebird census and monitoring results would be improved if Sable Island was included in the study area. Management needs for both the DNR and Ontario Ministry of Natural Resources could be better identified through a shared data set.

Action 6.2 Initiate a cooperative shorebird census and monitoring program with Ontario.

Section 7

EFFECTS OF MANAGEMENT ON SIGNIFICANT RESOURCES

A. Piping Plover (Charadrius melodus) and Common Tern (Sterna hirundo)

Several actions in this plan are directed specifically at the Piping Plover and Common Tern populations in the SNA. These fall into the following groups: Protection, Monitoring, Management and Education.

Protection - Wildlife sanctuaries will be more effective in protecting nesting areas by providing more flexible boundaries (Action 1.2), improving signing (Action 2.2) and increasing enforcement (Action 1.1).

Monitoring - Census and Monitoring activities will provide a better understanding of the plover and tern populations (Action 3.1, 3.2, 3.3, 3.4, 6.2). Predators will also be observed. (Action 3.6, 3.7). Nesting habitat will be monitored (Action 4.1). There is concern that monitoring activities themselves may disturb the plovers and terns. This will be continuously evaluated. All measures will be taken to minimize, or if necessary, eliminate any activities impacting the populations.

Management - Problems with nonconforming uses have been alleviated by eliminating, or limiting those uses of specific areas (Section 1, Action 1.5). Certain nonconforming uses which do not conflict with SNA objectives will be permitted (Action 1.4) but these occur after Piping Plovers and Common Terns have left the SNA. Predator control techniques will be investigated, and the need for predator removal will be evaluated (Action 3.8). Control of Ring-billed Gulls will be implemented and nesting attempts will be monitored (Actions 3.5A and 3.6 respectively).

Education - Increased public and governmental awareness of management objectives and use restrictions in the SNA will maximize protection (Action 1.6, 1.7, 1.8, 1.9, 2.3, 2.4, 2.5).

B. Sand Beach Natural Community

No habitat manipulation is proposed. This is a dynamic community type. The major ecological processes that support it are still intact (storms, wind, ice heaving, longshore sand transport).

Section 8

MANAGEMENT COSTS AND IMPLEMENTATION

Actions recommended in this plan have been separated into two categories: (1) administrative and (2) operational. The costs of administrative actions are difficult to itemize because they are included in an SNA staff member's salary.

Operational actions are on-site activities. These often have both capital and labor costs. Capital costs have been listed. Estimates of labor needs are provided where possible.

Administrative and operational actions are often funded out of different budget sources. This makes it difficult to present an implementation schedule that equates both types of actions. To accommodate budget planning, separate implementation schedules are outlined for each category.

It is important, however, to have a mechanism that does allow comparison between all actions in this plan and between actions from different plans. The system outlined below distinguishes between (a) actions needed to improve or maintain the integrity of a site's most important features called elements, (b) legal or moral obligations of ownership or land management by the Department, and (c) all other actions important for reasons other than above.

Group I Actions: Actions that prevent or reduce the vulnerability of the element to destruction or serious degradation. That is, in the absence of these actions the preservation of the element is threatened on this site. Research, ecological survey and monitoring may be included here if, without such information, it is not known what actions are necessary to maintain the element.

Group II Actions: Actions necessary because they constitute an obligation of land management/ownership by the Department. These may be legal obligation, departmental, or SNA program standard requirements.

Group III Actions: Actions taken for all other reasons. For example, actions taken to provide for public use, acquire supplementary resource information, administrative coordination, etc.

The following chart illustrates the scheduling of actions described in the text, and the immediate and on-going capital costs of implementation. The scope of this plan covers a ten year period. The plan should be reviewed every five years to evaluate progress, reassess priorities, and refine management techniques. Actions listed under the category "Begin Immediately" need immediate attention or are a continuation of an existing program. "Phase I" is the first five year period. "Phase II" is the second five year period. Implementation of many actions depend on availability of materials, equipment and labor. An action may be initiated sooner than scheduled if circumstances so dictate and earlier scheduled actions will not suffer as a result.

ADMINISTRATIVE ACTIONS	GROUP	BEGIN IMMEDIATELY	PHASE I	PHASE II	COMMENTS
Action 1.2 Amend wildlife sanctuary boundaries	I		X		SNA, joint amendment with 1.2, 1.3, 1.4
Action 1.6 Distribute brochures	I	X			W, continuation of existing program
Action 1.8 Maintain Attention Boaters signs	I	X			W, continuation of existing program
Action 1.3 Publicize that waterfowl hunting is permitted	II	X	X		NG, W
Action 1.4 Amend Commissioner's Order to allow winter vehicle use	II		X		SNA, joint amendment with 1.2, 1.3, 1.4, 1.5
Action 1.5 Amend Commissioner's Order to designate an additional shorelunch area	II		X		SNA, joint amendment with 1.2, 1.3, 1.4, 1.5
Action 6.1 Include BLM unit #11 in SNA	III			X	SNA
Action 6.2 Develop cooperative census/monitoring program with Ontario	III		X		SNA, NG, see 3.1
Action 1.6 Contact Canadian and International L.O.W. Control Board	III		X		SNA
Action 1.9 Coordinate public education	III	X			SNA, through Nongame Regional Specialist

OPERATIONAL ACTIONS

Action 1.1 Increase enforcement effort	I	X			E
Action 2.1 Annually sign wildlife sanctuaries	I	X			W, continuation of existing program
Action 2.2 Post "No Landing" signs in sanctuaries	I		X		W
Action 2.3 Post rules and regulations signs	I		X		W
Action 3.1 Annually monitor piping plover population	I	X			NG, continuation of existing program
Action 3.2 Tentatively continue piping plover banding	I	X			NG, continuation of existing program
Action 3.4 Annually monitor common tern colony	I		X		NG, in conjunction with 3.1
Action 3.8 Evaluate predator control	I	X	X		NG
Action 2.4 Post SNA unit sign	II		X		W
Action 2.5 Post interpretive sign	II		X		SNA
Action 2.6 Remove trailerhouse and other debris	II			X	SNA
Action 3.3 Census other piping plover nesting locations	III			X	NG
Action 3.5 Test avian predator exclosures	III			X	SNA
Action 3.6 Study avian predation	III		X		NG
Action 3.7 Census mammalian predators	III		X		W, could be done with 3.1, concurrent w/3.8
Action 4.1 Monitor vegetation change	III		X		SNA
Action 5.1 Conduct bird census every 10 years	III			X	NG
Action 5.2 Complete floral inventory	III			X	NHP
Action 5.3 Survey fauna	III			X	SNA
Action 3.5A Implement nest control on Ring-billed Gulls	I	X	X		NG, SNA, W

*SNA = Scientific and Natural Areas primary responsibility
W = Area Wildlife Manager primary responsibility
NG = Nongame Program primary responsibility

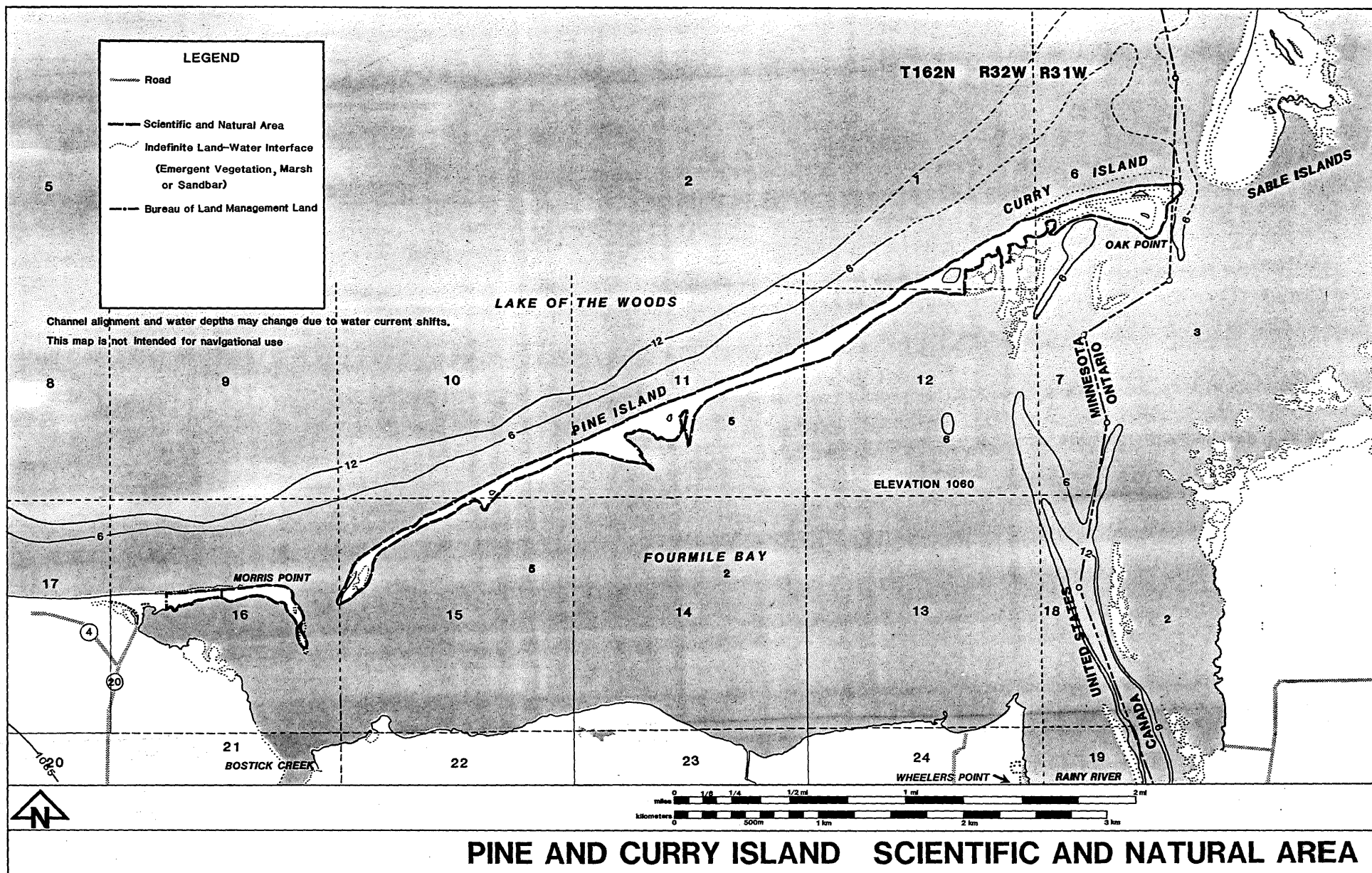
E = Enforcement primary responsibility
NHP = Natural Heritage Program primary responsibility

APPENDIX

PINE AND CURRY ISLAND
SCIENTIFIC AND NATURAL AREA
RESOURCE INVENTORY

JANUARY 1985

Land Use History
Present Vegetation
Status and Breeding Biology
of the Piping Plover
The Birds of Pine & Curry Island
Status and Reproductive Success
of Common Tern



LAND USE HISTORY

Pine & Curry Island Scientific and Natural Area (SNA) is located at the mouth of the Rainy River along the southern shore of Lake of the Woods in Lake of the Woods County, Minnesota. The area includes Pine & Curry Island and on the adjacent mainland, Morris Point. To the east lies Ontario, Canada, to the south is Four Mile Bay, separating the island from the mainland, and Zippel Bay, also of historic value and now part of Zippel Bay State Park, lies to the west of the SNA along the southern shore of the lake.

The history of Pine & Curry Island reveals an interesting story about the previous uses of the now deserted islands. The solitude of Pine & Curry today would give no indication that it was once the site of a small but very active fishing town, LeClair, and two commercial fisheries, the Sandusky Fish Co. and the Baltimore Packing Company. Very little of LeClair remains today and now a completely different situation exists on the island. History of this island was reconstructed by research of state historical records, maps, and aerial photos, original surveyors' notes of the area, old ownership records, and interviews with local people. Since Pine & Curry Island affected and was affected by the surrounding areas of Lake of the Woods, a general history of the county will be discussed to clarify the events that occurred along the shores of Lake of the Woods.

Geomorphology

Over a thousand years ago, during the Pleistocene epoch, a giant glacier covered northern Minnesota, North Dakota, and a large portion of Canada. As the ice sheet retreated, a channel to the north drained the waters, called Lake Agassiz, into the Hudson Bay leaving several lakes, including Lake of the Woods, as remnants. Lake of the Woods is a relatively shallow lake, studded with small islands and bordered on the north by the Canadian Shield. The fine claylike silt that accumulated on the bottom of Glacial Lake Agassiz is responsible for the extreme fertility of the Lake of the Woods drainage basin. The Rainy River runs through this rich alluvial basin for over 80 miles, eventually emptying into Lake of the Woods through Four Mile Bay.

The land now called Pine & Curry Island was originally connected to the mainland at Morris Point forming a long narrow peninsula between Lake of the Woods and Four Mile Bay that was then called Oak Point. Since then winds and wave action have had a pronounced effect on the shoreline of the peninsula, eroding away its banks in some places and depositing sand and sediments in others. An International Boundary Map of 1912-13 is the first indication of a breakup of the peninsula between Morris Point and Pine Island and between Pine Island and Curry Island. The map shows a large portion of the current western end of Pine Island under water -- a small sandbar/island was all that remained between Morris Point and Pine Island. The unofficial name of this sandbar, now assimilated to Morris Point, was Seagull Island to local fishermen. Maps of 1915 and 1945 continue to show Pine & Curry as two separate islands with a little variation as to the small sandbar/islands in between. Extremely high water in 1926 from heavy rains did extensive damage to lakeshore property and may have affected the shape of Pine & Curry Islands. An aerial photo of 1961 indicates that Pine & Curry have by that time joined together as one island and it remains that way today with a gap about a quarter mile wide between Pine Island and Morris Point.

Lake of the Woods is a reservoir with the water level being regulated from two places. A dam along the Rainy River at International Falls, the headwaters of the river, regulates the inflow of water and two dams at Kenora, Ontario control the outflow. The lake level fluctuates 2-3 feet.

Early History

The earliest archaeological records of the Lake of the Woods area date back from 200 BC to 800 AD when people of the Laurel culture inhabited the wooded lands around its shores. Very little is known about their now extinct Indian culture except that they were hunters and gatherers and they built extensive burial mounds. These mounds, now covered with trees, are almost all that remains of their once active community. None are known to occur on the SNA.

The Laurel people were either assimilated or pushed out by a new people, the Blackduck Culture, around 1000 AD. They, too, utilized burial mounds and elaborate jewelry and pottery have been unearthed from two such mounds located at the mouth of the Rainy River, near the current SNA. The Blackduck people dominated the area until about 1400 AD when they were replaced by the gradual immigration of many different Indian tribes: Assiniboine, Cree, Chippewa, and Sioux. The Chippewa (Ojibway), Assiniboine, and Cree became allies in the northern parts of Minnesota against the Sioux in the south.

Regional Exploration and Early Settlement

It was 1688 before the first white man reached Lake of the Woods and that man was Jacques de Noyon, a French explorer from Three Rivers, Quebec. His party of white men and Indians traveled south to Lake Superior, up to Rainy Lake, and then down the Rainy River and through the channel by Curry Island to reach Lake of the Woods. The next explorer, Pierre Gauthier LaVerendrye, arrived with a party of 50 men at Lake of the Woods in 1733, traveling a similar route. His men built Fort St. Charles at Rainy Lake and Fort St. Pierre at the mouth of the Rainy River. Relations between the white men and the Indians were generally good although there was always a risk of a Siouan attack. In 1736 the Sioux raided a camp of some of LaVerendrye's men, supposedly believing the white men had caused a recent measles outbreak among their tribes. They massacred all 19 men, including LaVerendrye's own son. That island in Lake of the Woods is called Massacre Island today.

Lake of the Woods became an important crossroads in the voyageurs' highway. As more explorers ventured into the area trading posts were established around its banks. The Ash House and Hungry Hall, built by the Hudson's Bay Co. and the Northwest Co., respectively, were only two that stood at various times near the mouth of the Rainy River, just across Four Mile Bay from the SNA. Fur trading flourished during the next several decades and the posts each struggled to monopolize trade. Voyageurs traveled extensively down the Rainy River in their canoes seeking the "gateway to the West", stopping at the various posts to rest and trade stories.

Fur trading, the livelihood of all the men of the trading posts, began to diminish in the early 1840's, shortly after the American Fur Company gained the fur trade monopoly on the southern side of the Lake. People were beginning to think of settling permanently into the area, clear the land, and establish homesteads. In 1858 Minnesota became a state and shortly thereafter the land was surveyed, parceled, and sold to willing buyers. The area around Lake of the Woods was settled relatively late in comparison with the rest of the state, however. The land was heavily timbered, requiring much clearing, the winters long and harsh, and there were still occasional Indian raids by the Sioux.

Commercial Fishing

The first settler along Lake of the Woods near the SNA was a German immigrant named Wilhelm Zippel who settled in 1885 at what is now known as Zippel Bay, west of the Rainy River. Zippel and Alonzo Wheeler, an early settler near the mouth of the Rainy River, became the first commercial fishermen on the southern side of the lake. It is not known how commercial fishing really began but it certainly was successful and expanded rapidly. The waters were full of sturgeon, whitefish, walleye, tullibee, northern pike, and burbot. By 1894 at least three fish-packing stations had been built on the Minnesota side of the lake: Zippels at Zippel Bay, and two at Oak Point on the northeastern end of Curry Island; the Sandusky Fish Co. and the Baltimore Packing Company. Although information is incomplete there appears to have been a fishery run by Ole Johnson around 1891 on the peninsula, also (where Morris Point Gap has since formed).

Fishermen flocked to Lake of the Woods to take advantage of the abundance of fish and "the aggregate catch of all parties engaged in business there for the year 1894 was about 900 tons".¹ About this time the town of LeClair grew up on the peninsula and it thrived on the success of the fishing stations. LeClair was named after E.T. LeClair who was the manager of the Baltimore Fish Packing Co. The village, composed entirely of men, established a Post Office in 1898 which continued to operate until 1902. Old photos of LeClair indicate it was a very active and prosperous town in its day. Several buildings were erected (homes, a store, ice houses, and packing buildings) along with net drying racks, boat docks, and all the other necessities of a busy fishing village. There was also a caviar factory at both the Sandusky and Baltimore Fish companies.

No restrictions were placed on the fishermen of that time on the amount or type of gear used. Sturgeon was the most desirable fish at this time and were removed from the lake in mass quantities. The sturgeon catch peaked in 1893 when 1,300,000 lbs. were taken from the American waters of the lake. "Their fishing technique generally involved the use of pound nets and two steam tugs were used to tow the fishermen and their sailboats to the nets along the southern shore of the lake. After the last fisherman raised his nets the tug would return, picking up those boats that had not returned to port under their own power. This system was used until about 1903 by the Sandusky Co. and its successor, the Armstrong Trading Co., which purchased the firm in 1901."²

The Canadian Pacific Railroad had reached Lake of the Woods since 1881 but it wasn't until 1908 when the Great Northern Railroad built into the U.S. side of the lake at Warroad, near the southwestern end of the lake. Fish could then be transported by rail from Warroad back to the East. A barge travelled twice a week to Oak Point and other fishing stations to pick up shipments to be sent to other parts of the state and the East coast.

After the sturgeon peak in 1893 the catch sizes began to decrease. They had been fished very heavily and "at one time more than 320 pound nets...were being fished".³ Oftentimes the sturgeon were taken for their roe (caviar) and the flesh unutilized and left to sit on the beaches. As the sturgeon catch decreased the fishermen turned to whitefish and later to walleye. It wasn't until 1895 that the first restrictions were imposed, limiting each licensee to 50 pound nets. (This number was reduced to 25 in 1911 when gill nets were first used and to 6 in 1925.)

The Sandusky Company of LeClair, purchased in 1901 by the Armstrong Co., later became a part of Booth Fisheries which also operated a fishing station in Warroad. However, in 1915 the LeClair station was destroyed by high water which terminated the activities of the fishing village. Destruction of LeClair did not lead to permanent desertion of the island, although winds and waves continued to batter it from the north, gradually reshaping its shoreline.

Later Years

The fishing industry could not support the growing populations around Lake of the Woods and the area sunk into a depression. Several industries were initiated in the area in the late 1920s but most of them failed. In 1934 Highway 72 was completed--the first direct link to the south, and soon tourists began coming up to Lake of the Woods. In 1935 John Morris built a series of cabins at Morris Point, the first resort in the area, and soon afterward several other resorts were built along the lake and along Rainy River to attract vacationers and anglers to the area.

Sometime⁴ around 1926 Len Anderson and Charles Tobin built a house on Curry Island. The house was built from pulpwood, with 2 x 10s nailed together from top to bottom. It had two rooms, board floors, and was approximately 24' x 30'. Within 100 yards of this house were two small one-room shacks, approximately 16' x 20' and 12' x 16'. They were moved from the mainland onto the island sometime before 1935 and used only during the summer season by Mr. & Mrs. Desmond Gunderson and Mr. & Mrs. Albert Jenson. Charles Tobin operated a fishery there on the island and had a dock and fish house with connected ice house down by the shore. A very old log house existed on the island near that area, too--possibly a building left standing after the 1915 high waters, and Anderson and Tobin used it as an ice house at one time. The three houses eventually burned down, possibly from stove explosions. Two had been vacated for some time but it is believed that the smallest one still housed some personal property. The ice house and fish house apparently just collapsed and fell down; their demise is unknown.

By 1957 Mr. & Mrs. Sidney Moorhead owned Curry Island and they operated a small food and minnow shop on the island for about four summers. It was open seasonally and sold candy, pop, coffee, and soup to fishermen and also minnows, stocked in their nearby minnow tank. Their shop was equipped with a stove, a freezer, and electric lights which received power from a generator there.

Existing Structures

The first indication of a lighthouse on Oak Point is from Mr. Pat O'Connor whose father (also Pat O'Connor) was the lighthouse keeper from approximately 1904-1950.⁶ The lighthouse existed before 1904 but details about its original construction are unknown. It was located on the northeast end of Curry Island and was almost all wood except for four steel corner supports and a concrete foundation. It was intact in October of 1983 (minus the beacon). A new structure was erected about 130 feet away from the old one in July of 1983. The new structure is all steel, on wooden supports and was lifted in by helicopter to the island. The new laser beacon requires less maintenance and is operated by the U.S. Coast Guard office in Duluth. Boat traffic is heavy down the Rainy River and to reach Lake of the Woods from the mouth of the river a channel has been marked out with buoys through Four Mile Bay and around Curry Island to facilitate navigation through the shallow waters. These markers are still used today but due to silting they are occasionally relocated to mark the best channel.

Little evidence exists on the island today of the many structures and activities that once occurred there. The foundation of a house or trailer (30 x 15') is located on the south shore of Oak Point and remains of an old stove lie within the foundation. Approximately 40 feet southwest of that foundation lies another concrete structure (4' x 12') that has been heaved up by the ice onto the top of a berm. A stripped down engine, probably a water pump, lies next to it indicating that this was probably Moorhead's minnow tank and the stove and foundation was their shop. An old breakwall constructed in 1913 (75' x 3' x 6") still stands and is on the northeastern end of the island, near the location of the new lighthouse. While the Moorehads were there they planted several Norway and Jack pines on Curry Island to alleviate a problem of tree removal by the public for Christmas trees. These trees stand near the widest part of Curry.

Since Pine & Curry Island is such a narrow piece of land and so vulnerable to wave action it never had much developmental potential and it remains today as it was many years ago in several places. Early owners were simply interested in fishing in the nearby waters and later owners bought the land as a retirement investment or with the intention of preserving it to maintain an unspoiled view of Lake of the Woods from the mainland.

Original Vegetation

In an attempt to understand what the magnitude of the human impact may have been on Pine & Curry Island, it is important to know how the vegetation appeared prior to settlement there. Tools for reconstructing the state's vegetation at the time of settlement are available in records of the General Land Survey Office. Those records constitute the field notes of the men who originally surveyed Minnesota during the late 1800's.

As the men surveyed each township, they walked along the section lines, marking the mile and half mile intervals by recording tree species, diameter at breast height (dbh), and distance from the survey corner to the nearest tree. Theoretically, the only criteria for selecting these bearing trees was that they had to have a minimum dbh of five inches. As the surveyors travelled through the townships, they also recorded the location of uplands, swamps, prairies, marshes, groves, and windfalls, as well as all streams, rivers, lakes, and roads. Houses, cabins, fields and other 'improvements'

were noted with less regularity, depending on the surveyor and the year the survey was done. Although there are several problems in the use of survey notes for determining past vegetation, including fraud, bias, and species name duplication, the records remain a valuable source of information regarding the nature of the vegetation prior to settlement by European man.

The transcription of the survey notes has been carried one stop further by Francis J. Marschner (1930), who used the records to develop comprehensive maps of the state's original vegetation. Using the General Land Office Survey notes and maps as well as Marschner's map, a general description of the original vegetation of the area can be prepared.

According to those sources of information, the original vegetation south of Lake of the Woods was heavily timbered with tamarac, balsam, birch, aspen, and spruce. The land directly south of Four Mile Bay was termed "open bog" and some of it was described as being burned (parts of Secs. 20-23). Little references can be found to early fires except that in 1804-05 a large forest fire did extensive damage to the land south of the lake. Wallace McDonald and John Doulin, the original surveyors of the Lake of the Woods area in 1895, described the township as "rather level land some 20 feet above the level of Lake of the Woods (mostly swampy). A long sandy point extends from Sec. 16 to Sec. 6 (Th162R31W). The shore of Lake of the Woods is used as a fishing grounds."* The "long sandy point" referred to here was Oak Point, the peninsula now separated into Pine and Curry Island and Morris Point. Since the section lines crossed such a small part of the peninsula longitudinally, only a few notes exist about specific tree species at those locations. East-west section line descriptions give a better indication of the trees and the terrain and the general descriptions of the sections are also helpful.

Analysis of the surveyors' notes indicates much of the peninsula was covered with beach sand, generally bare of vegetation and supporting only a few scattered plants. However, there were some areas of the peninsula, generally in the higher spots, that had grass, dense undergrowth, and fairly tall trees. Few trees were noted by the surveyors as they walked the shorelines but they did record the distance inland to the nearest tree. Along the shoreline, five out of seven trees recorded at the meander corners were balm of gilead, ranging from 35 feet away at the narrow parts of the island to 250 feet in wider areas. As the surveyors walked the inner parts of the island they recorded "dense undergrowth" and sometimes "heavy timber". Aspen and oak were dense between Sections 1 and 12 along Curry Island with dense willows along the shores in some places. Pine Island was dense with oak, young aspen, several plum bushes, and also had several large white pine (20 dbh) along its eastern end. The land was described as mostly level but occasionally there was a rise up to a ridge or grassy plateau.

PRESENT VEGETATION

INTRODUCTION

The Pine and Curry Island SNA contains a unique natural community type - Sand Beach. This community, which develops on loose sand with no true soil, is confined to the shorelines of Lake Superior and to a few large inland lakes. Sand Beaches support unusual assemblages of plant species which are adapted to highly stressed environments. In general, plant cover is sparse and total species diversity is low. The Sand Beach community in Minnesota is significant simply because it is so rare in extent. Minnesota Point on Lake Superior is the largest known Sand Beach - much of it however has been developed. Pine and Curry Island is the largest known Sand Beach occurring on an inland lake.

Despite the history of disturbance on the SNA (see land use history section) the area displays a fairly good spectrum of beach vegetation types ranging from dry open sand to closed forest. The vegetation assemblages form somewhat distinct zones moving landward to seaward. The lower beach, which is under constant wave wash, is essentially devoid of vegetation. The middle and upper beaches, which are above direct wave action except during severe storms, are colonized by a relatively diverse assortment of plants. Within the middle and upper beach zones a mosaic of habitat types may occur as a result of changes in microtopography and/or differences in the water table level.

Analysis of the surveyors records (see land use history section) indicates that the general vegetation zones on Pine and Curry Island are similar now to what they were at the turn of the century. It is, however, not possible to reconstruct the actual composition of the presettlement vegetation. The degree of alteration to the original vegetation by the early development that took place on the island is difficult to assess. To the east of the preserve, a partial inventory of the undeveloped Sable Islands indicated a similar vegetation. The Sable Islands, however, are distinguished by a prolific lichen cover which is absent on Pine and Curry Island. These lichen covered areas are often quite sensitive to human use, and can be destroyed by trampling and off road vehicle use. It is not known whether Pine and Curry Island ever supported a prominent lichen cover.

METHODS

The floristic patterns and vegetation communities on the Pine and Curry Island Preserve are described in the following section. Relieve's were used to describe and identify the major vegetational assemblages. A complete floristic list and a systematic search for rare plant species was not conducted. The beach vegetation was sampled in August 7, 8, 1984. Relieve's were established in three separate belt transects each beginning at the point of plant colonization in the lower beach zone. Schematic cross-sectional views of the island illustrate the zonation of the flora (Figure 1). Four natural vegetation types within the Sand Beach community were identified and are described below. These vegetation types were not delineated on a cover type map due to the narrow width of the island and the dynamic nature of the vegetation. The Sand Beach community is among the most dynamic of environments. The form and position of the beach itself may change abruptly in response to waves, winds, and water levels. The vegetation is equally responsive, and hence very unstable.

COMMUNITY DESCRIPTION

Beach-Dune Grass

The beach-dune grass association, dominated by grasses and forbs, may occupy the entire lower and upper beach (Figure A). It is an early successional community characterized by plants which colonize open sand and act to anchor the substrate. The most abundant species in the community are Canada wild rye (Elymus canadensis), beach pea (Lathyrus maritimus) and wormwood (Artemisia campestris). Common associates include sand dropseed (Sporobolus cryptandrus), Russian thistle (Salsola kali), knotweed (Polygonella articulata), sand cherry (Prunus pumila), quack grass (Agropyron repens), starry Solomon's seal (Smilacina stellata), wild four o'clock (Oxybaphus nyctagineus), and poison ivy (Rhus radicans). This is typically a species poor community. Vegetation cover varies from dense (as high as 90% cover) on the upper beach to sparse (as low as 10% cover) on the middle beach. The lower beach is typically devoid of vegetation. The ice-push ridges common on the east shore of the island contain numerous annual and weedy species including lambs quarters (Chenopodium album), Russian thistle, knotweed, mint (Mentha arvensis), cocklebur (Xanthium strumarium) oldfield milkweed (Asclepias syriaca) and Baltic rush (Juncus balticus).

Mixed Forest

The mixed forest is best represented by transect B (Figure B), which occurs near the middle of the preserve at one of its widest points. The forest composition appears to closely reflect the presettlement conditions. The stand is dominated by a supercanopy of white pine (Pinus strobus) with diameter at breast height reaching 28 inches, age at 100 years. The pines are widely spaced with a subcanopy of hackberry (Celtis occidentalis), and bur oak (Quercus macrocarpa). The understory is dominated by round-leaved dogwood (Cornus rugosa), peach-leaved willow (Salix amygdalus), red-berried elder (Sambucus pubens), and Canada yew (Taxus canadensis). In small wet pockets, black spruce (Picea glauca), white cedar (Thuja occidentalis) and boxelder (Acer negunda) are also found. The herb layer is sparse (<25% cover). The most prevalent species are twisted stalk (Streptopus roseus), poison ivy (Rhus radicans), jewelweed (Impatiens biflora), wild grape (Vitis riparia), nettle (Urtica dioica), and mayflower (Maianthemum canadense).

Deciduous Forest

The deciduous forest is found on narrow ribs of land and more extensively on Oak Point. This is basically a scrub community dominated by balsam poplar (Populus balsamifera) with cottonwood (Populus deltoides) and trembling aspen (Populus tremuloides). The understory is a dense thicket of oak and shrubs. The most abundant shrubs are chokecherry (Prunus virginiana), red osier dogwood (Cornus stolonifera), poison ivy, and wild grape.

Planted Pine Trees

On Oak Point, a small area - the site of a former development - has been planted to red pine (Pinus resinosa). The site is very well drained with an understory similar to the beach-dune grass community; poison ivy is abundant.

Wetlands

Wetland vegetation is found where the water table is at or above the ground surface. These depressions can be readily seen on the air photo of the island (Figure). They include open pond, emergent aquatic and shrub carr communities. Emergent aquatic communities are found in swales and around the margins of ponds. Dominant plants are giant reed grass (Phragmites communis), bluejoint grass (Calamagrostis canadensis), beaked sedge (Carex cf. rostrata), sedge (Carex sp.), bulrush (Scirpus validus), arrowhead (Sagittaria sp.), burreed (Sparganium eurycarpum), water hemlock (Cicuta bulbifera), mint (Mentha arvensis), bugleweed (Lycopus americanus), and skullcap (Scutellaria galericulata). This community often grades into shrub carr. The dominants are willows (Salix interior, Salix lucida and Salix amygdaloides), and red-osier dogwood (Cornus stolonifera). The open pond community is often covered with bladderwort (Utricularia sp.).

Footnotes

- 1) John Dobie, "Commercial Fishing on Lake of the Woods", MN History Vol 35 No. 6, June 1957
- 2) Ibid
- 3) Ibid
- 4) Following details were obtained through an interview with Des Gunderson, a former resident of Curry Island, June, 1984
- 5) Interview with Mrs. Sid Moorhead, June 22, 1984
- 6) Interview with Pat O'Connor by B.J. Farley, 10-5-83
- *) McDonald, Wallace and John Donlin 1895. Original Surveyor notes.

LAKE OF THE WOODS

FOUR MILE BAY

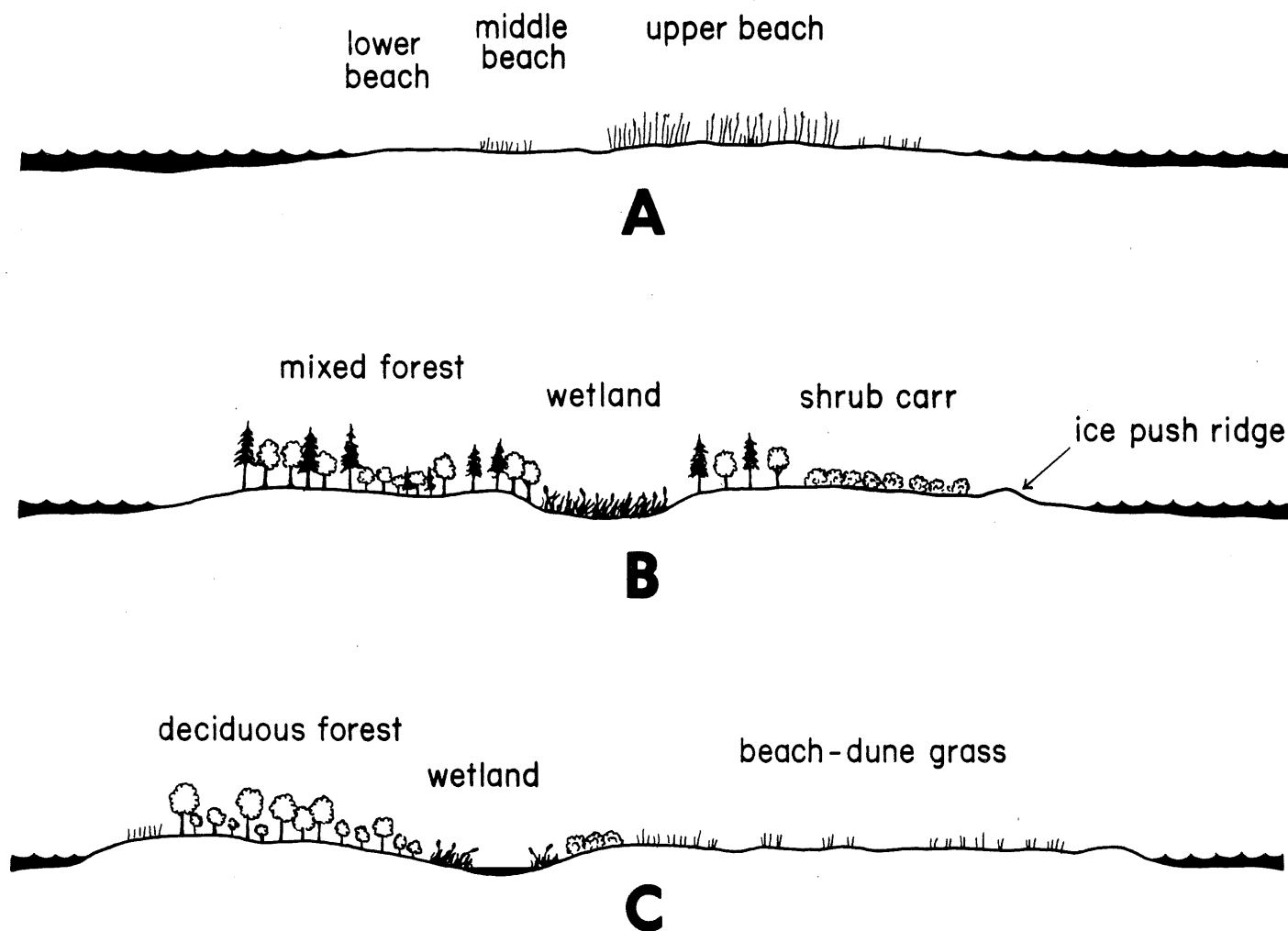


Figure Schematic cross-sectional view of the Pine and Curry Island S.N.A. illustrating zonation of flora and mosaic of habitats at western tip (A), central portion (B), and eastern portion (C), of island.

STATUS AND BREEDING BIOLOGY
OF THE PIPING PLOVER
IN LAKE OF THE WOODS COUNTY, MINNESOTA

A THIRD PROGRESS REPORT SUBMITTED TO:
NONGAME PROGRAM
MINNESOTA DEPARTMENT OF NATURAL RESOURCES
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Not For Publication

INTRODUCTION

The Piping Plover (Charadrius melodus) population in Lake of the Woods Co., Minnesota has been the focus of a breeding biology study since 1982 (Cuthbert and Wiens 1982, 1984; Wiens and Cuthbert 1984). Funding was received in the spring of 1984 (Nongame Wildlife Program of the Minnesota Department of Natural Resources and the Minnesota Chapter of the Nature Conservancy) to extend the project for a third breeding season. The project goals for 1984 were to: 1) census the number of adult plovers at Pine and Curry Island, Morris Point, and Zippel Bay, 2) color-band juvenile plovers produced in 1984, 3) capture and reband selected adults (those with bands showing excessive wear), and 4) monitor the reproductive success of each nesting pair. This report summarizes the results of the 1984 study.

METHODS

The project goals were realized through the performance of the following tasks. From early May to late July T. Wiens established a base camp on Pine and Curry Island and collected data on the following aspects of plover biology: 1) breeding chronology, 2) total number of plovers present throughout the season (non-breeding individuals and breeding pairs), 3) philopatry, nest-site tenacity, and mate retention of birds color-banded in 1982 and 1983, 4) nesting success, 5) factors causing reproductive failure, and 6) nest density and distribution of

nests.

To determine breeding chronology, factors causing reproductive failure, and size of territories, plovers were observed daily (weather permitting) from 6 May to 18 July 1984. An additional check was made on 27-28 July. Most observations were made from a 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, a total of 17 individuals (all previously unbanded) were captured and banded in 1984. Two adults and 14 juveniles were banded with U.S. Fish and Wildlife Service aluminum leg bands and unique combinations of colored leg bands. One additional juvenile received only an aluminum leg band. Adults were captured with a wire mesh drop trap; juveniles were captured by hand.

Finally, the occurrence and distribution of additional nesting pairs in the vicinity of Pine and Curry Island and Morris Point was determined during reconnaissance trips by boat to Zippel Bay (14,23 May, 3,19 June, 11 July) and Rocky Point (28 June).

RESULTS

BREEDING CHRONOLOGY

The chronology for Piping Plovers on Pine and Curry Island in 1984 was very similar to that of 1982 and 1983 (Cuthbert and Wiens 1982,1984). Individual nest histories from egg' laying through hatching are presented in Table 1.

Arrival.--Minnesota Department of Natural Resources personnel observed one plover in the vicinity of Pine and Curry Island and Morris Point on 24 April (Mike Haws, pers. commun.). Many plovers were present on 6 May, and the majority had arrived by mid-May.

Courtship and territory establishment.--upon arrival on 6 May, T. Wiens observed courtship and territorial defense. Copulation was first observed on 12 May. Courtship activities continued until eggs were laid; territorial defense continued, at varying levels of intensity, until the chicks were almost fledged or the breeding attempt failed.

Nest construction.--scrape digging was first observed on 12 May. Many scrapes were dug by each male until clutch initiation; none were constructed after this stage unless renesting occurred.

Egg laying.--the first eggs were laid on 19 May. Of 27 nests, 13 were initiated in late May, 6 in the first half of June, and 8 in mid-June. The latest nests were initiated on 18-20 June. In all cases eggs were laid every other day.

Renesting.--eight pairs lost nests on or before 14 June; of these,

5 pairs renested. 13 pairs (including the 5 which renested) lost nests from 16 June to 15 July; none of these birds attempted to build another nest.

Hatching.--The first two nests hatched on 19 June, the latest nest on 6 July.

Fledging.--The first juveniles fledged on 12 July, the last on approximately 26 July.

Departure from Pine and Curry Island.--some adults began leaving as early as very late June. Groups of non-breeders were observed throughout early July. No adults and only 3 juveniles were observed in the area on 27-28 July.

POPULATION SIZE

We estimate the plover population size for 1984 to be 47 to 50 adults. This is consistent with the estimates for 1982 (44) and 1983 (49). Forty four individuals (22 pairs) attempted breeding in 1984, compared to 30 individuals in 1982 and 42 in 1983. An additional 3 to 6 non-breeding adults were present in 1984. All birds observed had a complete breast band characteristic of the Great Plains race C. melodus circumcinctus.

PHILOPATRY, NEST-SITE TENACITY, AND MATE RETENTION

Philopatry.--a total of 34 plovers banded in 1982 or 1983 returned to the study site in 1984. Returns for both 1983 and 1984 are shown in

Table 2. All birds banded in 1982 that were observed in 1984 had also been recorded in 1983.

One plover banded at Lake of the Woods as a breeding adult in 1983 was subsequently reported feeding on the Gulf Coast beach at Waveland, Hancock County, Mississippi, on 3 November 1983 (Judy Toups, pers. commun.). The bird returned to Lake of the Woods in 1984 but did not breed.

Of the 34 returning plovers observed in 1984, only 3 (9 %) were missing any of their leg bands. These three birds were banded as adults in 1982, and each lost one plastic colored leg band between the 1983 and 1984 field seasons. To avoid excessive disturbance, no banded plovers were recaptured to replace worn or missing bands.

Nest-site tenacity.--of the 34 color-banded plovers that nested in 1983, 18 were recorded nesting in 1984. Fifteen of these birds returned to their respective nesting locale (i.e. Morris Point or the southwest end of Pine and Curry Island). However, one female moved from the northeast end of Pine and Curry Island to the southwest end (6 km). Another female moved from the southwest end of Pine and Curry Island to Morris Point (0.5 km), and a third female moved from Zippel Bay to the southwest end of Pine and Curry Island (8 km). The mean distance between the 1983 and 1984 nests (not including the three extremes) was 55.0 m. One 1984 nest was constructed in the same location as the nest from the previous year. Despite the three extremes, there was no

significant difference between male and female nest site tenacity ($p=0.19$).

Mate retention.--of the 21 breeding pairs recorded in 1983, 2 (10%) remained together in 1984. Both of these pairs had also been together in 1982. For 3 (14%) of the 1983 pairs both the male and female returned in 1984 but did not mate with each other. Nine pairs (43%) were no longer together and only one member of each pair was observed in 1984. No birds from 4 pairs (19%) were seen in 1984, and the fate of 3 pairs (14%) could not be determined. Based on this sample, 86% of the plover pairs did not remain intact for consecutive breeding seasons. This is similar to the estimate of 80% reported for 1983.

NESTING SUCCESS

The 22 pairs of breeding plovers in 1984 produced 27 nests; 5 were renesting attempts (Table 1.). Twenty two of the nests had 4 egg clutches, one nest had a 3 egg clutch, one a 2 egg clutch, and 3 nests were destroyed before the clutch was completed. The mean number of eggs per clutch was 3.9, the same as 1982 and 1983.

A total of 99 eggs was laid in 1984, and 19 (19%) hatched ($\bar{x}=0.7/\text{nest}$). Six of the 22 pairs succeeded in hatching 1 or more eggs. Hatching success was much lower than 1982 (44%) and 1983 (75%).

Of the 19 eggs that hatched, 13 chicks (68%) survived to fledging age, an average of 0.6 fledglings/pair. Four pairs successfully fledged

one or more chicks. Hatching to fledging success was consistent with the 68% estimate reported for 1982 and the 69% for 1983. However, the total number of fledglings produced in 1984 was considerably lower than the 26 reported for 1982 and 44 for 1983.

Overall reproductive success (measured as percent of chicks fledged from eggs laid) was 13%. Again, this was considerably lower than the 30% reported in 1982 and 52% in 1983.

FACTORS CAUSING REPRODUCTIVE FAILURE

Egg mortality.--a total of 80/99 eggs (81%) failed to hatch. This was considerably higher than the 56% egg mortality reported in 1982 and especially the 25% mortality reported in 1983. Total nest failure occurred in 21 of the 27 nests. We attribute egg mortality to the following causes: predation (70%) and storm damage (30%).

Chick mortality.--of the 19 chicks that hatched, 6 (32%) did not survive to fledging age. Two were found dead at age 1-3 days, and one was found dead at age 16-20 days. Three other chicks disappeared within a few days after hatching. No cause of mortality was apparent.

Adult mortality.--no adults were known to have died in 1984.

As in the previous two years, cause of mortality was difficult to determine. No predation was observed, but gull and/or corvid tracks were found at three nests which lost entire clutches. The most likely suspects were Herring Gulls (*Larus argentatus*), Ring-billed Gulls (*L. delawarensis*), Common Ravens (*Corvus corax*), and American Crows (*C.*

brachyrhynchos). We were unable to determine why egg predation was significantly higher in 1984 than in the previous two years.

At least one fox was present on Pine and Curry Island in 1984, and was responsible for Common Tern (Sterna hirundo) mortality. However, there was no direct or indirect evidence of predation by fox on Piping Plover adults, chicks, or eggs.

Between 12 May (first day of fishing season) and 15 July, 40 cases of human trespass were observed on the Wildlife Sanctuaries of Pine and Curry Island and Morris Point. The average time of each intrusion was 9 minutes. There was no direct evidence to indicate that human disturbance reduced reproductive success.

DENSITY AND DISTRIBUTION OF NESTS

Of the 27 nests found in 1984, 13 were located on the southwest end of Pine and Curry Island, 8 on Morris Point, and 6 on the northeast end of Pine and Curry Island. Nest locations are shown in Figures 1, 2, and 3. The mean distance from each nest at time of initiation to the nearest active nest was 48 m (range = 8-221 m), which was not significantly different from the average of 58 m in 1982 and 62 m in 1983.

FIGURE 1

THE DISTRIBUTION OF PIPING
PLOVER NESTS ON THE
SOUTHWEST END OF PINE
AND CURRY ISLAND.
IN 1984

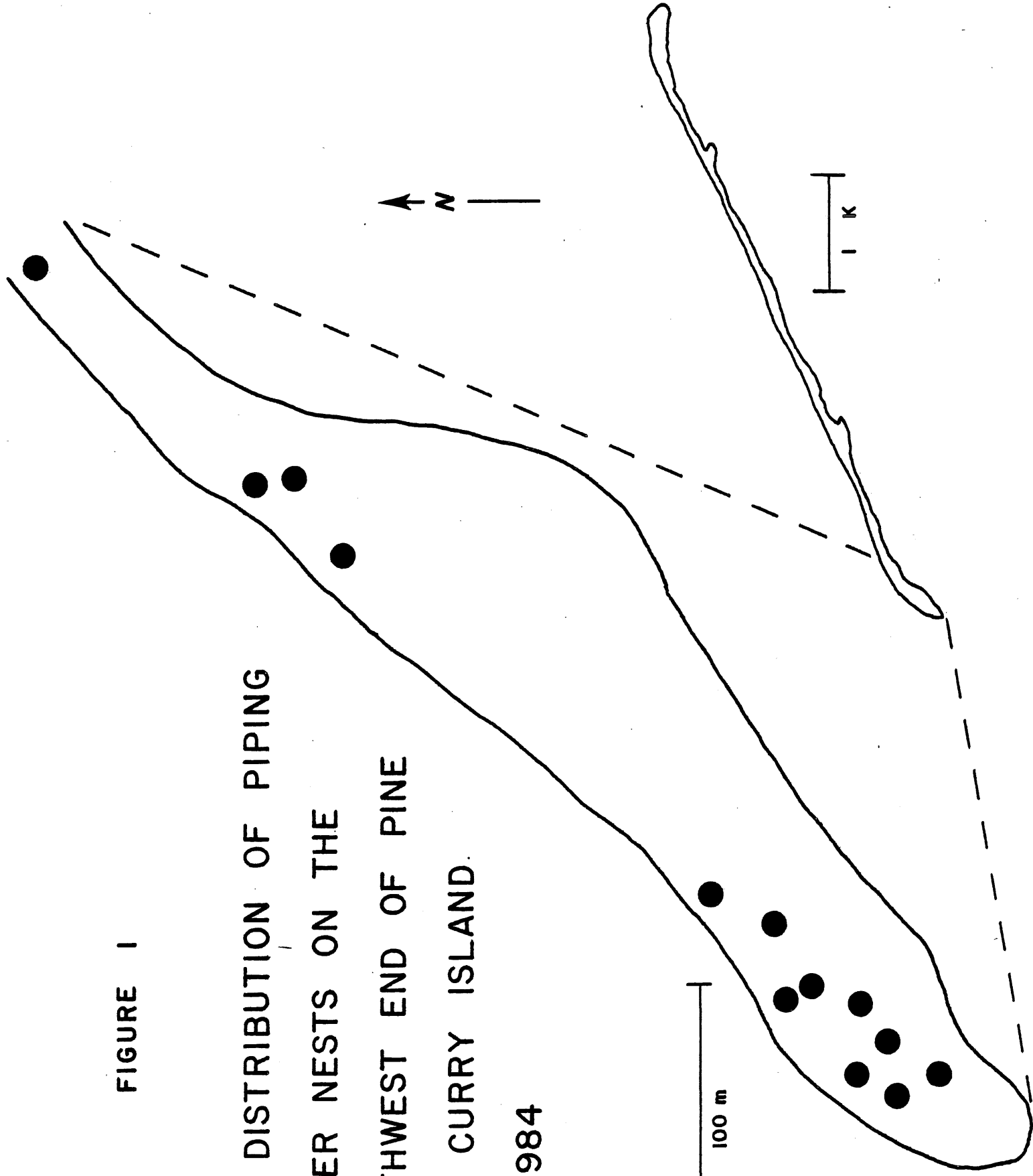
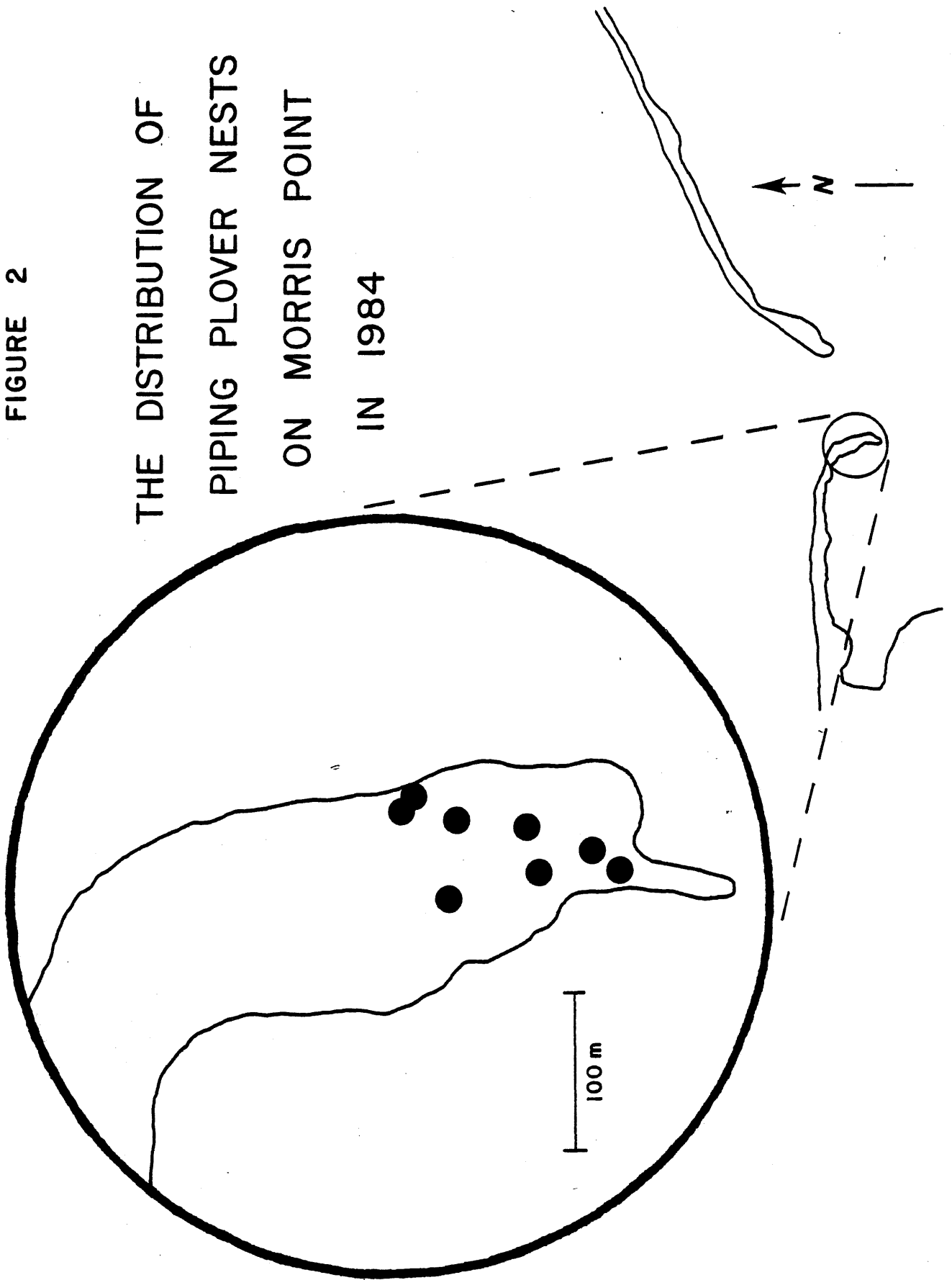


FIGURE 2

THE DISTRIBUTION OF
PIPING PLOVER NESTS
ON MORRIS POINT
IN 1984



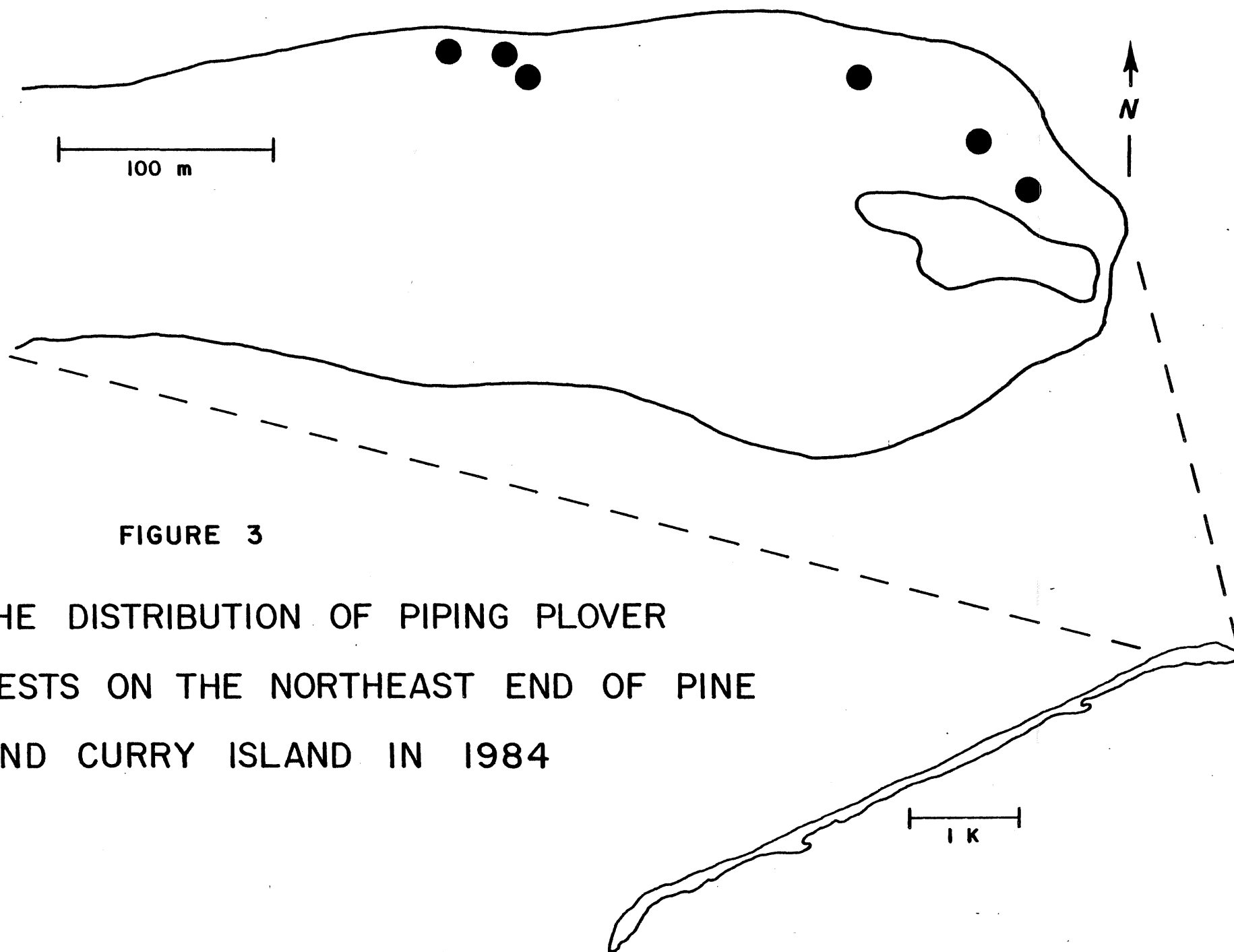


FIGURE 3

THE DISTRIBUTION OF PIPING PLOVER
NESTS ON THE NORTHEAST END OF PINE
AND CURRY ISLAND IN 1984

Table 1. Individual Nest Histories of Piping Plovers in 1984

¹ NEST	² DATE FIRST EGG LAYED	³ NUMBER OF EGGS LAYED	³ DATE OF HATCHING	EGGS HATCHED	CHICKS FLEDGED
1	19-21 May	4	*	0	0
2 (Morris Point)	19-20 May	4	*	0	0
3 (Morris Point)	20-21 May	4	*	0	0
4	23-24 May	4	*	0	0
5 (Morris Point)	-	4	*	0	0
6	19-21 May	4	*	0	0
7	-	4	19 June	4	4
8	-	4	19 June	4	4
9 (Morris Point)	22-24 May	4	*	0	0
10	23-25 May	4	*	0	0
11	27-28 May	4	*	0	0
12	29-31 May	4	2 July	3	0
13	27-29 May	4	29 June	4	4
14	-	2	*	0	0
15 (Morris Point)	5-7 June	4	*	0	0
16	-	4	*	0	0
17	-	4	2 July	2	1
18	10-12 June	4	*	0	0
19	14-16 June	4	*	0	0
20	17-19 June	1*	*	0	0
21 (Morris Point)	18-20 June	4	*	0	0
22 (Morris Point)	16-18 June	2*	*	0	0
23	-	4	6 July	2	0
24	-	4	*	0	0
25	18-20 June	3	*	0	0
26	16-18 June	4	*	0	0
27 (Morris Point)	-	3*	*	0	0
TOTAL		99		19	13

¹
Nest located on Pine and 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.

Table 2. Philopatry of Piping Plovers in 1984

	Number observed <u>in 1983</u>	Number observed <u>in 1984</u>
37 adults banded in 1982	26	16
26 juveniles banded in 1982	9	5
8 adults banded in 1983	-	7
44 juveniles banded in 1983	-	6

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Status and Reproductive Success of the Piping Plover in Lake of the Woods

Terry P. Wiens and Francesca J. Cuthbert

The Piping Plover (*Charadrius melodus*) is one of 38 species of plovers in the world (Johnsgard 1981), and its distribution is restricted exclusively to the North American continent (Godfrey 1966; American Ornithologists' Union Checklist, 1983). There can be little question that the Piping Plover is declining in many areas throughout its range (Cairns and McLaren 1980; Lambert and Ratcliff 1981). In 1973 the National Audubon Society recognized the precarious status of this species by placing it on its "Blue List" of declining species (Tate 1981).

Two breeding populations are recognized (Johnsgard 1981); these include an interior race (prairie provinces of Canada, the Dakotas, Nebraska, states bordering the Great Lakes) and an eastern race (coastal North America from Quebec and Newfoundland south to Virginia). Only two breeding localities are known in Minnesota: Lake of the Woods (Hirsch 1982) and the Duluth Harbor (Niemi and Davis 1979).

Recognizing the rarity of this species and its potential rapid extirpation from a substantial portion of its range, the Non-game Wildlife Program of the Minnesota Department of Natural Resources initiated a several year study of the breeding biology of this species in Lake of the Woods. The purpose of this paper is to report our estimates of population size and productivity for the 1982-1983 breeding seasons, and to discuss factors affecting the reproductive success of Piping Plovers breeding in Lake of the Woods.

METHODS

In Lake of the Woods, Piping Plover nest sites are concentrated on Pine and

Curry Island and adjacent Morris Point (Fig. 1). From late April through mid-August 1982-1983, T. Wiens collected data on total number of plovers present throughout the season (non-breeding individuals and breeding pairs), nesting success and factors causing reproductive failure.

Plovers were monitored by direct observation of adults, nests, and nest contents. Most observations were made from a small land-based blind or boat anchored near the shoreline. Juveniles were considered to have fledged once they were capable of flight.

To facilitate recognition of individual plovers, 136 birds (45 adults, 91 juveniles) were captured and banded with U.S. Fish and Wildlife Service aluminum leg bands and most (122) were given unique combinations of colored leg bands. Adults were captured with mist nets or wire mesh drop traps; juveniles were captured by hand.

The occurrence and distribution of additional nesting pairs in the vicinity of Pine and 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 AND DISCUSSION

Population Size

In both seasons breeding plovers were found on Pine and Curry Island and Morris and Rocky Points (Fig. 1). Plovers only nested at Zippel Bay in 1983 and no evidence of nesting was found at Stony Point, a site used by plovers in previous years.

Breeding pairs. — This category includes any pair known to have laid at least

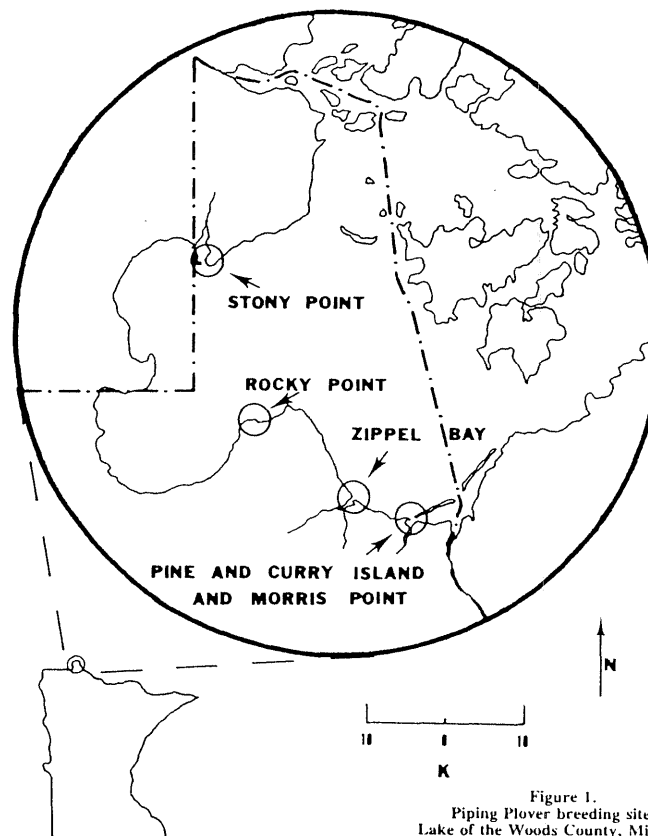


Figure 1.
Piping Plover breeding sites in
Lake of the Woods County, Minnesota.

one egg. A total of 15 pairs of Piping Plovers produced eggs in Lake of the Woods in 1982. Twelve pairs nested on Pine and Curry Island, two pairs on Morris Point, and one pair on Rocky Point. In the 1983 season, 21 breeding pairs were located; 16 on Pine and Curry Island, three on Morris Point and one each at Zippel Bay and Rocky Point.

Non-breeding individuals — Approximately 14 non-breeding plovers were observed in the study area in 1982 and seven non-breeders were recorded in 1983. 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 there was a total of 44 adult Piping Plovers present in 1982 and 49 in 1983. All but one individual possessed a complete breast band and relatively dark markings which are characteristics of the interior race *C. m. circumcinctus*. The one exception had an incomplete breast band and relatively light markings, indicating it was of the eastern race *C. m. melodus*.

This individual was present for three to four weeks but did not reproduce.

Nesting Success

In determining nesting success, we considered only the pairs that were known to have produced eggs. In 1982 this group of 30 birds (15 pairs) produced a total of 24 nests with eggs. Nine clutches were re-nesting attempts. Of the 24 nests, 18 were located on Pine and Curry Island, five on Morris Point, and one on Rocky Point. The clutch size was typically four eggs (\bar{x} = 3.9). In 1983 the 21 pairs produced 22 nests with eggs. Only one clutch was a re-nesting attempt. Of the 22 nests 17 were located on Pine and Curry Island, three on Morris Point, and one each at Zippel Bay and Rocky Point. Mean clutch size was also 3.9 in 1983.

In 1982 a total of 86 eggs were laid but only 38 (44%) hatched. Of the chicks that hatched, 26/38 (68%) were known to have fledged (\bar{x} = 1.7 chicks/adult pair). One of these juveniles was found dead on 12 September 1982 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. In 1983 a total of 85 eggs were laid and 64 (75%) hatched. Of the chicks that hatched, 44/64 (69%) were known to have fledged. This is an average of 2.1 chicks produced/pair. Both hatching rate and the number of chicks fledged were considerably higher in 1983 than in 1982.

In 1982, overall reproductive success (measured as percent of chicks fledged from eggs laid) was 30%. Success in 1983 was 52%, considerably higher than the 1982 rate. Comparative data from other Piping Plover populations are limited. Cairns (1982) found that 72-79% of the eggs hatched in her study area in Nova Scotia. Wilcox (1959) found an even higher rate, 92%, on Long Island. Although these estimates are greater than our two season average (60%), our estimate of mean number of chicks fledged/pair was 1.7-2.1 which is slightly higher than the 1.3-2.1 chicks fledged/pair reported by Cairns (1982).

Factors Causing Reproductive Failure

Egg mortality — A total of 48/86 eggs (56%) failed to hatch in the 1982 season. We attribute egg mortality to the following causes: predation (67%), storm damage (21%), human disturbance (8%), and unknown factors (4%). In 1983, 21/85 eggs (25%) did not hatch. Causes of mortality were: predation (48%), storm damage (19%), unknown factors (19%) and human disturbance (14%).

Chick mortality — Of the 38/86 chicks that hatched in 1982, 12 (32%) died between hatching and fledging. Of those that died, nine (75%) disappeared and we believe they were eaten by predators. The other three (25%) were found dead from no apparent cause. In 1983 64/85 (75%) hatched. Twenty (31%) died between hatching and fledging. All of these disappeared and we believe most were eaten by predators.

Cause of mortality was difficult to determine in both years. Fourteen eggs were washed out of nests by storm generated waves, and seven eggs (two clutches) were stepped on by vacationers visiting Pine and 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*). Several potential mammalian predators, weasel, *Mustela* sp.; mink, *Mustela vison*; and river otter, *Lutra canadensis* were observed on Pine and Curry Island.

CONCLUSIONS

The Lake of the Woods, Minnesota, population may be the largest concentration of breeding Piping Plovers in the Upper Midwestern United States. This two season

study indicates that although the population is small (less than 50 breeding individuals) chick productivity is good (1.7 to 2.1 chicks/pair/year). Recent land acquisition efforts by the Minnesota Department of Natural Resources Nongame Wildlife Program and The Minnesota Chapter of the Nature Conservancy have secured the prime nest habitat (Pine and Curry Island and Morris Point) as a State Scientific and Natural Area. In addition to habitat preservation, current conservation strategies include population monitoring, a public information program (focused at local resorts), and construction of signs to prevent human trespass during the breeding season.

ACKNOWLEDGMENTS

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Finally, we especially want to thank Lee Pfannmuller for her advice, enthusiasm, and genuine commitment during all phases of this project.

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Immature Bald Eagle, March 16, 1984
Prairie Island, Goodhue County. Photo by Oscar Johnson

banded over 300 woodcock chicks in one year and has been working with the species for 30 years, have much more experience with woodcock than I do. I recently phoned Prawdzik; he said that he doubted that woodcock ever carry their chicks, beyond the occasional chick that gets entangled briefly in the belly feathers of a brooding female and moved a few inches or feet before dropping free. He also said that no woodcock biologist of his acquaintance had ever seen the behavior. Another woodcock chick bander, Robert Butsch of Ann Arbor, Michigan, agreed completely with Prawdzik. Butsch has been banding woodcock for 20 years.

Andy Ammann, dean of woodcock banders who use pointing dogs, author of a small book on the subject, and for 30 years the woodcock specialist in the Michigan DNR, tells me that he is convinced that American Woodcock do not transport their chicks in flight. Ammann points out that European observers are confident that the European Woodcock does carry its chicks in flight, and he's inclined to accept their word. Closely related species of birds are almost certain to differ in behavior in many ways. The lack of convincing evidence for carrying by American Woodcock does not mean that European Woodcock

are not carriers, but the burden of proof for that species still remains on the proponents of the carrying hypothesis. I remain skeptical.

The issue here is not the truthfulness of the observers, but the interpretation of what is believed to have been seen. The evidence convinces me that woodcock, or at least the American Woodcock, do not carry their chicks. Convincing evidence that they do transport chicks by carrying them would be recovery of a chick seen to be dropped by its mother in flight, or capture in some way or a good photograph of a female in flight with its chick.

The idea that woodcock carry their chicks in flight is embedded in the literature and in the minds of well-read birders. People tend to see what they expect to see. This problem of observer-expectancy bias was discussed by Balph and Balph (1983, *Auk* 100:755-757), who quote Foster et al. (1975, *Exceptional Children* 41:469-473) as follows: "I wouldn't have seen it if I hadn't believed it." Despite the lack of solid evidence, I expect casual woodcock observers will continue to report carrying behavior while experienced woodcock observers will continue to deny its existence. — *Bell Museum of Natural History, University of Minnesota, Minneapolis 55455.*

THE BIRDS OF PINE AND CURRY ISLAND, LAKE OF THE WOODS COUNTY, MINNESOTA

Terry P. Wiens

Introduction

While conducting a study of Piping Plovers during 1982 and 1983, I compiled a list of birds observed in the immediate area of Pine and Curry Island, Lake of the Woods County, Minnesota. Pine and Curry Island is a long, narrow, sandy island located near the southern edge of Lake of the Woods. Habitat includes open beach,

sparsely vegetated dunes, patches of mixed deciduous woods, and marsh. A number of factors make this site an excellent place to observe birds. The lake and its environs attract waterfowl and provide nesting sites for colonial waterbirds. A large variety of shorebirds use the extensive beaches of Pine and Curry Island to rest and feed during migration. Finally, migrating raptors

and passerines, following the lake edge to avoid crossing open water, often pass over the island.

Despite these features, few birders have visited Pine and Curry Island due to its remoteness. Swanson and Carlander (1940) were the first to publish a record of bird observations from Lake of the Woods. Since then, records have been scarce and usually based on a limited amount of time spent in the area (Hirsch 1982, Eckert 1983). This paper summarizes records of birds seen throughout the spring and summer of 1982 and 1983.

cated by the following symbols, based on the criteria of Green and Janssen (1975).

- A Abundant
- C Common
- U Uncommon
- R Rare
- Never observed in that season

Peak counts are included because they help determine when a species is most likely to be seen and how many individuals may be present. A * after the species name indicates that positive nesting evidence was found on Pine and Curry Island for at least one of the two years of observation.

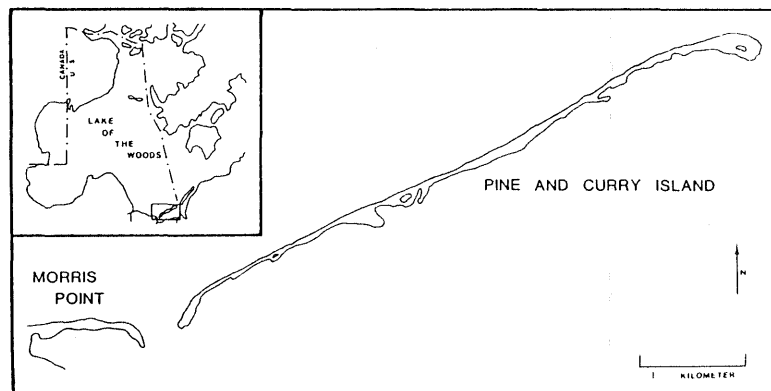


Figure 1. Map of the study area in Lake of the Woods County, Minnesota

Methods

This checklist includes all birds seen on or from Pine and Curry Island, and also a small portion of Morris Point (Fig. 1). Additional observations were made from a boat up to 100 m offshore. Observations were made daily (weather permitting) from 1 May to 31 July 1982, and 17 April to 31 July 1983.

In the following list, the abundance of each species is indicated by seasonal status and peak count. The observation period is divided into two seasons, spring (17 April to 19 June) and summer (20 June to 31 July). It should be noted that some species (e.g. waterfowl) may have been most abundant before 17 April, and that some birds seen in July were early fall migrants. Abundance of birds for each season is indi-

Results and Discussion

A total of 170 species was recorded during the two years of this survey. 119 were seen in both years. Waterfowl and raptors were most abundant in late April and early May, becoming scarce during the summer. The passerine peak for both years was in mid-May. The largest warbler counts were 11 species on 15 and 18 May of 1982, and 13 species on 21 May of 1983. Migrating shorebirds were most abundant in late May/early June and late July. The presence of many late spring migrants, early fall migrants, and birds of unknown destination made it possible to observe shorebirds at almost any time during the study. For example, Ruddy Turnstones and Black-bellied Plovers, presumably migrating northward, were seen as late as 25 and 30 June

NAME	SEASONAL STATUS		PEAK COUNT	
	SPR.	SUM.	COUNT	DATE
Common Loon	U	U	4	30 June
Pied-billed Grebe	R	R	2	23 April
Horned Grebe	C	—	40	24 April
Red-necked Grebe	C	—	15	4 May
Western Grebe	R	—	3	12 May
American White Pelican	A	A	75	30 April, 30 May
Double-crested Cormorant	A	A	150	29 April
American Bittern	U	U	2	27 July
Great Blue Heron	C	C	9	27 May
Tundra Swan	U	—	15	1 May
Snow Goose	U	—	75	6 May
Canada Goose	C	—	25	24 April
Wood Duck	R	—	2	12 May
Green-winged Teal	C	R	15	4 May
Mallard *	A	C	75	22 April
Northern Pintail	U	—	6	24,30 April
Blue-winged Teal	C	U	20	2 May
Northern Shoveler	R	—	1	27 April
American Wigeon *	C	C	20	24 April
Redhead	U	U	6	6 May
Ring-necked Duck	U	—	10	17 April
scaup spp.	A	R	2000	24 April
Greater Scaup	20 identified			
Lesser Scaup	300 identified			
Common Goldeneye	C	U	15	17 April
Bufflehead	C	—	15	12 May
Hooded Merganser	R	R	3	24 April
Common Merganser	C	U	50	22,24 April
Red-breasted Merganser	U	—	10	24 April
Turkey Vulture	U	—	6	1 May
Osprey	U	U	2	13 May, 28 July
Bald Eagle	U	U	4	24 April, 4 May
Northern Harrier	C	R	6	30 April
Sharp-shinned Hawk	U	—	3	25 April
Northern Goshawk	R	R	1	22 April, 2,4 May, 27 July
Broad-winged Hawk	R	—	1	3,4 May
Red-tailed Hawk	R	—	1	28 May
American Kestrel *	U	R	4	15 May
Merlin	R	—	1	25 April, 7,14 May
Peregrine Falcon	R	—	1	27 April, 7,11,12,19 May
Sora	R	—	1	5,10,13 May
American Coot	R	—	1	21,24 April, 1,3,5,10 May
Sandhill Crane	U	R	2	23,24 April, 22 May
Black-bellied Plover	U	R	2	25 May, 7,12 June, 27 July
Lesser Golden-Plover	R	—	2	25 May
Snowy Plover	—	R	1	11-18 July
Semipalmated Plover	U	U	5	22,25 May
Piping Plover *	C	C	10-30	Various dates
Killdeer *	C	C	5-10	Various dates

American Avocet	R	—	1	22 May
yellowlegs spp.	C	C	50	14 July
Greater Yellowlegs	20 identified			
Lesser Yellowlegs	150 identified			
Solitary Sandpiper	—	R	1	31 July
Willet	R	—	1	14 May
Spotted Sandpiper *	C	C	5-20	Various dates
Whimbrel	R	—	1	11 June
Hudsonian Godwit	—	R	1	17 July
Marbled Godwit	R	U	4	10,11 July
Ruddy Turnstone	C	U	50	27 May
Red Knot	R	—	1	19,22,29 May, 7,9 June
Sanderling	C	C	25	9 June
Semipalmated Sandpiper	C	C	50	27 May
Least Sandpiper	C	C	15	11 July
White-rumped Sandpiper	U	R	10	28 May
Baird's Sandpiper	—	R	1	28 July
Pectoral Sandpiper	R	U	6	25 July
Dunlin	C	—	10	24 May
Stilt Sandpiper	—	U	2	20,28 July
Buff-breasted Sandpiper	—	R	6	31 July
dowitcher spp.	U	U	9	17 July
Common Snipe	U	R	6	20 April
Wilson's Phalarope	R	R	2	23,27 May
Franklin's Gull	C	A	5000	5,21 July
Bonaparte's Gull	C	C	40	13 May
Ring-billed Gull	A	A	200	12 May
Herring Gull	A	A	100	12 May
Caspian Tern	C	U	30	25 May
Common Tern *	A	A	200	Various dates
Forster's Tern	R	R	3	14 May
Black Tern	C	C	10	28 July
Mourning Dove	U	R	4	19 May
Great Horned Owl	U	U	1	Various dates
Northern Saw-whet Owl	R	—	1	27 April
Common Nighthawk	U	—	15	11 June
Whip-poor-will	R	—	1	3,9,10,20 May
Ruby-throated Hummingbird	U	—	4	17 May
Belted Kingfisher	U	R	1	Various dates
Red-headed Woodpecker	R	—	2	19 May
Yellow-bellied Sapsucker	R	—	3	26 April
Downy Woodpecker	R	R	1	3,12, May, 31 July
Hairy Woodpecker	R	—	1	4 May
Northern Flicker	C	R	30	1 May
Olive-sided Flycatcher	R	—	1	8 June
Eastern Wood-Pewee	R	R	1	2 June, 19,20,21 July
Least Flycatcher	U	U	3	22 May, 20 June
Eastern Phoebe	U	—	2	25 April
Eastern Kingbird *	C	C	9	16 May
Purple Martin *	C	C	20	Various dates
Tree Swallow	A	C	200	5 May
Northern Rough-winged Swallow	R	—	1	30 April, 15 May
Bank Swallow	R	—	1	31 May
Cliff Swallow	A	A	300	11 May

Barn Swallow	C	R	20	8 May
Blue Jay	U	—	2	13,19 May
American Crow *	C	C	20	17 April
Common Raven *	C	C	5	22 April
Red-breasted Nuthatch	R	—	1	4,15,19 May
White-breasted Nuthatch	R	—	1	21 May
Brown Creeper	C	—	15	26 April
House Wren	R	U	2	6,11 July
Golden-crowned Kinglet	C	—	15	26 April
Ruby-crowned Kinglet	A	—	100	4 May
Veery	U	R	1	Various dates
Gray-cheeked Thrush	R	—	1	12 May
Swainson's Thrush	U	—	2	21 May
Hermit Thrush	R	—	1	24,28 April, 4,14,15 May
American Robin	U	R	2	20,27 April, 6 May
Gray Catbird *	U	U	4	24,25 May
Brown Thrasher	R	R	1	Various dates
Water Pipit	R	—	2	25 May
Cedar Waxwing	U	R	8	1 June
European Starling *	C	C	5-15	Various dates
Warbling Vireo *	U	U	3	8 June
Red-eyed Vireo	R	R	1	Various dates
Tennessee Warbler	U	—	2	18,21,22 May
Orange-crowned Warbler	U	—	20	4 May
Nashville Warbler	U	—	9	12 May
Northern Parula	U	—	4	12 May
Yellow Warbler *	C	C	40	27 May
Chestnut-sided Warbler	R	—	1	17 May
Magnolia Warbler	U	—	3	18 May
Cape May Warbler	R	—	2	16 May
Yellow-rumped Warbler	A	—	500	10 May
Black-throated Green Warbler	R	—	1	18 May
Blackburnian Warbler	R	—	1	15,18 May
Pine Warbler	R	—	1	17 May
Palm Warbler	C	—	30	3 May
Bay-breasted Warbler	R	—	1	21 May
Blackpoll Warbler	U	—	6	21 May
Black-and-white Warbler	U	—	5	15 May
American Redstart	C	—	8	17,21 May
Ovenbird	R	—	1	12,13,16,20,21 May
Northern Waterthrush	R	—	1	12 May
Mourning Warbler	R	—	1	18 May
Common Yellowthroat	R	—	1	18,28 May, 6 June
Wilson's Warbler	R	—	1	15,17,18,22 May
Canada Warbler	R	—	1	21,27 May
Rose-breasted Grosbeak	R	—	1	16,18 May
American Tree Sparrow	U	—	5	28 April
Chipping Sparrow	C	—	30	18 May
Clay-colored Sparrow	R	—	2	18,19 May
Savannah Sparrow	R	—	1	22 May
Fox Sparrow	R	—	2	23 April
Song Sparrow *	C	C	5-25	Various dates
White-throated Sparrow	C	—	10	11,14 May
White-crowned Sparrow	U	—	2	19 May

Harris' Sparrow	R	—	2	19 May
Dark-eyed Junco	A	—	100	20 April
Lapland Longspur	R	—	1	24 May
Snow Bunting	C	—	30	17 April, 4 May
Red-winged Blackbird *	C	C	10-30	Various dates
Western Meadowlark	R	—	2	21 April
Yellow-headed Blackbird *	C	C	10-30	Various dates
Common Grackle *	A	A	75	4 May
Brown-headed Cowbird *	C	U	25	12 May
Northern Oriole *	C	U	8	27 May
Purple Finch	R	—	3	4 May
Pine Siskin	R	—	1	3 May
American Goldfinch	—	R	1	8,29 July
Evening Grosbeak	R	—	1	5,13 May, 5 June
House Sparrow	R	—	2	2 May



One of approximately 250 Common Terns breeding on Pine and Curry Island in 1982
Photo by Terry Wiens

respectively; Semipalmated Plovers were seen on 30 June and 1 July; yellowlegs spp. and Least Sandpipers, presumably southbound, were seen as early as 30 June and 4 July respectively.

Shorebirds were well represented in this survey. Of the 33 regular species in Minnesota, 28 were seen on Pine and Curry Island. In addition, one accidental species, a Snowy Plover, was present for a week during the summer of 1982 (Wiens 1982).

Sixty eight (40%) of the 170 species seen were waterbirds or shorebirds. A number of these nested in the Lake of the Woods area. For example, American White Pelicans, Double-crested Cormorants, Ring-billed Gulls, and Herring Gulls nested on exposed islands near the north end of the lake; Piping Plovers, Killdeer, Spotted Sandpipers, and Common Terns nested on Pine and Curry Island. The 5000 Franklin's Gulls seen at Pine and Curry Is-

land may have been associated with the very large breeding colony at Agassiz National Wildlife Refuge, located about 110 kilometers southwest of the island (Green 1983).

Pine and Curry Island is State owned and has been designated a Scientific and Natural Area. Portions of the island where Piping Plovers nest have been posted as Wildlife Sanctuaries and should not be disturbed during the breeding season. Access requires a boat, and the best way to observe most waterbirds is by boat. Many resorts in the area provide boat rental or launching facilities.

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Minnesota Bird Distribution (Part IV)

Robert B. Janssen

This is the last of the four part series on Minnesota Bird Distribution by county. Please refer to *The Loon* 55:129 for details on how the maps are compiled.

This series covers Blue-winged Warbler through House Sparrow on the Minnesota Check-list.

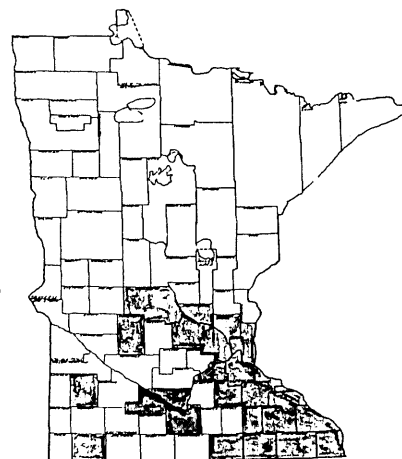
The following 30 species have been recorded in all 87 counties and are not mapped.

Tennessee Warbler
 Nashville Warbler
 Yellow Warbler
 Yellow-rumped Warbler
 American Redstart
 Common Yellowthroat
 Rose-breasted Grosbeak
 Indigo Bunting
 American Tree Sparrow
 Chipping Sparrow
 Vesper Sparrow
 Savannah Sparrow
 Fox Sparrow
 Song Sparrow
 Lincoln's Sparrow

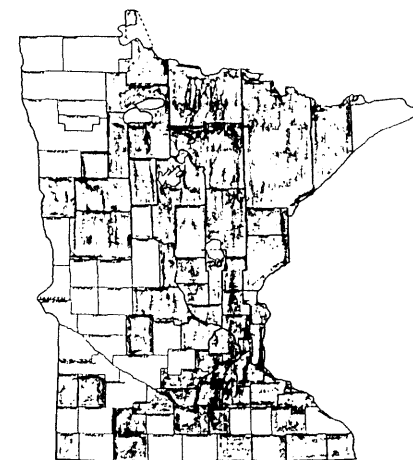
Swamp Sparrow
 White-throated Sparrow
 Dark-eyed Junco
 Bobolink
 Red-winged Blackbird
 Western Meadowlark
 Yellow-headed Blackbird
 Rusty Blackbird
 Brewer's Blackbird
 Common Grackle
 Brown-headed Cowbird
 Northern Oriole
 Pine Siskin
 American Goldfinch
 House Sparrow

The following 13 species have been recorded in all but one or two counties, as indicated, and are also not mapped.

Orange-crowned Warbler — Hubbard
 Magnolia Warbler — Chippewa
 Palm Warbler — Hubbard, Norman
 Black-and-white Warbler — Douglas
 Ovenbird — Traverse
 Northern Waterthrush — Nobles
 Wilson's Warbler — Roseau, Mahanomen
 White-crowned Sparrow — Watonwan
 Harris' Sparrow — Koochiching
 Lapland Longspur — Clearwater
 Snow Bunting — Mahanomen
 Purple Finch — Traverse
 Common Redpoll — Murray, Jackson



Blue-winged Warbler — 25



Golden-winged Warbler — 54

STATUS OF THE COMMON TERN
ON PINE AND CURRY ISLAND

Portions of the report entitled
"Status and Reproductive Success of
the Common Tern in Minnesota"

A Progress Report Submitted to:
Nongame Wildlife Program
Minnesota Department of Natural Resources
15 January 1985

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INTRODUCTION

The Common Tern (*Sterna hirundo*) breeds at four primary sites in Minnesota (Mille Lacs Lake, Leech Lake, Duluth Harbor, Lake of the Woods) (Cuthbert et al. 1984). Despite knowledge of the location of these colonies and growing regional and federal interest, recent accurate information on colony size and reproductive success is unavailable for the Minnesota population of Common Terns. Recognizing the need for these data, the Minnesota Nongame Wildlife Program contracted with F. Cuthbert to examine the status and reproductive success of this species. The objectives of the study were to: (1) determine the number of breeding pairs of terns at each colony site, (2) determine chick survival at each colony site, (3) identify colonies with low reproductive success, (4) identify actual or potential causes of egg, chick, or adult mortality, and (5) make recommendations on strategies to improve reproductive success at sites with low chick survival. This report summarizes the results of our study.

DESCRIPTION OF COLONY

Lake of the Woods is the site of a major colony (Pine and Curry Island); small numbers of terns (less than 10 pairs) have been reported at several other localities in Lake of the Woods. We focused our efforts at Pine and Curry Island. This island is owned by the State of Minnesota and the portion used by the terns is a Wildlife Sanctuary.

Pine and Curry Island: Most of the terns (98%) nested on the southwestern point of the island. Vegetation density in the colony site was highly variable. Although many gulls "loaf" on adjacent Morris Point, none nest nearby. The island is posted against human trespass and human disturbance is minimal.

RESULTS

A summary of the data regarding the reproductive success of the terns on Pine and Curry Island follows:

1. Number of breeding pairs on 22 June, 1984	139
2. Hatching rates and chick survival in 1984	
Number of eggs samples	66
Percent hatched	39
Number of chicks hatched	26
Percent fledged	15
3. Breeding success in 1984	
Percent Fledging success (Fledglings/Total eggs)	6
Reproductive success (Fledglings/Breeding pair)	.17
4. Fates of unhatched eggs and unfledged chicks in 1984	
A. <u>Unhatched eggs</u>	
Disappeared	88%
Broken	7
Deserted	0
Inviable	5
B. <u>Unfledged chicks</u>	
Disappeared	75%
Died	25

Factors Contributing to Reproductive Failure

Because of higher than normal water levels on Pine and Curry Island this year, many nests were washed out during storms. All of the nests in two of three enclosures were destroyed. The predominant cause of chick death appeared to be from Red Fox (Vulpes vulpes) predation. Few chicks survived past 5 days of age and fox tracks were discovered during each visit after hatching was in full progress.

Both these factors were unusual for Lake of the Woods this year and in past years success has appeared better. In 1982, Terry Wiens and Tom Martin counted 123 nests in the tern colony and approximately the same number of pairs nested in 1983. These numbers indicate that Lake of the Woods is a stable colony and that 1984 may have been a year of unusually low reproductive success for the terns.

Preliminary Management Recommendations

This study indicates that Minnesota Common Tern reproductive success in 1984 was below that required to maintain the population at its current size. Based on these results, we recommend that the MDNR monitor the major colonies for at least 2 additional breeding seasons to determine how much variability occurs in reproductive success between years and among colonies. This information is required before a long term management strategy can be proposed.

The following recommendations are short term measures that we recommend be pursued until reproductive success data are collected for additional seasons:

1. Visit major colonies during late incubation to census number of breeding pairs at each site. Recommended visitation dates are: Duluth (6/13-6/20), Mille Lacs

Lake (6/20-6/27), Leech Lake (6/12-6/19), and Lake of the Woods (6/18-6/25).

2. Make a second visit to the major colonies late in the season to estimate reproductive success. Recommended dates are: Duluth (7/15-7/31), Mille Lacs Lake (8/1-8/11), Leech Lake (7/17-8/11) and Lake of the Woods (7/21-7/27).
3. Check for evidence of fox on Pine and Curry Island (examine shoreline for tracks) and remove them as soon as their presence is detected.

LITERATURE CITED

- Cuthbert, F.J., J.E. McKearnan, and T.E. Davis. 1984. Status of common terns nesting at the Duluth Port Terminal 1982-1983. Loon 56:20-24.

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