

ST. LOUIS RIVER ESTUARY COLONIAL BIRD PROGRAM 1985

Prepared for: The State of Minnesota, Department of Natural Resources

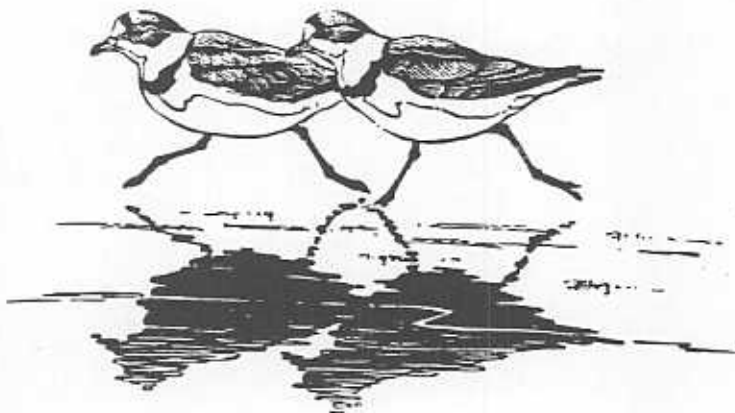


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BACKGROUND

During the past three years, the Minnesota Department of Natural Resources (MDNR) has been involved in the development and implementation of a Colonial Bird Management Program for the St. Louis River estuary. The purpose of the program is to provide adequate, protected nesting sites for two species - the Common Tern and the Piping Plover. This effort has been a cooperative one involving the Arrowhead Regional Development Commission (ARDC), the Wisconsin Department of Natural Resources (WDNR) and the MDNR. The past three years, ARDC, under contract with the MDNR, has been responsible for overseeing implementation of the program as well as making recommendations regarding future efforts.

Concern for the terns and plovers, and thus the impetus for the program, stems from their precarious statewide and/or nationwide status. The lack of suitable nesting sites in the St. Louis River estuary and the relatively poor nesting success these birds have experienced in the estuary during the past several years compound this concern. The tern has an official status of Special Concern in Minnesota and is considered a species of Special Emphasis in U.S. Fish and Wildlife Service Region 3 (Regional Resource Plan, USFWS, 1983). In addition, it is considered an Endangered species in the state of Wisconsin which shares the estuary with Minnesota. The Piping Plover has an official status as Endangered in both Minnesota and Wisconsin and is under consideration for Federal Threatened status. The Federal listing will most likely designate the plover as Endangered in the Great Lakes system and Threatened elsewhere in its range. Poor nesting success and the need for alternative nesting sites for these species have been documented in previous reports (Davis 1983 and 1984). The program's primary objective is to relocate the birds from their present unsuitable nesting area to sites which have been especially set aside and prepared for them.

The effort to provide nesting habitat for the terns and plovers has focused on three islands, Hearing, Interstate, and Barkers, which lie in the lower estuary and relatively close to the birds' present nesting area, the Port Terminal. Hearing Island is located in the Minnesota portion of the estuary and Barkers is in the Wisconsin portion. Interstate Island sits astride the state line and thus is shared by the two states. Although the program is one in which the management of all three islands has been coordinated between the two states, due to the location of the islands, Minnesota has assumed management responsibility for Hearing Island, Wisconsin for Barkers Island, and both states for Interstate Island.

All three islands are man-made and were created during the early 1900's as harbor sediments being dredged to create shipping channels were deposited in shallow near-shore waters. The resulting islands, offering broad sandy beach habitat, constituted ideal nesting sites for Piping Plovers and Common Terns. Both Hearing Island and Barkers Island have a known history as tern and plover nesting areas. It is not known whether the birds ever nested on Interstate Island, but it appears to have the same potential as Hearing and Barkers. Neither terns nor plovers have

nested on the islands in recent years because of encroaching vegetation including hardwood trees and shrubs. The habitat management program therefore has included the removal of vegetation from portions of the islands - thus recreating the habitat which proved attractive to the birds in earlier years. Eight acres on Barkers Island were cleared for this purpose in 1981 while approximately 13 acres were cleared on Hearding Island in 1983 and, in the fall of 1984, several acres were similarly cleared on Interstate Island.

In addition to creating nesting habitat for the target species, the management efforts have included attraction efforts in which terns have been actively encouraged to nest on the islands. The approach has been to place tern decoys on the islands and to play tapes of calling terns. This technique was used on Hearding Island and Barkers Island during the 1983 and 1984 nesting seasons. Observations made during those years indicate that the terns responded to the system and, in 1983, one pair actually attempted to nest on Hearding Island. No nesting attempts were observed in 1984.

This report summarizes work done as part of the St. Louis River Estuary Colonial Bird Management Program during 1985. Although it includes pertinent information regarding the Wisconsin portion of the estuary (e.g., Barkers Island), the emphasis is on those elements pertaining directly to the State of Minnesota. Two significant changes were incorporated this year. First, Interstate Island, having been cleared last fall, was included in the attraction/relocation program. Thus decoys and tapes were utilized on both Hearding and Interstate Islands during 1985. Second, terns and plovers were actively discouraged from using their primary nesting site - the Port Terminal. This element was added because adequate protected nesting space was now available on the islands and because the birds had experienced such poor fledging rates at the Port Terminal the past several years.

The Principal Investigator, although no longer associated with ARDC, was the project leader for that agency during the past three years. Thus the 1985 work program actually constitutes the continuance of this work for the investigator.

OBJECTIVES

This study is a continuation of a program which has been underway for the past three years. The specific objectives of this year's work were:

1. To coordinate program activities between the MDNR, WDNR, local government, Port Terminal staff, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and local interest groups and citizenry.
2. To assist the MDNR in implementing plans for Hearding and Interstate Island Wildlife Management Areas.
 - a. To provide recommendations to the MDNR regarding on-site vegetation management which may be necessary.

- b. To implement plans to attract breeding Common Terns and Piping Plovers to the islands.
 - c. To implement plans to discourage Ring-billed Gull use of the islands as nesting sites.
 - d. To advise the MDNR of any need for predator control on the islands (e.g., removal of owls) and to assist in any efforts to remove problem animals.
3. To implement plans to discourage Common Tern and Piping Plover use of traditional nesting sites that are highly disturbed or developed and where the birds' chances of future success are quite low (i.e., the Port Terminal and Erie Pier sites).
 4. To census the Common Tern, Piping Plover, and Ring-billed Gull nesting populations in the Minnesota portion of the St. Louis River estuary.
 5. To conduct a banding program in which all Piping Plover chicks and a large portion of Common Tern chicks produced in the estuary were to be marked so as to allow individuals to be identified by site and origin. This was to be done in cooperation with the WDNR and was intended to determine if any movement of terns between Duluth and Ashland, Wisconsin or plovers between Duluth and Lake of the Woods is occurring.
 6. To develop long-term management recommendations for the St. Louis River Estuary Colonial Bird Program.

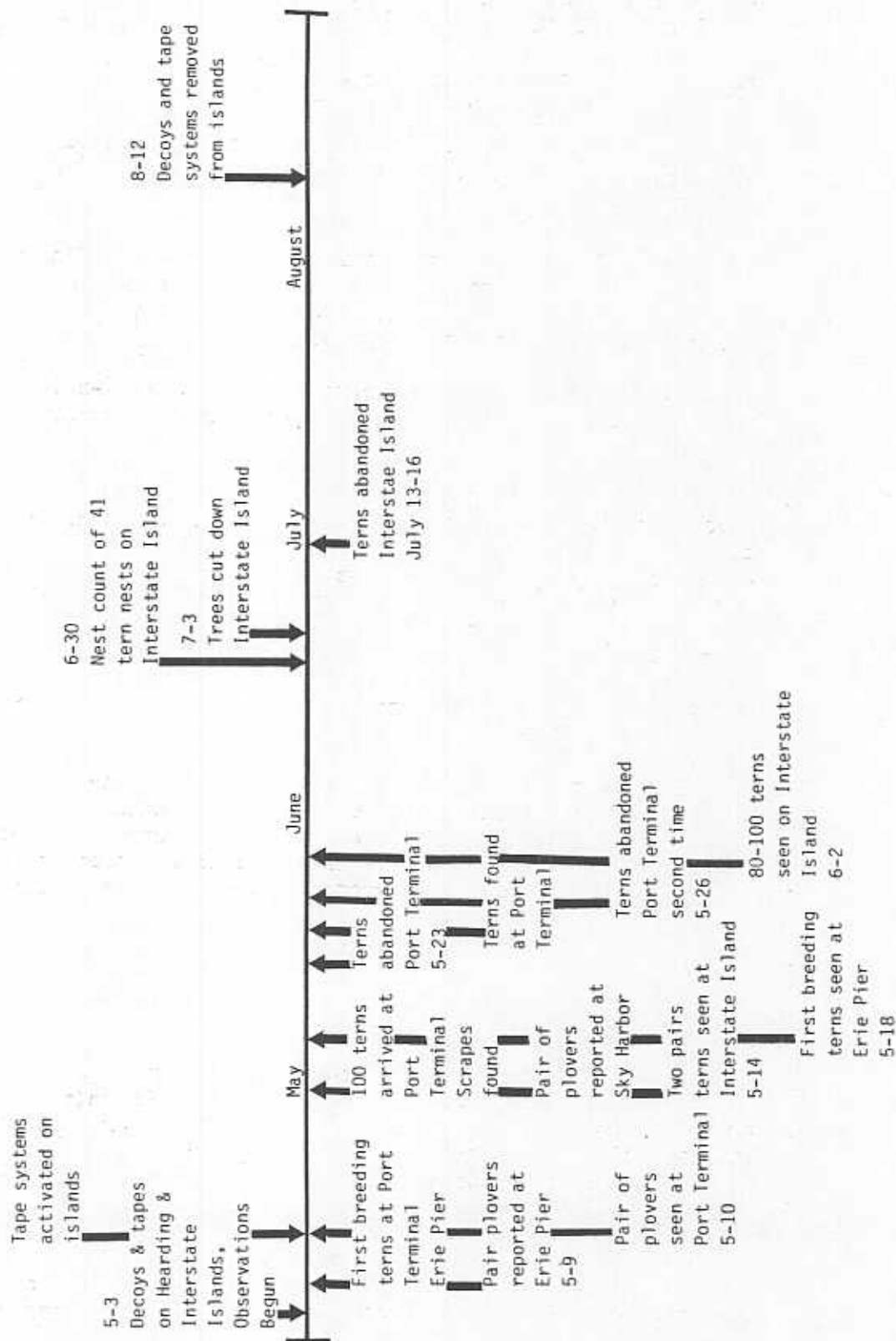
The initial work program included limited work with the Piping Plover population at Pine and Curry Island, Lake of the Woods. This was to include a census, banding of chicks, and an assessment of fledging success. These work elements were later eliminated from this project and were conducted by a second researcher under contract with the MDNR.

METHODS

Objective 2

Attraction Techniques: Decoys of Common Terns were used to attract terns and plovers to both Hearding and Interstate Islands. A total of 50 decoys in two groups of 25 each were placed on each island prior to the spring arrival of breeding terns and plovers (first week of May) (Table 1). The decoys were left in place the entire nesting season because terns eventually nested on both sites. In addition, portable tape playing systems which broadcast Common Tern calls during daylight hours were used on each island. These systems were operated from the time the decoys were placed on the islands until nesting had occurred. In order to keep the tape systems operating, the batteries which powered them were replaced

Table 1. Chronology of major events and tasks performed.



with freshly charged ones every two weeks. However, once nesting terns were present on the islands, this was discontinued to avoid disturbance to nesting birds. Thus once nesting occurred, the tape systems operated only until the batteries were depleted. For a detailed description of both the decoys and the tape system see Davis (1983, 1984).

Observations: Initially, tern and plover use of the islands was assessed via regular observations made from a boat. Each island was checked a minimum of three times a week during the early spring, but this was reduced to weekly visits once nesting was confirmed. At the peak of incubation, weekly on-land visits were added to the boat observations. These visits were used to determine the nesting populations present, to band chicks, and to make subjective observations regarding fledging success and general condition of the colonies. In the case of Interstate Island, actual on-land visits were reduced to once every two weeks later in the season after it was discovered that a Great Horned Owl was causing major disturbance to the nesting terns. Boat observation continued however. Observations continued until no actively incubated nests were present on the islands (late July).

Ring-billed Gull Discouragement: Ring-billed Gull use of the management areas was monitored in conjunction with observations of tern and plover use. Since no gull nesting occurred on the islands, no discouragement was necessary.

Predator Control: Evidence of predators was watched for during all of the above observations. A Great Horned Owl was found to be using Interstate Island and most of the remaining trees on the island were removed in early July to discourage this use. Although removal of the trees appeared to eliminate day use of the island by the owl, some predation did occur at night. These actions and results are discussed in detail under the discussion for Interstate Island (p. 8).

Objective 3 - Tern and Plover Discouragement

Terns and plovers were discouraged from nesting at the Port Terminal and the Erie Pier primarily through extensive presence of the investigator on these sites during the arrival and courtship stages. Great Horned Owl decoys were also placed in areas where terns appeared to be interested in nesting.

The planned disturbances usually involved walking and/or driving into any areas the terns or plovers appeared to be settling in. These efforts continued until the birds moved. If the movement was to another location on-site, the actions were repeated at these locations. The disturbances were initially conducted from dawn to dusk, but the schedule was modified to mid-afternoon to dusk when it became apparent the birds were more "sensitive" during this time period. The planned disturbances were conducted 4-5 days per week until the birds nested elsewhere or were no longer using the sites.

Objective 4 - Censuses

All Common Tern, Piping Plover, and Ring-billed Gull nesting areas in the estuary were censused via total ground counts made during the peak of incubation for each species. In addition, Common Tern nests on Interstate Island were marked with numbered wooden sticks and bi-weekly nest counts made.

Objective 5 - Banding

Since no plover or tern chicks were known to survive, no banding was conducted.

RESULTS AND DISCUSSION

Discouragement Program

Ring-billed Gull

No discouragement of Ring-billed Gull nesting was required during the 1985 nesting season since no gulls attempted to nest on the island management areas. Gulls, as in prior years, did use the beaches of the islands as loafing sites and a few individuals were seen feeding on the islands. The numbers ranged from only a few birds to as many as 100.

Common Tern

Terns were successfully discouraged from nesting at both the Port Terminal and Erie Pier sites. Breeding birds were first seen at the Port Terminal on May 9 and discouragement activities began immediately. The first arrivals consisted of a group of about 16 birds. On May 14 a large group of about 100 additional breeding adults arrived. The aggregate group persisted in using the Port Terminal site as a stage for courtship activity until May 23 when all but a few abandoned the site due to the discouragement activities. It appeared that these birds gathered at the Erie Pier site. A group of 340 terns were seen at this site later in the day on May 23. Prior to that date only six breeding adults had been seen at this location. Where the additional 240 came from is unknown.

On May 24 the investigator harrassed terns at the Erie Pier from 9:00 a.m. until 5:30 p.m. when all terns left the site as a group. On May 25 it was found that a large number of these birds (approx. 80) apparently had returned to the Port Terminal site. These birds were actively discouraged from nesting at the latter site for two additional days after which all but six to eight birds abandoned the site. At this stage only two pairs of terns were known to be nesting at the Port Terminal and one at the Erie Pier site. On June 2 a group of approximately 80 terns was observed on Interstate Island. It was presumed that these were the birds which had

abandoned the Port Terminal site on May 26. These birds remained to nest on the island (see Breeding Populations).

The first breeding terns were seen at the Erie Pier site on May 18. This included only eight adults. Discouragement of these birds was begun immediately and continued until May 30 when all but one pair had abandoned the site.

Piping Plover

Discouragement of Piping Plover use of the Port Terminal and the Erie Pier proved more difficult than with the terns. Despite continued human presence at both sites, a pair of plovers attempted to nest at each. One pair eventually did nest at the Port Terminal. The pair observed at the Erie Pier eventually abandoned the site, not due to the planned disturbances conducted as part of this project, but due to extensive earth-moving activity and deposition of dredged material. The fate of the Port Terminal nest is not clear, although it was incubated for 27 days (see Breeding Populations).

Management Areas

Hearding Island

The attraction program, in conjunction with the above described discouragement efforts, proved successful in attracting breeding Common Terns to Harding Island. Two pairs nested on the island, although no eggs hatched. The nests were located one each in the two sets of decoys and each had three egg clutches. Both nests were incubated for nearly three weeks before the eggs disappeared. The fate of the eggs is unknown, but since no chicks were ever seen on the island, it is believed they were eaten by some type of predator. No eggshell fragments were found. Although no evidence of mammalian predators was observed, this possibility cannot be ruled out. The other most likely explanation is gull predation. As mentioned earlier, gulls were often seen on the island and the small nesting population and thus relatively low number of birds defending the site probably made the nests susceptible to gull predation. However, one would expect to have found eggshell fragments in this case.

In addition to the two nests with eggs, another nine scrapes were observed within the decoy groups on Harding Island. There were signs of fresh excavation of these scrapes through early August, but no eggs were ever observed. The birds apparently responsible for the scrapes were quite aggressive during July as they displayed typical nest defense behaviors (e.g., diving at intruders). By early August the defensive behavior was no longer seen.

Since the maximum number of birds seen defending the island at a given time was 16, it appears that somewhere on the order of eight breeding

pairs used the island. This correlates fairly well with the eleven nests and scrapes seen (terns often make more than one scrape).

Interstate Island

There was also great success in attracting terns to Interstate Island. During the arrival period 6 to 10 terns were regularly seen at the island. These birds were present on the island and displayed nesting behavior before the Port Terminal group had been displaced, indicating this small group had selected Interstate Island as a first choice for nesting. After the Port Terminal group had abandoned that site, another 70 to 90 birds began using the island. Thus a total of 80 to 100 birds eventually chose the island as their nesting site.

The maximum number of nests present at a given time was 41. An additional nine nests were located later in the season, but it is not clear how many of these represented additional breeding pairs and how many were renesting attempts. Nonetheless, it appears that approximately 50 breeding pairs nested on the island. It is believed that most of these birds were those initially attempting to nest at the Port Terminal. As on Hearding Island, the nests were located within and adjacent to the two decoy groups. None were found in other portions of the island despite the fact that these other areas were suitable nesting habitat.

Although the efforts to attract terns to Interstate Island were quite successful, the birds were not successful in fledging young. In fact, most eggs did not hatch; and the few chicks which hatched died or were preyed upon within the first few days. The apparent fate of the eggs and chicks varied. Perhaps most relevant to the nesting failure is the fact that a Great Horned Owl was known to be present on the island during late June and early July. This bird was responsible for several periods of major disturbance to the terns and apparently preyed upon some of the few chicks which hatched. The terns eventually abandoned the island sometime in the period between July 13 and July 16, and it is presumed the owl played a major role in this abandonment.

The owl was first observed on April 20. The response of the colony was typical in that the terns mobbed the owl until it moved away. The owl appeared to be using the trees in the buffer zone as a day roost. It was observed again on July 1 and at that time it became apparent the bird was presenting a major hazard to the tern colony and should be removed from the island. On July 3 most of the remaining trees on the island were cut down in hopes this would discourage the owl.

The cutting was done using two chain saws simultaneously and took about three hours to complete. July 3 was chosen since it was a warm, dry day thus minimizing the chance of detrimental effects to chicks and eggs while the adults were disturbed. A line of trees was left between the colony and the cutting area until all the trees to be cut were down. This appeared to minimize disturbance as the incubating adults settled on their nests after only 20-30 minutes of cutting. The distance between the cutting area and the colony was approximately 150 yards.

The cutting appeared to be effective as the bird was never seen again despite intense observation of the island (including two nights). However inspection of the island later in the summer indicated some chicks had been eaten by the owl (see below).

The fate of the eggs and the few chicks that hatched varied. Many eggs showed no signs of pipping, others had obviously been eaten by predators, and yet others showed signs of pipping but no emergence. Most of the dead chicks were found in their nests. Some had been preyed upon while others appeared undamaged. Those which showed obvious signs of predation had been decapitated as is typical of owl predation. The owl apparently continued to use the island occasionally during the night despite removal of the trees.

Although mammalian predation would seem the likely explanation for the egg losses observed, no evidence that mammals had been on the island was found. It is possible that the egg losses were due to gulls, especially since the terns were not as attentive to their nests as normal due to the presence of the owl. Observations of the colony when the owl was present indicated the terns were off their nests for extended periods of time (in one case as long as 40 minutes). Since Ring-billed Gulls were usually present on the island, it may be that they took eggs at this time. Gulls also may have preyed upon eggs after the colony abandoned.

The reason for the death of apparently undamaged chicks is not known nor is the reason that some chicks began pipping but died before emerging. The undamaged chicks may have suffered death from exposure due to inattentiveness of the adults, or some of them may have died at the time the colony was abandoned. It seems unlikely that pipped eggs died from exposure, and the presence of several eggs in this condition seems to point to other causative agents such as chemical contaminants. Unfortunately the eggs and chicks found this year were too badly decomposed for analyses.

Breeding Populations

The colonial birds under study nested at six different locations in the St. Louis River estuary during the 1985 breeding season (Map 1). These include the traditional nesting sites at Sky Harbor Airport, the Minnesota Power Hibbard Power Plant, and the Duluth Port Terminal as well as the more recently used sites at the Erie Pier and both Hearding and Interstate Island Wildlife Management Areas. Due to the discouragement program and other disturbance factors which will be discussed later, tern use of the sites changed as the season progressed.

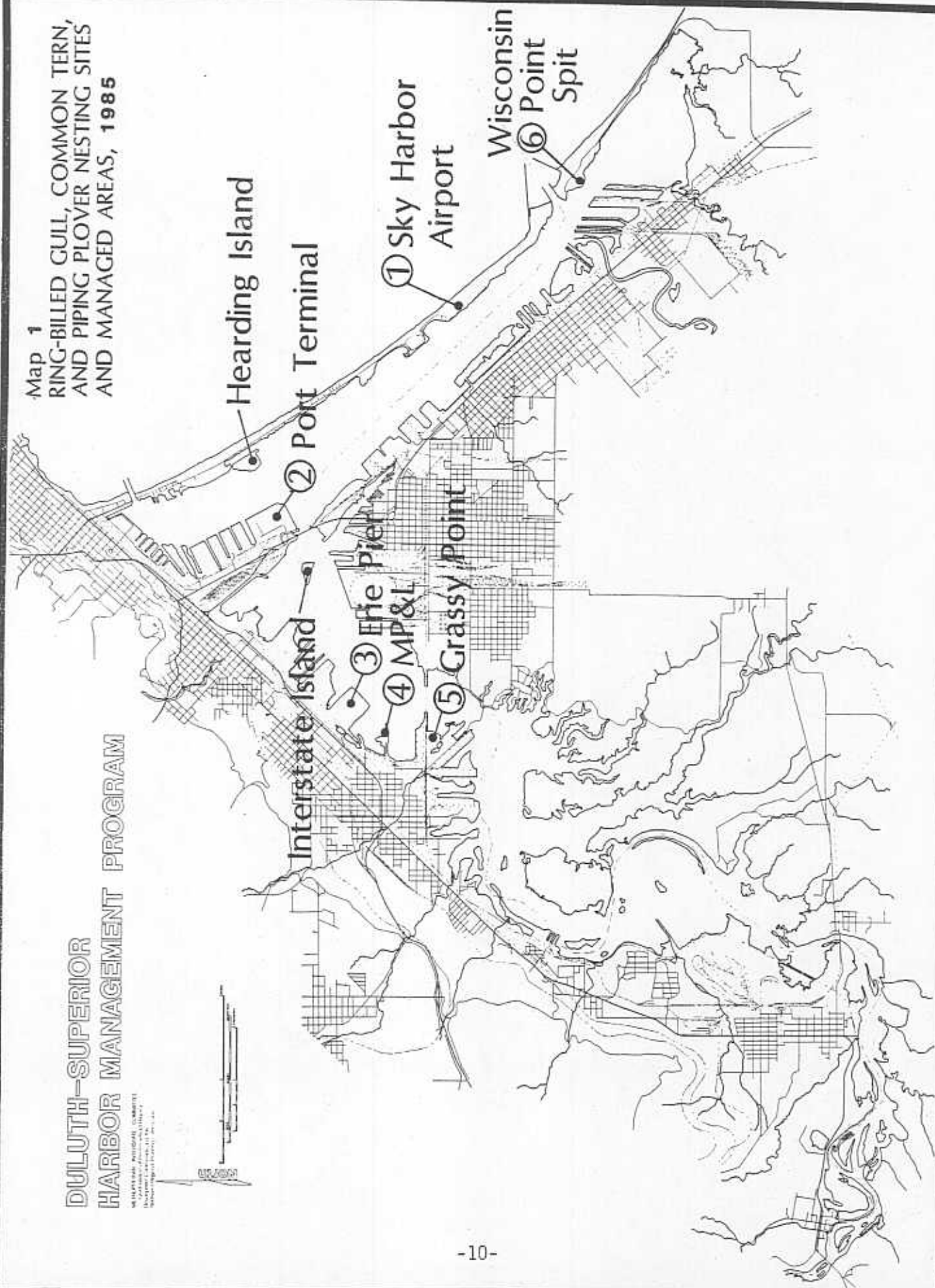
Notable due to their lack of use as nesting sites are the small islets at Grassy Point and the spit near the end of Wisconsin Point. The Grassy Point location is one which has been used with some regularity by terns since 1977. However, this marks the second consecutive year that no birds nested there, and it appears that use of this site may have

DULUTH-SUPERIOR HARBOR MANAGEMENT PROGRAM

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DULUTH-SUPERIOR, MINN.
1985

Map 1

RING-BILLED GULL, COMMON TERN,
AND PIPING PLOVER NESTING SITES
AND MANAGED AREAS, 1985



come to an end due to encroaching vegetation. The Wisconsin Point spit is another site which has been used intermittently by Common Terns in the last decade, including 1984.

The breeding populations at each site and the estuary totals for each species are given in Tables 2 and 3. Data from prior years are included for comparative purposes.

Ring-billed Gull

The Ring-billed Gulls nested at two locations in the estuary during 1985 - the Port Terminal property and the spit near the Minnesota Power Hibbard Power Plant. These sites have been used by this species for the last several years. No new nesting sites were noted. Although groups of gulls were often observed on the beaches and upland areas of both Interstate and Hearing Islands, no nesting attempts were recorded.

For the first time since 1981 it appears that the number of Ring-billed Gulls nesting in the estuary did not increase significantly over the previous year. The total number of breeding adults in the estuary during 1985 was near 16,000, similar to the 1984 total (Table 3). This "stability" applies on a site-specific basis also as the populations at both the Port Terminal and Minnesota Power sites were essentially unchanged from 1984 (Table 2). Thus the population may have stabilized after several years of rapid growth.

Censusing the Port Terminal population is becoming quite difficult due to the increasing use of dense willow areas for nesting and the large population. Thus the population data at this site is becoming less accurate than in the past. This year's data for this site is further complicated by the fact that a long spell of cold wet weather delayed the census. Thus some chicks had hatched and left their respective nests. This made it difficult to determine whether a given empty nest was an unused scrape or a nest in which the chicks were no longer present.

Common Tern

As in the case of the Ring-billed Gull, it appears that the Common Tern breeding population in the estuary during 1985 was unchanged from 1984 (Table 3). As noted during the past few years, estimating the number of breeding birds was complicated by asynchronous nesting and multiple re-nesting attempts. The observation of one group of 340 terns at the Erie Pier well after the migratory period indicates that at least that many resident birds were present in the estuary. This implies that a minimum of 64 non-breeding terns were present.

Although the overall tern population appeared unchanged from 1984, due to the discouragement and relocation efforts major changes did occur with respect to site utilization. The changes include:

Table 2. Breeding populations of Common Tern, Ring-billed Gull, and Piping Plover at five colony sites in the St. Louis River estuary, 1977-1985.

Site No. (See Map 1)	Location	Species	Breeding Adults									
			1977	1978	1979	1980	1981	1982	1983	1984	1985	
1	Sky Harbor Airport	Common Tern	16	14	18	26	20	34	58	58	158	
		Piping Plover	0	0	0	0	0	0	0	0	2 (?)	
2	Port Terminal	Common Tern	370	296	356	322	454	380	244	226	4	
		Ring-billed Gull	468	1,946	2,954	7,878	7,494	No Data	11,216	14,206	14,030	
		Piping Plover	12	12	10	6	8	4	6	4	2	
3	Erie Pier	Common Tern				No Data	No Data	No Data	48	8	2	
		Piping Plover				No Data	No Data	No Data	4	4	2	
4a	Minnesota Power Hibbard Plant	Common Tern	8	6	10	0	0	No Data	0	0	0	
		Ring-billed Gull	1,146	2,454	2,546	2,744	2,448	No Data	1,502	1,524	1,480	
4b	"Islands" near Hibbard Plant	Ring-billed Gull	360	722	354	306	No Data	No Data	No Data	No Data	No Data	
5	Grassy Point Islets	Common Tern	22	40	36	No Data	No Data	No Data	44	0	0	
		Ring-billed Gull	112	152	156	No Data	No Data	No Data	0	0	0	
6	Wisconsin Point	Common Tern	?		0	No Data	No Data	No Data	No Data	30	0	
	Interstate Island	Common Tern	0	0	0	0	0	0	0	0	100	
	Hearding Island	Common Tern	0	0	0	0	0	0	2	0	16	

Table 3. Total breeding populations of the Common Tern, Ring-billed Gull, and Piping Plover in the St. Louis River estuary, 1977-1985.¹

Species	Breeding Adults									
	1977	1978	1979	1980	1981	1982	1983	1984	1985	
Common Tern ²	416 (394)	356 (316)	420 (384)	348 (348)	474 (474)	414 (414)	394 (350)	322	280	
Ring-billed Gull ³	2,086	5,324	6,010	10,928	9,942	No Data	12,718	15,730	15,510	
Piping Plover	14	12	10	6	8	4	6-10 ⁴	8	6	

¹ Data for 1977-79 taken from Davis and Niemi (1980) and Niemi et al. (1979); data for 1981-82 unpublished data (Davis); data for 1983 from present study.

² Figures in parentheses exclude Grassy Point population.

³ Data for Ring-billed Gull populations include small islands near MP&L spit for 1977-79, but not for 1980-84.

⁴ Exact number of breeding Piping Plovers unknown since two nests may have been re-nesting attempts. These figures represent minimum and maximum.

- only two pairs nested at the Port Terminal site
- only one pair nested at the Erie Pier
- the population at the Sky Harbor increased to 79 pairs
- two pairs nested on Hearding Island
- approximately 50 pairs nested on Interstate Island

Terns therefore nested at five locations in the estuary. The major breeding populations were located at Sky Harbor Airport and Interstate Island. Small numbers nested at the other three locations which included Hearding Island, the Port Terminal, and Erie Pier. The details regarding the changes in site utilization are discussed in the previous sections of this report (see Discouragement Program and Attraction Program).

Overall Common Tern nesting success in 1985 was dismal once again as very few eggs hatched and no chicks were known to survive to fledging. The reasons for the lack of success on Interstate Island have already been discussed (see Management Areas). As has been observed during the past several years, nesting success at the Sky Harbor colony was nonexistent. The reasons for this have been postulated in earlier reports and they continue to be likely explanations (Davis 1983 and 1984).

This year several factors contributed to the nesting problems. First, a fox was observed in the area and the likely den site was found. This den was located within a quarter mile of the colony. In addition, the airport operators reported witnessing the fox killing an adult tern. This investigator found the carcass and it appeared to have been eaten by a mammalian predator. Since foxes are known to be a major problem in such colonies and colonies can be devastated by one such animal, it seems likely that this fox and/or family of foxes accounts for many of the egg and chick losses noted at this colony. However, this does not account for all of the losses since some unhatched eggs were uneaten.

The observations made at this site were similar to those made at Interstate Island. Many eggs were found which never hatched, some which pipped but did not emerge, and some chicks were found which died in the nest which showed no signs of having been preyed upon. Once again, the possibility of chemical contaminants must be considered.

Piping Plover

It appears that three pairs of Piping Plovers were present in the estuary this year. Of these, only the pair observed at the Port Terminal actually nested. Another pair of birds was observed in courtship at the Erie Pier site, but they deserted the site prior to egg laying. The third pair was observed at the Sky Harbor Airport, but they also disappeared prior to egg laying. No nests were found at these latter sites. The Port Terminal pair incubated a four-egg clutch for 27 days, but the fate of the eggs is unknown. The eggs were still being incubated at dusk on the 27th day, but the following morning no eggs were present in the nest. One was found a few feet from the nest and it apparently had been eaten as it was

broken and some egg yolk present. The other eggs were gone with no trace of egg shells present. The adults were present for about five minutes that morning, but neither they nor any chicks were ever seen on the site after that time. Although it is possible the other three eggs hatched and the chicks, being precocial moved off site, this seems unlikely. In past years, plover chicks have always been seen in the general area of the nest for several days following hatching. Thus it appears most likely that the eggs were preyed upon at the very end of incubation.

The two plovers seen at the Erie Pier both had leg bands. One had a standard Fish and Wildlife band on its right leg while the second had two bands, one standard and one colored, on its right leg. Although a positive determination of the color of this second band was not possible, it appeared to be orange or red. Since the only Piping Plovers which have been banded in Duluth were chicks which hatched in 1984, and, these birds were banded with yellow color bands, it appears that these two breeding adults came from some other location. The colors used at the Piping Plover colony in Lake of the Woods the past few years do indicate red and orange, and it is possible the one adult came from that colony. This may indicate that the Duluth population intermixes with the Lake of the Woods population. If true, this would be considered quite positive since the Duluth population is in such a precarious state. Any possible influx of birds into the Duluth area greatly increases the odds of perpetuating this population.

LONG-TERM MANAGEMENT RECOMMENDATIONS

The following recommendations include actions and/or management practices which are considered important to realization of the goals of the St. Louis River Estuary Colonial Bird Program. They are intended to convey both specific actions and an overall management approach regarding the next few years of the program.

Overall Program Direction

This year the program made some significant steps forward. Most importantly, it was shown that terns can be successfully discouraged from using the Port Terminal and that they will nest on the island management areas. Without this success, serious doubts about the validity of the program and in particular the relocation efforts would have to have been raised at this time. With this relative success, it appears the program merits several more years of effort. This is especially true since other workers attempting to relocate or reestablish colonial birds have found that it takes several years before success is achieved. The work of Kress with terns and puffins is particularly relevant in this regard. The St. Louis River Estuary program is actually ahead of schedule with respect to these similar programs.

The overall goal of the program should continue to be to establish protected tern and plover nesting colonies at a minimum of two sites and preferably three sites in the estuary. The emphasis should be on islands specifically set aside for this purpose. The need for three such sites stems from the desire to maintain satellite colonies and thus a built-in "stability" which would help ameliorate any major losses which may occur in a given colony (such as occurred on Interstate Island this year). In addition, the use of three sites allows for a rotating habitat management scheme in which each of the sites is at a slightly different stage in terms of encroaching vegetation, etc. This approach has been used in other areas of the country in managing dredged material islands for colonial birds and was earlier suggested regarding the Duluth Harbor (Davis 1982). This approach would be especially useful if deposition of dredged material on the islands is ever to be used as a habitat management tool (deposition could be rotated such that each island would receive freshly deposited material every three to four years, thus maintaining ideal nesting habitat).

Several actions must be taken in the next few years to bring the program to a successful stage, i.e., the point where only routine population monitoring will be necessary. These specific actions are discussed in detail below. It is impossible to anticipate or account for all contingencies that may develop in the next few years, but the following represent what is felt to be the most reasonable approach under present circumstances.

1. Censuses: The effort to census the breeding populations of the Ring-billed Gull, Common Tern, and Piping Plover should be continued on an annual basis. This should include documentation of traditional nesting sites as well as use of the island management areas. The census technique should continue to be absolute ground counts made during the peak of incubation for each species. Although the Ring-billed Gull population at the Port Terminal site is becoming quite difficult to census in this manner due to its large size and the use of dense willow brush for nesting, a total ground count still appears to be the best estimate available. Some consideration should be given to other accepted techniques (e.g., aerial or subplot sampling), but none of these appears to be feasible at this time. If an alternative technique is implemented in the future, ground counts and the alternative approach should be used concurrently for a few years in order to allow a comparison of the two to be made. This would allow at least gross comparisons between population figures obtained in the two different manners to be made.

Since population data are crucial to making management decisions regarding the species of concern, it is strongly recommended that the censuses be continued. If the populations appear to stabilize, it may be appropriate to census only every other year. However, due to the precarious status of the terns and plovers, this type of action should be given very careful consideration before implementation.

2. Attraction Program: The Attraction Program as implemented during 1985 should be continued. No changes in technique are recommended at this time.

The sites to be included in the Attraction Program should include the three island management areas - Hearing, Barkers and Interstate. Both Hearing and Interstate have shown great promise in the past few years, and they should be continued as part of the program for the next several years.

Interstate, especially if it is made more suitable as plover nesting habitat, should be involved in attraction efforts for up to five years unless a stable tern population establishes itself prior to that time. Hearing Island, although it has met with relative success, does have some inherent management problems - primarily the unavoidable presence of trees on the island and the proximity to Minnesota Point and therefore human activity. The trees are a problem with respect to owls. Owls are known to use the island on occasion and this situation should be monitored closely over the next couple of years. If owls present a problem to colonization of the island, a decision will have to be made as to whether this makes the island unsuitable for inclusion in the program. A decision as to whether or not to include the island in the program should be made within the next three years. If it is omitted, alternatives to it need to be considered such as creation of an additional island in the Interstate Island area. This option was previously raised in the Management Plan for Interstate Island (Davis 1982).

The Barkers Island situation is not as hopeful as either Hearing or Interstate. During the several years this island has been part of the program, no nesting attempts have been observed. While the reasons for this are unknown, it seems that efforts to attract birds to the island are not worth continuing unless some success is seen soon. If, as recommended in the recommendations regarding the Discouragement Program (see below), terns are not allowed to nest at Sky Harbor Airport, it appears worthwhile to include the island in the Attraction Program for at least another three years. Barkers Island lies immediately across the bay from the airport and it is possible that terns would relocate there when kept from nesting at the airport. Monitoring efforts should be increased also in order to fully understand what is happening at this site.

Should no nesting occur in the next three years, serious consideration should be given to construction of another island specifically set aside for colonial birds. As was indicated with respect to Hearing Island, this could be located in the Interstate Island area or in the vicinity of Barkers Island.

3. Discouragement Program: Active discouragement of tern and plover use of the Erie Pier and Port Terminal sites should be continued until it is apparent that the birds are well established on the islands or the

former sites have become unsuitable nesting habitat. Emphasis should be placed on planned human disturbances at these sites during the arrival and courtship stages. With respect to the terns, it is particularly important that they are harassed during the later hours of the day (approximately 6:00 p.m. to dusk). It is this time of day during site selection that they appear most "bothered".

Supplemental use of Great Horned Owl decoys is also recommended. At the Port Terminal it may prove useful to place decoys atop light poles in the area during the arrival period. These would probably have to be relocated periodically since the birds do habituate to them. The decoys should be placed on the site just after the arrival of breeding terns and plovers.

Active discouragement of tern nesting at the Sky Harbor Airport site should be started in 1986 and continued until the birds no longer show interest in this site. This colony has experienced poor nesting success for several years, and the prospects for the future are not good. The location of the colony immediately adjacent to the airstrip, the continued presence of a fox in the vicinity, and the potential for increased interaction between aircraft and terns as evidenced by the increase in the nesting population seen this year all indicate that it would be beneficial to relocate these birds. Since the three island sites are available and it is known that the birds will use Interstate and Hearding Islands, it appears that the time is right to discourage use of this site.

In addition to planned disturbances, long-term solutions should be implemented if possible. These should focus on elimination of potential tern and plover nesting habitat on the sites. This is especially important with respect to the Piping Plover since discouragement of plover use of the Port Terminal and Erie Pier via planned human disturbances has not proven successful in the past.

Elimination of nesting habitat may occur as a result of various developmental activities on the sites. Although no immediate plans for development at either site are known of at this time, both the Port Terminal and Erie Pier are industrial properties, and it can be assumed that at some time they will be fully developed and therefore unusable by the birds. While the timing of any developments is impossible to predict, it is known that the Erie Pier cannot be developed until its use as a dredged material disposal area is over. This is projected to occur in 1990.

Since the timing of any developments is unknown, and may not occur for several years if at all, an interim plan should be implemented. This most appropriately would consist of a program to establish persistent, dense vegetation in the remaining open areas on the sites. This approach was recommended for the Port Terminal when the relocation program was first proposed (ARDC 1977), and much of the area has become overgrown since that time. However, one large area remains open and indeed continues to be used by both terns and plovers. This is the area in which the City of Duluth places snow removed from city streets. The

resulting snow piles prevent establishment of vegetation and thus maintain an open area suitable as nesting habitat. It is recommended that the MDNR work with the city of Duluth and the MPCA in trying to locate a different snow disposal area. This action is necessary if terns and especially plovers are to be prevented from nesting on this site. If a new site is found, plant species which would result in dense persistent cover should be planted in the open area.

Although similar planting efforts would prove useful at the Erie Pier, this will not be possible until this site's use as a disposal area is over. When disposal operations are completed, it may be possible to work with the Corps of Engineers and the city of Duluth to accomplish this. The initiative would have to be taken by the MDNR.

As during earlier years, Ring-billed Gull use of the island management areas should be monitored and nesting discouraged if need be. The techniques recommended to discourage nesting remain as in the past (e.g., human presence, nest destruction, etc.).

4. Hearding Island: Some of the vegetation on the Harding Island Management Area should be removed before the 1986 nesting season. As was noted last year, the vegetation in the management area is approaching a density which may make it less appealing as nesting habitat for plovers and terns. Despite the relative success of this past year, it is still important that this vegetation be removed or at least thinned. This is especially important for potential plover use of the site. Of particular importance is removal of the vegetation directly adjoining the beach on the bay side.

5. Interstate Island: Several changes regarding the status of Interstate Island should be considered.

a. The brush piles which were formed during the initial clearing of the island should be burned and/or dispersed to the extent possible prior to the 1986 nesting season. Observations of Great Horned Owls on these piles indicates they are contributing to a potential hazard for nesting terns.

b. The trees located in the Minnesota portion of the "buffer zone" should be removed prior to the next nesting season. As in the case of the brush piles, these trees have served as a roosting site for owls.

c. The plans by Burlington Northern to raze the trestle abutting the island should be carefully monitored. Under no circumstances should demolition or associated activities which could cause undue disturbance during the nesting season be allowed. The necessary protection of this nesting site would probably best be addressed as part of the permit process required for demolition.

d. Since the trees in the Wisconsin portion of the "buffer zone" were not removed initially in response to concerns raised by Burlington Northern with respect to operation of its trestle, and, since the trestle has since been abandoned, the possibility of removing the trees and vegetation from this area should be explored. This portion of the island, were it cleared of vegetation, would provide excellent habitat for Piping Plovers (long sand point with beaches) as well as increase the available habitat for terns. Possible actions range from merely obtaining permission from BN to conduct the work to actual purchase of the property. These actions of course should be considered jointly by the WDNR and the Nature Conservancy.

6. Banding: A banding program similar to that proposed for 1985 should be implemented the next several years. The decision as to how intensive this program would be depends upon an assessment of the stability of the colonies and the amount of disturbance the birds are being subjected to. Certainly the banding efforts should be considered secondary to establishing successful colonies on the islands. If the island colonies become well established, banding of adult birds should be considered as well. For the next few years assessments of reproductive success should remain a subjective endeavor such as was used this year. More intense quantitative methods could be used once the colonies are well established.

7. Since there are some indications that at least some of the poor nesting success by terns may be due to chemical contaminants, a program to examine egg contaminants should be conducted the next year or two. This should be coordinated with the U.S. Fish and Wildlife Service which presently is conducting such work with Great Lakes tern populations. Prior to initiation of the program, data derived from tern eggs collected in Duluth during 1984 by the U.S. Fish and Wildlife Service should be examined.

8. Liaison: Liaison with local government and citizenry should be continued. It is especially important to keep the Park Point Community Club and the Sand Point Yacht Club informed regarding work on Hearing Island. This is best done by meeting with them just prior to the field season.

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