

**ALBERTA PIPING PLOVER PREDATOR
EXCLOSURE AND POPULATION
MONITORING PROGRAM**

2003 Field Season Report

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In cooperation with:



EXECUTIVE SUMMARY

Nest depredation has been identified as a significant limiting factor to the Great Plains piping plover population. Previous studies conducted in east-central Alberta have shown that the use of predator exclosures can significantly reduce piping plover nest depredation. As a result, predator exclosures are applied to as many nests as possible in Alberta with the goal of increasing nest success.

In addition to protecting nests, annual surveys are conducted on core breeding lakes in order to better gauge population numbers and movement. These surveys complement the International Census conducted every five years. They also give researchers an opportunity to re-sight piping plovers banded in Alberta in previous years, as well as those banded in other jurisdictions. The information collected from band recoveries assists wildlife managers in determining dispersal patterns as well as adult and juvenile survival.

Two types of predator exclosures were used during the 2003 field season. Both were very similar in design. The only difference in the two was that one design was prefabricated by a steel manufacturer and the second type was built in the field by researchers. Both exclosures were small, quick to apply and proved very effective in protecting piping plover nests from potential predators. Twenty four more nests were enclosed in 2003 than in 2002. Ninety three percent of the 71 enclosed nests hatched compared with only 43 percent of the seven unenclosed nests of known fate.

One hundred fifty two adult plovers were located on 23 lakes during surveys in Alberta in 2003. Over half of these birds were found on four lakes (Muriel, Dowling, Reflex and Chain #4). A total of 33 waterbodies were surveyed in Alberta. Brood surveys were conducted on 15 Alberta lakes and 83 young were counted. Additional effort was directed towards monitoring broods and ultimately at least 104 young were considered to have fledged. One hundred and one young were banded and 34 band re-sightings were recorded during the summer of 2003.

In addition to the field work associated with this project, field crews gave talks to a variety of groups including local school children, boy scouts and girls guides.

All activities carried out during the course of this project were done in support of the “*Alberta Piping Plover Recovery Plan 2002-2004*”. In particular, these activities were conducted to address Section 5.3 Productivity Enhancement, Section 5.4 Information and Education and Section 5.5 Research of the Recovery Plan. Results from this project will be presented at the next Alberta Piping Plover Recovery Team meeting to seek endorsement for the continuation of this project in 2004.

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Please note that the results and recommendations presented in this report do not necessarily represent official positions of our funding agencies.

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1.0 INTRODUCTION

The piping plover is designated as “Endangered” in Canada (COSEWIC 2003), “Threatened” in the United States (United States Fish and Wildlife Service 2003), “Vulnerable” by The World Conservation Union (IUCN 2002) and is listed as “Endangered” under Alberta’s *Wildlife Act* (Prescott 1997). Low productivity, in part resulting from nest depredation, has been identified as a significant limiting factor to piping plover populations in the Great Plains (Whyte 1985, Haig 1992, Heckbert 1994, Richardson 1999). Results from studies carried out in east-central Alberta from 1995 to 1997 showed that through the use of predator exclosures, piping plover nest depredation can be significantly reduced thus increasing productivity (Heckbert and Cantelon 1996, Richardson 1999). A four-year management project implementing the use of predator exclosures on a large-scale basis in Alberta was concluded in 2001. The positive results from this project led the Alberta Piping Plover Recovery Team to endorse the use of predator exclosures as a management technique in the “Alberta Piping Plover Recovery Plan 2002-2004” (Alberta Piping Plover Recovery Team 2002). In addition to exclosure application, this program has been expanded to include additional inventories on many lakes with the potential to support plover populations. These annual surveys will assist wildlife managers in determining the population trends and distribution of Alberta’s piping plovers. Field crews have also become increasingly involved with the information and education component of the Recovery Plan.

2.0 STUDY AREA AND METHODS

The majority of this program is carried out on waterbodies in east-central and southeastern Alberta. Extra emphasis was put on lakes further north this year than in years past to ensure adequate coverage given the substantial increase in plover numbers found on Muriel Lake in 2001 and 2002. All but two lakes where exclosures were applied were in Alberta, the exceptions being Reflex lake which straddles the Alberta/Saskatchewan border and Freshwater Lake, which is entirely in Saskatchewan. These lakes were included because of their proximity to many of the Alberta lakes included in the program.

Four researchers in two field crews carried out the majority of the work. One crew was stationed at Dillberry Lake Provincial Park along the Saskatchewan border just north of Provost, Alberta. The second crew was stationed at Whitney Lakes Provincial Park, east of St. Paul, Alberta. This crew also spent time monitoring lakes in the Hanna area, which were jointly monitored with ACA and Fish and Wildlife staff from Red Deer, Alberta. Fish and Wildlife staff also assisted in monitoring a number of lakes in the area surrounding Vermillion, Alberta.

Beginning on 12 May, potential breeding lakes were checked for returning piping plovers. Initial efforts focussed on seven lakes that historically have had relatively large piping plover populations. Once these were completed, efforts were made to conduct population inventories on other lakes that have had plovers on them in the past. Adult surveys were conducted on these lakes, as well as on the initial seven lakes. Adult surveys were conducted between 25 May and 7 June, during the peak of breeding activity, and following guidelines outlined by Goossen (1990). These surveys were conducted in order to record an annual population count for Alberta. Lakes were surveyed by walking approximately 60 to 70% of the way from the waters edge to the vegetation line and stopping periodically to scan for plovers. Location of adult plovers and breeding activity was recorded and mapped and all adults were checked closely for leg bands.

In addition to the adult surveys, brood surveys were conducted on the majority of the lakes that had breeding confirmed during the adult surveys. Brood surveys were carried out from 3 to 11 July. Lakes were surveyed by walking approximately 60 to 70% of the way from the waters edge to the vegetation line. Areas where nests had been recorded were checked thoroughly for young plovers. Location of adults and juveniles were recorded and mapped. Adults were again checked closely for bands. All data collected was loaded into a province wide wildlife database.

Field crews remained in the field until 30 July, two weeks longer than they have traditionally, before beginning data compilation of the summers work. This was done to ensure that a more accurate count of fledged young was recorded. Young were considered to have fledged if they were seen at 18+ days of age (Murphy et al 1999).

The locations of nests found during lake surveys were recorded in UTM NAD 83 by using a Garmin 12XL GPS unit. Those lakes with two or more nests were surveyed regularly in an attempt to locate additional nests. Once located, nests had predator exclosures applied to them within one day of discovery.

Two predator exclosure designs were used in the summer of 2003. The first design was identical to those used in 2002. These were circular in shape, made of a single length of stucco wire approximately 2 m long and 40 cm high. The two ends of the stucco wire were overlapped by three sections and attached using 10 cm nylon cable ties forming a circular exclosure 60 cm in diameter. In an effort to prevent predatory birds from perching on the exclosures, the horizontal wire along the top of the exclosure was removed in order to expose the vertical wires, creating 5 cm spikes around the top of the exclosure. Each exclosure was held in place by five 10 cm nails, bent at the top. The nails were evenly spaced and inserted through the bottom section of the exclosure in order to secure it to the substrate. To protect against aerial predators, the tops were covered with 2 cm x 2 cm plastic mesh, secured with 10 cm nylon cable ties. The second design was very similar to the first. However this design was prefabricated by a steel manufacturer. It had the same base diameter and height but was slightly tapered towards the top to facilitate stacking of the exclosures. It was also reinforced with two 3/16 gauge steel rings, one around the bottom and one just below the top 5 cms below the vertical spikes that were exposed. Finally, three 3/16 gauge steel rods were attached to the exclosure to reinforce it to protect against attempts by coyotes to prey upon the enclosed nests. All other aspects of the exclosure and application were the same as the first design.

Exclosure application and monitoring techniques followed the procedures outlined by Richardson (1997). One researcher carried the exclosure to the nest and secured it to the substrate. After application, each nest was monitored through a spotting scope from 70 to 100 m away until an adult resumed incubation. Enclosed nests were visited at least once a week throughout the incubation period. Changes in nest status were noted including exclosure damage, depredation of eggs, unexplained abandonments and hatching. No exclosures were applied to nests that could not be monitored regularly, or that were deemed to be too close to human activity. In these cases it was believed that the exclosure would draw unnecessary attention to the nest site. Nest success was calculated by dividing the number of successful nests (those hatching at least one egg) by the total number of nests at each lake.

In addition to the population inventories and enclosure application, opportunistic banding of young plovers was also carried out. Young were captured using hand nets and marked with a combination of one metal and two coloured plastic bands. Bands were applied in combinations that allow band re-sightings to be traced back to the lake and year that the bird was banded. Researchers also weighed those young for which an accurate age was known. In future years, this information will be used to assist with age determination of chicks for which hatching dates are not known.

3.0 RESULTS

3.1 Population Inventories

Population inventories were conducted on 33 waterbodies in Alberta (Figure 1). A total of 152 adults were located on 23 lakes during the course of these surveys (Table 1). An additional 19 adults were located in Saskatchewan, seven on Freshwater Lake and 12 on the Saskatchewan side of Reflex Lake. Three plovers were located on one lake that was never before surveyed (West Lake). No other new lakes with plovers were located in 2003. Fifty four percent of the plovers recorded were found on just four of the 23 lakes that had plovers.

Brood surveys were conducted on 16 lakes. These lakes were chosen based on the occurrence of relatively high historical population numbers or having at least two active nests in 2003. A total of 83 young were located in Alberta during the brood surveys, with an additional 13 counted in Saskatchewan, 11 on Freshwater Lake and two on the Saskatchewan side of Reflex Lake.

Table 1. Alberta piping plover population inventories for 2003.

| Lake | Adult Survey | Brood Survey | | Nests Found | | Lake | Adult Survey | Brood Survey | | Nests Found |
|--------------------------|--------------|--------------|-------|-------------|--|--------------|--------------|--------------|-----------|-------------|
| | | Adults | YOY | | | | | Adults | YOY | |
| Muriel | 30 | 30 | 25 | 15 | | Red Deer | 2 | NS | NS | 0 |
| Reflex-AB side (SK side) | 16 (12) | 14 (9) | 2 (2) | 11 (5) | | Gooseberry | 2* | NS | NS | 0 |
| Dowling | 24 | 12 | 11 | 14 | | Foster | 2* | NS | NS | 0 |
| Chain #4 | 12 | 12 | 7 | 3 | | Cipher | 1 | 4 | 3 | 1 |
| Handhills | 9 | 8 | 2 | 4 | | Beaverhill | 1 | NS | NS | 0 |
| Frog | 8 | 8 | 7 | 1 | | McLaren | 1 | NS | NS | 0 |
| Horseshoe | 8 | 13 | 3 | 3 | | Rider | 1 | NS | NS | 0 |
| Akasu | 7 | 5 | 2 | 2 | | Albert | 0 | NS | NS | 0 |
| Freshwater ¹ | 7 | 18 | 11 | 7 | | Chain #3a | 0 | NS | NS | 0 |
| Piper | 6 | 2 | 0 | 3 | | Chappice | 0 | NS | NS | 0 |
| Baxter | 5 | 8 | 7 | 4 | | Christopher | 0 | NS | NS | 0 |
| Chain #1 | 4 | 1 | 2 | 1 | | Laurier | 0 | NS | NS | 0 |
| Killarney | 4 | 10 | 4 | 2 | | Leanne | 0 | NS | NS | 0 |
| Hansman | 3 | NS | NS | 1 | | McGregor | 0 | NS | NS | 0 |
| Sunken | 3 | 2 | 5 | 1 | | Metiskow | 0 | NS | NS | 0 |
| West | 3 | NS | NS | 0 | | Plain | 0 | NS | NS | 0 |
| Birch | 2 | NS | NS | 1 | | Total | 171 | 163 | 96 | 81 |
| Little Fish | 2 | 7 | 3 | 2 | | | | | | |

¹ In Saskatchewan. NS = Not Surveyed * Two plovers were seen on 14 May on both lakes. Since this falls outside of the adults survey period, the birds were not included in the total of 171.

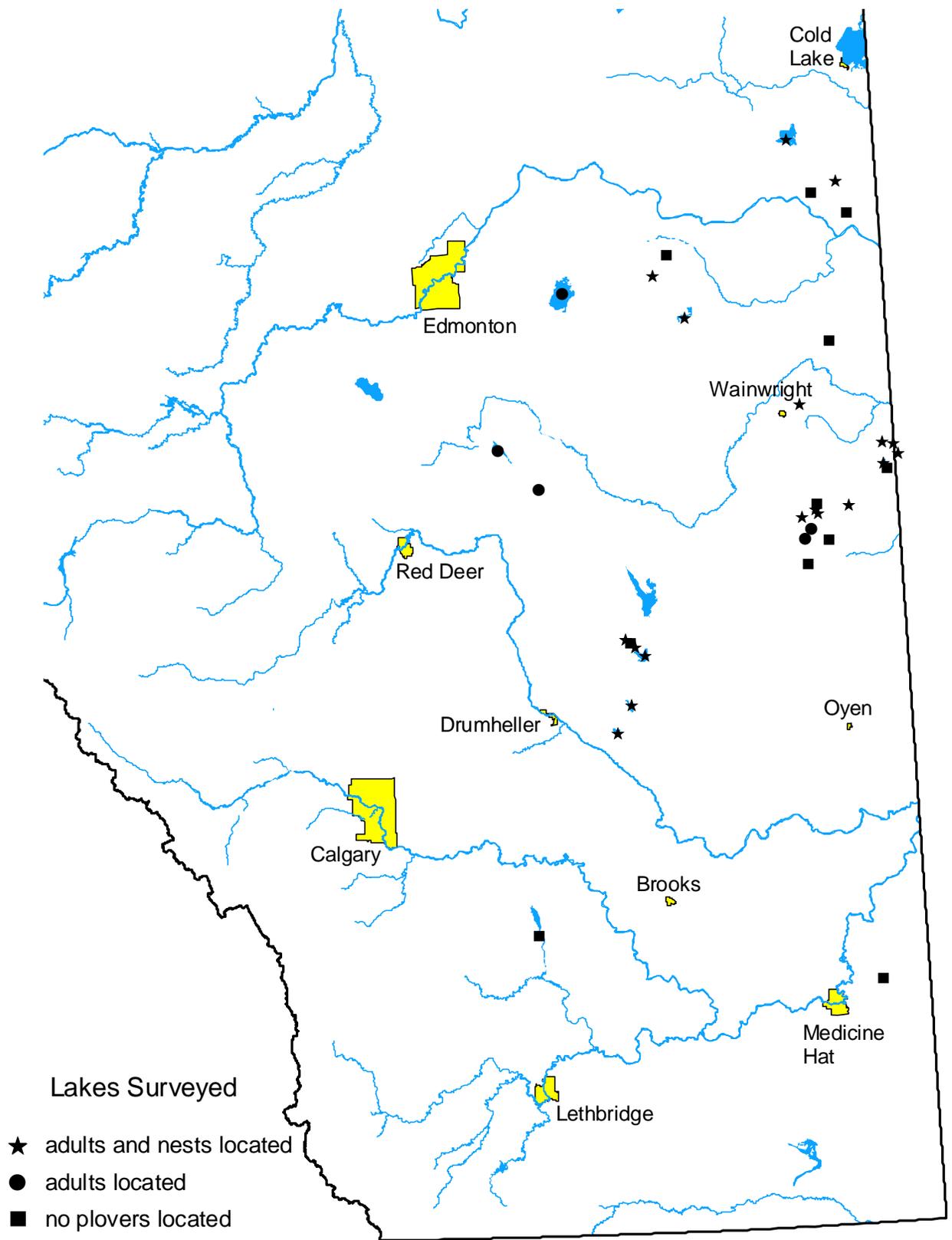


Figure 1. Location of lakes surveyed for piping plovers in 2003.

3.2 Nest Summaries

A total of 81 nests were found on 18 waterbodies (Figure 1, Table 2). Fifty nine percent of all nests located were found on four lakes (Reflex, Muriel, Dowling and Chain #4). Overall, apparent nest success was 88% for nests with known fate (69/78). For nests that were treated with exclosures, 93% were successful (66/71). For nests where exclosures were not applied, three out of seven with known fate hatched (43%). Three nests that were not enclosed had an unknown fate. From the 81 nests that were located, 104 young were seen at 18+ days old and were therefore considered to have fledged (Table 3). The following is a breakdown of the fates of the 81 nests found during the summer of 2003:

- 66 nests hatched with the exclosures applied
- 3 nests with exclosures applied were abandoned for unknown reasons
- 1 nest with exclosure applied was trampled by cattle
- 1 nest with exclosure applied was driven over by an ATV
- 3 nests hatched with no exclosures applied
- 4 nests were depredated with no exclosures applied
- 3 nests with no exclosure applied had an unknown fate

Table 2. Alberta piping plover nest summaries for 2003

| Lake | Exclosed nests | | | Unexclosed nests | | | Overall | | |
|--------------------------|----------------|------------------|--------------|------------------|------------------|---------------|--------------|------------------|---------------|
| | No. of Nests | Successful nests | Nest Success | No. of Nests | Successful nests | Nest Success | No. of Nests | Successful nests | Nest Success |
| Reflex-AB side (SK side) | 7 (5) | 6 (4) | 0.83 | 4 (0) | 1 (0) | 0.25 | 11 (5) | 7 (4) | 0.69 |
| Muriel | 14 | 14 | 1.00 | 1 | 0 | 0.00 | 15 | 14 | 0.93 |
| Dowling | 14 | 13 | 0.93 | 0 | 0 | | 14 | 13 | 0.93 |
| Freshwater* | 7 | 6 | 0.86 | 0 | 0 | | 7 | 6 | 0.86 |
| Baxter | 3 | 2 | 0.67 | 1 | 1 | 1.00 | 4 | 3 | 0.75 |
| Handhills | 3 | 3 | 1.00 | 1 | ? | ? | 4 | 3 | ? |
| Chain #4 | 3 | 3 | 1.00 | 0 | 0 | | 3 | 3 | 1.00 |
| Horseshoe | 3 | 3 | 1.00 | 0 | 0 | | 3 | 3 | 1.00 |
| Piper | 3 | 3 | 1.00 | 0 | 0 | | 3 | 3 | 1.00 |
| Akasu | 1 | 1 | 1.00 | 1 | 1 | 1.00 | 2 | 2 | 1.00 |
| Killarney | 2 | 2 | 1.00 | 0 | 0 | | 2 | 2 | 1.00 |
| Little Fish | 2 | 2 | 1.00 | 0 | 0 | | 2 | 2 | 1.00 |
| Birch | 1 | 1 | 1.00 | 0 | 0 | | 1 | 1 | 1.00 |
| Chain #1 | 1 | 1 | 1.00 | 0 | 0 | | 1 | 1 | 1.00 |
| Cipher | 1 | 1 | 1.00 | 0 | 0 | | 1 | 1 | 1.00 |
| Sunken | 1 | 1 | 1.00 | 0 | 0 | | 1 | 1 | 1.00 |
| Frog | 0 | 0 | 0 | 1 | ? | ? | 1 | ? | ? |
| Hansman | 0 | 0 | 0 | 1 | ? | ? | 1 | ? | ? |
| TOTALS | 71 | 66 | 0.93 | 10 | 3 | 0.43** | 81 | 69 | 0.88** |

* In Saskatchewan ** Counts from Handhills, Frog and Hansman are omitted from these calculations as their nest fates were unknown.

Table 3. Fledging success in 2003.

| Lake | No. of fledged ¹ young observed | No. of fledglings banded |
|---------------|--|--------------------------|
| Chain #4 | 6 | 6 |
| Dowling | 9 | 3 |
| Freshwater | 13 | 2 |
| Handhills | 8 | 5 |
| Muriel | 23 | 18 |
| Reflex | 20 | 11 |
| Handhills | 6 | 3 |
| Baxter | 3 | 0 |
| Sunken | 0 | 0 |
| Piper | 0 | 0 |
| Frog | 3 | 0 |
| Chain #1 | 0 | 0 |
| Cipher | 3 | 2 |
| Akasu | 1 | 1 |
| Horseshoe | 2 | 0 |
| Killarney | 4 | 0 |
| Frog | 3 | 0 |
| Total: | 104 | 51 |

¹ Birds were considered to have fledged if they were seen at a minimum of 18 days old.

3.3 Banding Summary

One hundred and one young plovers were banded in 2003 (Table 4). This brings the total number of young banded since 1996 to 516. In addition to observations of newly banded chicks and adults, 34 re-sightings of birds banded previously in Alberta, Saskatchewan or on the wintering grounds, were recorded (Table 5).

Table 4. Summary of young banded in 2003.

| Lake | Band Combination ¹ | No. of young banded |
|------------|--------------------------------|---------------------|
| Akasu | (O,m:--,B/W) and (O,m:--,Bl/R) | 3 and 4 |
| Baxter | (B/W,--:Y,m) | 4 |
| Chain #1 | (O,--:B/W,m) | 2 |
| Chain #4 | (Y,--:B/W,m) | 6 |
| Cipher | (B/W,--:O,m) | 2 |
| Dowling | (B/W,m:--,O) | 8 |
| Freshwater | (--,m:B/W,W) and (--,m:Bl/R,W) | 4 and 2 |
| Frog | (O,B/W:--,m) | 3 |
| Handhills | (B/W,m:Y,--) | 5 |
| Horseshoe | (Y,m:B/W,--) | 2 |
| Muriel | (--,G:B/W,m) and (B/W,m:--,G) | 32 and 1 |
| Piper | (--,B/W:G,m) | 3 |
| Reflex | (B/W,m:--,Y) and (Bl/R,m:--,Y) | 12 and 5 |
| Sunken | (B/W,m:O,--) | 3 |
| | | Total: 101 |

¹ Band combinations read as follows: upper left, lower left: upper right, lower right. Dashes (-) mean no bands were located on that part of the leg. The lowercase letter 'm' refers to a metal band, uppercase letters refer to the colours of plastic bands, and letters separated by a slash (/) are striped bands. Consecutive letters mean bands were stacked, where the first letter refers to the colour of the band highest on the leg. B=Black, Bl=Blue, G=Green, R=Red, W=White, Y=Yellow

Table 5. Adult plover band recoveries in 2003.

| Lake | Band Combination | No. of birds seen with this combination | Original banding location |
|---------------|------------------|---|--|
| Muriel | (--,m:B/W,G) | 1 | Muriel Lake, AB 2002 |
| Muriel | (--,m:W/B,G) | 2 | Muriel Lake, AB 2002 |
| Muriel | (--,m:B/W,--) | 2 | ? |
| Muriel | (--,m:W/B,--) | 1 | ? |
| Muriel | (W/B,m:--,--) | 1 | ? |
| Muriel | (m,RG:W*,Y) | 1 | Lake Diefenbaker, SK 2002 |
| Muriel | (m,BIBl:W*,G) | 1 | Lake Diefenbaker, SK 2002 |
| Muriel | (W,--:R,m) | 1 | Lake Diefenbaker, SK 2001 |
| Muriel | (B/W,--:--,m) | 1 | ? |
| Reflex | (--,--:--,m) | 1 | ? |
| Reflex | (--,m:--,--) | 1 | ? |
| Reflex | (B/W,Y:m,--) | 3 | Reflex Lake, AB 2001 – Banded as an adult |
| Reflex | (m,OG:W*G) | 1 | Lake Diefenbaker, SK 2002 or; Dryboro Lake, SK 2002 |
| Reflex | (W,m:--,OO) | 1 | Manitou Lake, SK 1998 |
| Reflex | (m,--:G,--) | 1 | Freshwater 2001 – Banded as adult |
| Killarney | (B/W,Y:m,--) | 1 | Reflex 2001 – Banded as adult |
| Freshwater | (B/W,Y:--,m) | 1 | Baxter 1999 |
| Freshwater | (--,--:--,m) | 1 | ? |
| Horseshoe | (m,BIY:W*,Bl) | 1 | Quill Lake, SK 2002 |
| Chain #4 | (B/W,--:m,--) | 1 | Alberta 2001 |
| Chain #4 | (--,m:Bl/R,O) | 1 | Dowling 2002 |
| Chain #4 | (--,m:B/W,O) | 1 | Dowling 2002 |
| Chain #4 | (B/W,m:--,--) | 1 | Muriel 2001 or Freshwater 2002 |
| Chain #4 | (--,R:--,W) | 1 | Likely from Texas – 1997 or 1998 |
| Chain #4 | (O,m:W/B,--) | 1 | Chain #4 - 2002 |
| Handhills | (O,m:W/B,--) | 1 | Chain #4 - 2002 |
| Handhills | (--,m:--,--) | 1 | ? |
| Handhills | (--,m:B/W,O) | 1 | Dowling 2002 |
| Handhills | (G,--:m,--) | 1 | Sunken 2001 |
| Frog | (W,Ym:--,--) | 1 | Lake Diefenbaker, SK 2001 |
| Total: | | 34 | |

* this band was a flag

4.0 DISCUSSION

Activities for this project were undertaken in support of the “*Alberta Piping Plover Recovery Plan 2002-2004*”. Exclosure applications addressed section 5.3 Productivity Enhancement. Population inventories and banding of young addressed recovery actions under section 5.5 Research. Field staff also addressed some of the actions under section 5.4 Information and Education by giving presentations to local school groups as well as the local boy scouts and girl guides. Presentations on the program were also made at the Partners in Conservation conference and at the North American Waterfowl Management Plan Biodiversity Conference.

As in previous years, nests exclosed in 2003 had a much higher success rate than those nests that were not exclosed. Ninety three percent of exclosed nests hatched compared to only 43% of

unenclosed nests with known fate. The two types of enclosures used were very similar. A more rigid version was tried this year in an attempt to make the enclosures more able to withstand attempts by coyotes to prey upon enclosed nests. They were also prefabricated to reduce effort in assembling enclosures in the field and the slight tapering at the top allowed the enclosures to be stacked, allowing more fully assembled enclosures to be transported at the same time. Disadvantages to the second design were that they were heavier and were more noticeable on the nesting beaches. No apparent difference in nest success was found between the two enclosure types. Both small enclosure had a number of advantages over previous designs. (see Engley and Schmelzeisen 2002).

Cattle displaced two enclosures, one on Freshwater Lake and one on the Saskatchewan side of Reflex Lake. The nest on Freshwater was subsequently trampled and the nest on Reflex had hatched just prior to the enclosure being displaced. There was no evidence to suggest that the small enclosures were drawing cattle to them, as was the case with previous designs (Michaud and Prescott 1999, Engley and Michaud 2000). Cattle were responsible for trampling much of the habitat on Freshwater Lake and given the level of cattle activity, it is likely that this nest would have been destroyed whether it had been enclosed or not. The same can be said for the Saskatchewan side of Reflex Lake.

An ATV was also responsible for the destruction of an enclosed nest. This nest, on the Saskatchewan side of Reflex Lake, was enclosed and subsequently run over by an ATV. It is likely that the highly camouflaged nature of the enclosure design was the reason for this and not an intentional attempt to destroy the nest. Vehicle tracks were noted in the area before application of the enclosure.

In 2003, ten nests were found but not enclosed. These nests were not enclosed because they were deemed to be too close to human activity or because they could not be monitored regularly. In previous years, nests enclosed in high traffic areas have drawn the attention of people in the area. Curiosity resulted in people approaching the enclosure and disturbing the nesting birds. In at least one case this caused the abandonment of a nest (Prescott and Michaud 1999). Efforts in these areas focused on information and education in an attempt to increase awareness about activities that were incompatible with nesting piping plovers, such as motorized vehicles on nesting beaches.

A total of 152 adult plovers were recorded on 23 waterbodies in Alberta in 2003. This represented an increase of eight percent from numbers recorded in 2002 (Engley and Schmelzeisen 2002) and is the first recorded increase in population numbers since this study was initiated in 1998. This number is comparable to the 150 adults counted during the 2001 International Piping Plover Census (Prescott 2001), and for consistency with the methods used in the 2001 census, does not include the additional 19 adults counted in Saskatchewan. As with in other years, the majority of the plovers located were found on just a few lakes, Reflex, Muriel, Dowling and Chain #4. A wet spring in 2003 provided adequate water levels in several more lakes and resulted in the remainder of the plovers being more dispersed than in dryer years.

In 2002, there appeared to be a northerly shift in the plovers' range, possibly resulting from the dry conditions east and south central Alberta has experienced over the past several years. Additional surveys were conducted on northerly lakes in 2003 in an attempt to locate new plover

populations. However, no new plover populations were located. This may be a result of the wetter conditions in the south as population numbers were up considerably on a number of lakes that were dry in 2002. Six Lakes (Dowling, Chain #4, Chain #1, Handhills, Horseshoe and Piper) that were dry in 2002 accounted for an additional 30 adults and 13 nests in 2003.

In addition to the work involved with the population inventories, banding and exclosure application, field staff also documented limiting factors on a number of lakes. This information has been passed along to those responsible for the delivery of section 5.2 Habitat Protection and Management of the “*Alberta Piping Plover Recovery Plan 2002-2004*” (Alberta Piping Plover Recovery Team 2002).

A number of studies have been conducted to try to gauge fledging success of piping plovers and several different ages are used to consider a young plover fledged. Haig (1992) used 25 days, Larson et al (2002) used 16 days and Murphy et al (1999) recommended using 18-20 days. For the purposes of this study, any young seen that were 18 days or older were considered to have fledged. This continues to be labour intensive way of monitoring fledging success as repeated visits to broods must be made within a few days prior to age 18 and within a day or two after age 18. This is currently the best method we have for determining fledging success. However, it is difficult to get an accurate fledging count with this method, since a brood seen on day 17 and not on day 18 cannot be considered fledged, even though it is possible the young fledged and left the area. Given the difficulties with determining fledging success through observation, it is likely that the number of young that fledged is higher than the 104 birds that were seen at 18 days of age or older.

5.0 RECOMMENDATIONS

Exclosures continue to be very effective in increasing nest success for piping plovers. As a result, the application of predator exclosures should continue on as large a scale as funding will allow. A comprehensive report detailing the findings of the past ten years of piping plover research in Alberta is currently being written and will be submitted to a refereed journal in early 2004. However, nest depredation is not the only management issue that needs to be addressed with regards to piping plover recovery efforts. Other issues include:

- Limiting factors were identified on several lakes over the course of the 2003 field season. This information has been passed along to the chair of the Alberta Piping Plover Recovery Team. However, two of the key areas of concern are located in Saskatchewan, on Freshwater Lake and on the Saskatchewan side of Reflex Lake. As a result, attempts should be made to encourage groups in Saskatchewan to focus some resources to address concerns on these two lakes. The major concern on both lakes is unrestricted cattle access.
- Restricting cattle from nesting areas during the nesting period (May to July) would reduce degradation of soft nesting substrate by deep hoofprints as well as the possibility of nest destruction. However, cattle should not be excluded entirely from nesting beaches. Allowing cattle to graze on nesting beaches beginning in August would help control the continuing problem of vegetation encroaching on nesting habitat. Restricting cattle access would also increase the usefulness of the exclosures being erected, since cattle were responsible for displacing two exclosures in 2003.

- Some efficiencies were achieved in determining fledging success in 2003. However, additional work is still needed to determine a better way of gauging fledging success. Key biologists should be consulted in attempting to determine a statistical way of measuring fledging success. In addition, additional efficiencies in field methods should be explored.
- The discontinuation of the annual brood survey should be considered. This has been a part of the program since 1998, however the information gathered from this survey varies greatly from year to year. There seems to be little value in conducting a survey within a set time frame each year as the initiation of nests and re-nesting attempts can vary significantly, making comparison of results from past years ineffective. The brood survey often comes at the expense of other, seemingly higher priority activities. In particular, field crews could put more effort into determining fledging success.
- Banding of piping plover chicks should continue. Additionally, capturing adults that have been banded in previous years should be considered. Recovering the metal band numbers would provide more detailed information needed to evaluate the existing banding protocol. However, capturing banded adults is a time consuming exercise and should be considered secondary to the rest of the enclosure program. This should only be pursued if dedicated resources and manpower can be secured.
- Communication of the results from the program is essential. Annual presentations will be made to the Alberta Piping Plover Recovery Team and at appropriate conferences. A talk is currently being prepared for the Northern Great Plains Piping Plover Science Workshop in November 2003. The final report will be available to the public or any other organization on the ACA's web page. (www.ab-conservation.com)
- Continued input to this program from the Alberta Piping Plover Recovery Team is essential. This will be addressed through the Alberta Conservation Association's membership on the Recovery Team. With a comprehensive piping plover management strategy now in place, field staff involved in carrying out this program may be able to assist in other areas of the plan, as they did in identifying limiting factors in 2003 and with a variety of information and education initiatives. Other areas of assistance should continue to be explored.
- In dry years, additional survey effort should be focused in areas along the southern fringe of the boreal forest around Cold Lake and Lac La Biche. Lakes in the south tend to be completely absent of water in dry years, whereas water remains in northern lakes at a lower level, potentially exposing suitable habitat for plovers.

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APPENDIX 1. Original nest data from 2003 field season.

| Nest No. (1) | Exclosed Y/N | Eggs Laid | Eggs Hatched | Comments |
|--------------|--------------|-----------|--------------|------------------------------|
| AKLA-03-01 | N | 3 | 3 | successful |
| AKLA-03-02 | Y | 4 | 4 | successful |
| BALA-03-01 | Y | 3 | 3 | successful |
| BALA-03-02 | Y | 4 | 4 | successful |
| BALA-03-03 | Y | 4 | 0 | unexplained abandonment |
| BALA-03-04 | N | 4 | 4 | successful |
| BILA-03-01 | Y | 4 | 4 | successful |
| CHL1-03-01 | Y | 5 | 4 | successful |
| CHL4-03-01 | Y | 4 | 4 | successful |
| CHL4-03-02 | Y | 4 | 4 | successful |
| CHL4-03-03 | Y* | 3 | 3 | successful |
| CILA-03-01 | Y | 4 | 4 | successful |
| DOLA-03-01 | Y | 2 | 2 | successful |
| DOLA-03-02 | Y | 4 | 4 | successful |
| DOLA-03-03 | Y | 4 | 3 | successful |
| DOLA-03-04 | Y | 4 | 4 | successful |
| DOLA-03-05 | Y | 4 | 4 | successful |
| DOLA-03-06 | Y | 4 | 4 | successful |
| DOLA-03-07 | Y | 4 | 4 | successful |
| DOLA-03-08 | Y | 4 | 0 | unexplained abandonment |
| DOLA-03-09 | Y | 4 | 4 | successful |
| DOLA-03-10 | Y | 5 | 5 | successful |
| DOLA-03-11 | Y | 4 | 4 | successful |
| DOLA-03-12 | Y | 4 | 4 | successful |
| DOLA-03-13 | Y | 4 | 4 | successful |
| DOLA-03-14 | Y | 4 | 4 | successful |
| FRLA-03-01 | Y* | 4 | 3 | successful |
| FRLA-03-02 | Y* | 4 | 4 | successful |
| FRLA-03-03 | Y* | 4 | 4 | successful |
| FRLA-03-04 | Y | 4 | 0 | Nest destruction from cattle |
| FRLA-03-05 | Y | 4 | 4 | successful |
| FRLA-03-06 | Y | 4 | 4 | successful |
| FRLA-03-07 | Y | 4 | 4 | successful |
| FROG-03-01 | N | ? | ? | Unknown fate |
| HALA-03-01 | Y | 4 | 4 | successful |
| HALA-03-02 | Y | 4 | 4 | successful |
| HALA-03-03 | Y | 4 | 4 | successful |
| HALA-03-04 | N | 3 | ? | Unknown fate |
| HANS-03-01 | N | 4 | ? | Unknown fate |
| HOLA-03-01 | Y* | 4 | 4 | successful |
| HOLA-03-02 | Y* | 4 | 4 | successful |
| HOLA-03-03 | Y* | 3 | 3 | successful |
| KILA-03-01 | Y | 4 | 4 | successful |
| KILA-03-02 | Y | 4 | 4 | successful |
| LFLA-03-01 | Y | 4 | 4 | successful |
| LFLA-03-02 | Y | 4 | 4 | successful |

* these exclosures were prefabricated.

APPENDIX 2. (continued)

| Nest No. (1) | Exclosed Y/N | Eggs Laid | Eggs Hatched | Comments |
|---------------------|-------------------------|------------------|---------------------|----------------------------|
| MULA-03-01 | Y* | 4 | 4 | successful |
| MULA-03-02 | Y* | 4 | 4 | successful |
| MULA-03-03 | Y* | 4 | 4 | successful |
| MULA-03-04 | Y* | 4 | 3 | successful |
| MULA-03-05 | Y* | 4 | 4 | successful |
| MULA-03-06 | N | 1 | 0 | nest depredation |
| MULA-03-07 | Y* | 4 | 4 | successful |
| MULA-03-08 | Y | 4 | 4 | successful |
| MULA-03-09 | Y* | 4 | 3 | successful |
| MULA-03-10 | Y* | 3 | 3 | successful |
| MULA-03-11 | Y* | 4 | 4 | successful |
| MULA-03-12 | Y | 4 | 4 | successful |
| MULA-03-13 | Y | 4 | 4 | successful |
| MULA-03-14 | Y | 4 | 4 | successful |
| MULA-03-15 | Y* | 4 | 4 | successful |
| PILA-03-01 | Y* | 4 | 4 | successful |
| PILA-03-02 | Y* | 4 | 4 | successful |
| PILA-03-03 | Y | 4 | 4 | successful |
| RELA-03-01 | Y* | 4 | 4 | successful |
| RELA-03-02 | N | 2 | 0 | nest depredation |
| RELA-03-03 | N | 4 | 0 | nest depredation |
| RELA-03-04 | Y* | 4 | 0 | unexplained abandonment |
| RELA-03-05 | Y* | 4 | 4 | successful |
| RELA-03-06 | Y | 4 | 0 | Nest run over by a vehicle |
| RELA-03-07 | N | 4 | 0 | nest depredation |
| RELA-03-08 | Y | 4 | 4 | successful |
| RELA-03-09 | Y | 4 | 4 | successful |
| RELA-03-10 | Y | 4 | 4 | successful |
| RELA-03-11 | Y | 4 | 4 | successful |
| RELA-03-12 | Y* | 4 | 4 | successful |
| RELA-03-13 | Y* | 4 | 4 | successful |
| RELA-03-14 | N | 3 | 1 | successful |
| RELA-03-15 | Y | 3 | 3 | successful |
| RELA-03-16 | Y* | 4 | 3 | successful |
| SULA-03-01 | Y* | 5 | 5 | successful |

* these exclosures were prefabricated.