

Introduction

Piping plover monitoring at Cape Lookout National Seashore (CALO) began with a baseline study in 1989. The park is a significant nesting area with about 2/3 of the nesting pairs in the state of North Carolina. Monitoring focuses on factors limiting nesting success and methods that could be used to increase the productivity of the birds.

Methods

All known nesting habitat was closed to entry with signs and/or symbolic fence by April 1. Beginning in late April nesting areas were searched at least three times per week for territorial pairs and nests. The locations of nests were recorded and the nests were monitored until they hatched or were lost. The area between Old Drum Inlet and New Drum Inlet was not monitored regularly due to logistic difficulties. Old Drum Inlet reopened in September 1999, preventing vehicle access to this area.

Nests were protected with predator exclosures if the topography of the location was suitable. Exclosures were circular, 10 feet in diameter, made of four feet high 4"x 2" mesh wire fence anchored with steel rebar. Exclosures were topped with 3/4" mesh bird netting. Because of high rates of losses to raccoons, nest exclosures were sometimes constructed before the clutch was complete.

After a nest hatched, broods were monitored until chicks fledged or were lost. Any ocean beach foraging areas were closed to vehicle traffic while the chicks were present.

Counts of wintering and migrating piping plovers were made monthly beginning in February 2000. The counts were made near the fifteenth of each month in the non-nesting season.

Results

Nesting Pairs

A total of 16 pairs of piping plovers nested or held a territory at CALO in 2001, the same number as in 2000. 12 pairs nested on North Core Banks (NCB) and 4 pairs on South Core Banks (SCB). Birds held territories in 5 distinct nesting areas (Table 1). Portsmouth Flats contained the highest number of nesting pairs. The birds at CALO accounted for 3/4 of the nesting pairs in North Carolina in 2001.

Table 1. Number of Nesting Pairs by Nesting Areas

NESTING AREA	NUMBER OF PAIRS
Portsmouth Flats	9
Kathryn-Jane Flats	1
New Drum Inlet (NCB)	2
New Drum Inlet (SCB)	3
Plover Inlet (Mile 23.4)	1

Table 2. Piping Plover Breeding Pairs at Cape Lookout National Seashore 1989-2001

	1989	1992	1993	1994	1995	1997	1998	1999	2000	2001
Ocracoke Inlet	0	2	0	2	2	1	0	1	0	0
Portsmouth Flats	14	8	9	7	8	17	15	9	11	9
Kathryn-Jane Flats	7	11	9	12	11	10	8	2	1	1
Old Drum Inlet	3	2	1	1	2	1	1	0	0	0
New Drum Inlet (NCB)	4	5	9	10	6	3	2	3	1	2
New Drum Inlet (SCB)	3	3	4	5	4	2	3	3	2	3
Plover Inlet (Mile 23.6)	0	0	0	0	0	1	1	1	1	1
Cape Point	0	0	0	0	0	0	0	1	0	0
Power Squadron Spit	3	2	3	2	2	1	2	1	0	0
CALO Total	34	33	35	39	35	36	32	21	16	16

Nests

19 nests were found in 2001. 15 nests were on NCB and 4 on SCB. 8 of the nests hatched and five chicks were fledged from a total of three nests. The fate of the chick from one nest was unknown (that pair was not included in the productivity total). The average clutch size was 3.4 eggs. At least 24 of 64 eggs hatched. Productivity for CALO was 0.33 chicks fledged per nesting pair (Table 3). A total of only 11 chicks survived to fledge in North Carolina in 2001.

Table 3. Piping Plover Nesting Success at CALO 1989-2001

YEAR	NESTING PAIRS	NESTS	CHICKS FLEDGED	FLEDGE RATE
1989	34	56	25	0.74
1992	33	39 (NCB only)	7 (NCB only)	0.25
1993	35	56	26	0.74
1994	39	66	9	0.23
1995	35	43	15	0.43
1997	36	41	7	0.19
1998	32	39	11	0.34
1999	21	22	2	0.09
2000	16	18	8	0.50
2001	16	19	5	0.33

Predator Exclosures

Predator exclosures were used to protect 13 nests. 54% of the nests with exclosures hatched. Only one of six nests without exclosures hatched. Two nests had eggs disappear from inside exclosures. Since 1997, at least 12 nests protected by exclosures have lost eggs during incubation, presumably to ghost crabs.

Table 4. Likely Causes of Piping Plover Nest Losses in 2001.

NESTING AREA	# NESTS	# LOST	PREDATORS	STORMS	ABANDONED	UNKNOWN
Portsmouth Flats	11	8	2	1	1	4
Kathryn-Jane Flats	2	1	1	0	0	0
New Drum Inlet (NCB)	2	1	1	0	0	0
New Drum Inlet (SCB)	3	0	0	0	0	0
Plover Inlet (Mile 23.6)	1	1	0	0	1	0
Total	19	11	4 (36%)	1 (9%)	2 (18%)	4 (36%)

Brood Foraging

No broods foraged on the ocean beach in 2001. Chicks foraged on soundside beach and sandflats in areas closed to all entry.

Non-nesting Piping Plover Surveys

Surveys in 2001 did not include the area from south of Old Drum Inlet to the north side of New Drum Inlet. This 3-mile stretch of beach is currently not accessible by vehicle and difficult to reach by boat. In past years the north side of New Drum Inlet was an important migratory stop for piping plovers so our surveys are potentially undercounting the number of birds in the park.

Table 5. Non-Nesting Piping Plover Counts at Cape Lookout National Seashore, 2001.

	January	February	March	August	September	October	November
NCB	1	15	?	18	21	37	14
SCB	9	7	9	2	4	3	11
SHACK	19	24	25	4	6	22	14

17 observations of seven different banded birds were made in the park in 2001 (Table 6). Three of these birds were identified as members of the Great Lakes breeding population. Two of these birds were banded in northern Michigan (RXOO and LXRO) and one was banded in southern Michigan (OBYX). The bird RXOO wintered in the park in 2000.

Two Atlantic Canada birds were found in the park in October. A bird banded as a juvenile in Newfoundland was seen near Ocracoke Inlet on 16 October and again on Shackleford Banks, over 40 miles away, two days later. A bird banded on Prince Edward Island was also seen on Shackleford Banks.

Table 6. Band Combinations of piping plovers observed with bands at Cape Lookout National Seashore, 2001.

Date	Left leg	Right leg	Island	Comments
1/11/01	Red/metal	Orange/orange	SHACK	Great Lakes-RXOO
2/8/01	Orange/blue	Yellow/metal	SHACK	Great Lakes-OBYX
3/14/01	Orange/blue	Yellow/metal	SHACK	Great Lakes-OBYX
3/16/01	Red/metal	Orange/orange	SCB	Great Lakes-RXOO
3/16/01	Black/metal	Red/orange	SCB	Great Lakes-LXRO
4/6/01	Red/metal	Orange/orange	SHACK	Great Lakes-RXOO
4/6/01	Black/metal	Red/orange	SHACK	Great Lakes-LXRO
9/14/01	Red/metal	Orange/orange	SHACK	Great Lakes-RXOO
9/19/01	Red/metal	Orange/orange	SCB	Great Lakes-RXOO
10/16/01	Metal	Red/blue bicolor	NCB	Newfoundland
10/18/01	Metal	Red/blue bicolor	SHACK	Newfoundland
10/18/01	Red/green bicolor	Metal	SHACK	Prince Edward Island
10/18/01		Orange/metal	SHACK	
10/18/01	Red/metal	Orange/orange	SHACK	Great Lakes-RXOO
11/19/01	Metal	Red/blue bicolor	SHACK	Newfoundland
11/19/01	Metal	Light blue metal	SHACK	
11/19/01	Red/metal	Orange/orange	SHACK	Great Lakes-RXOO

Discussion

Nest Success

Only half the nests with predator exclosures hatched this season. Two of these nests were abandoned well into incubation. One adult with a broken right foot was seen after a nest on Portsmouth Flats was abandoned. A nest on SCB with well-developed eggs was abandoned a few days before hatch and it's likely that one of the adults was killed. Predator exclosures have generally been effective in increasing hatch success. From 1997-2000, 65% of the nests protected with exclosures hatched, compared with 18% of the nests left unprotected. Flooding and eggs lost to ghost crabs were the two main threats to hatch success for nests protected by exclosures.

Fledging Success

The fledging success for piping plovers at CALO continues to be well below the "Recovery Plan" goal of 1.5 fledged chicks per pair. It is also below the 1.2 chicks fledged per pair estimated to be required to maintain a stable population. Most of the chicks continue to be lost in the first week after the nest hatches. The cause of the high chick mortality continues to be unknown. It is likely that raccoons are taking some of the chicks but this has been impossible to document. Starvation due to poor foraging habitat is another possibility. The Portsmouth Flats with unpredictable water levels and lack of soundside beach access consistently has a lower chick survival rate than other areas in the park.

Non-nesting piping plovers

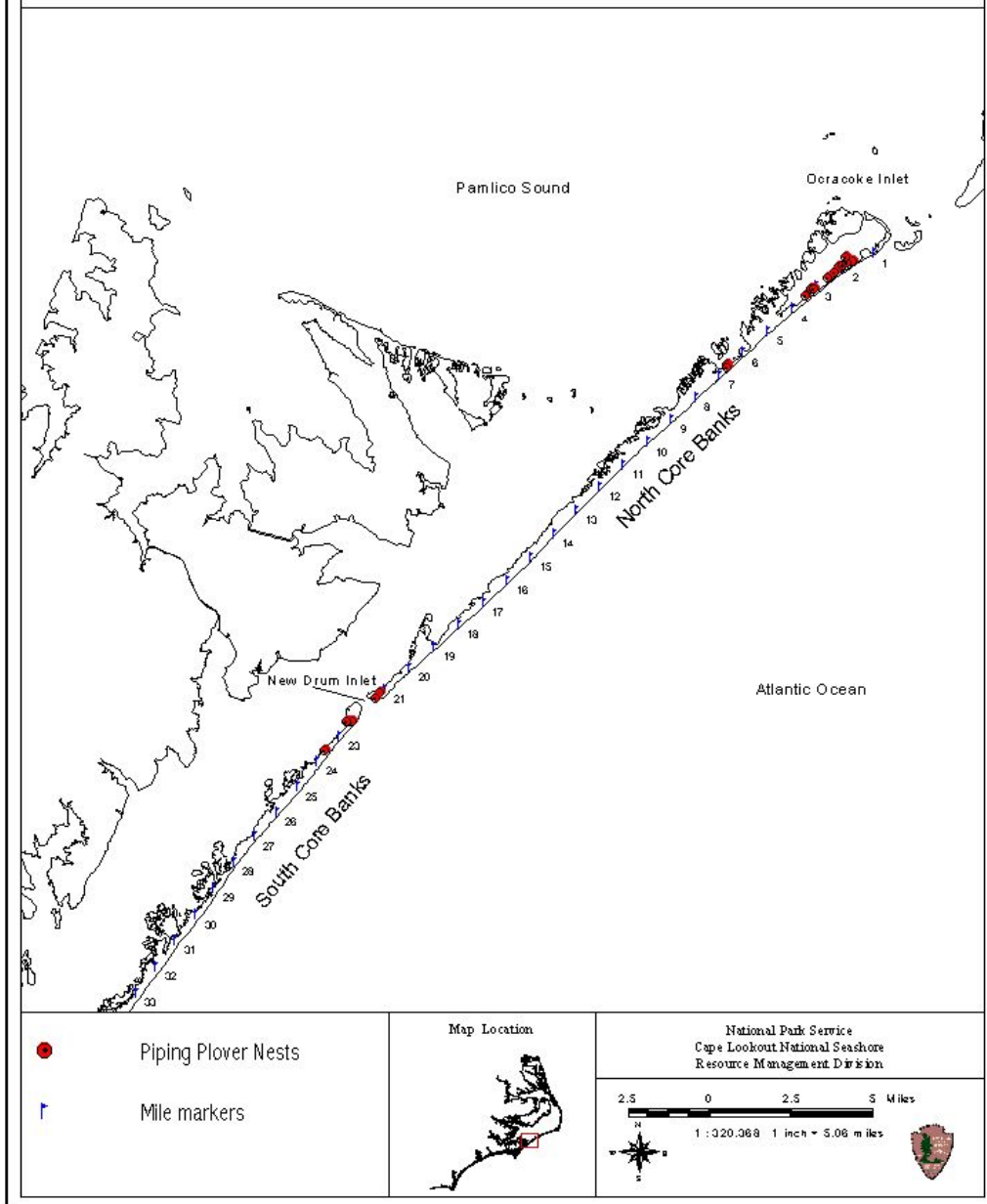
The park has now documented the presence of piping plovers on each island during every month of the year. Key foraging areas have been identified and monitoring will continue to document yearly variations. Information from banded birds has identified to park as a wintering site for the endangered Great Lakes population. CALO is also an important stopover location for many birds migrating along the Atlantic coast.

Conclusions

The management techniques that have been highly successful in the northern areas of the piping plover nesting range have failed to increase productivity at Cape Lookout. There are most likely some unknown environmental factors that limit reproductive success of the birds, despite apparently pristine and undisturbed nesting habitat.

Protection of non-nesting birds is a much easier management issue. Most foraging and resting areas used by non-nesting birds are locations seldom used by park visitors. Only one area of ocean beach habitat regularly used by wintering piping plovers is open to off-road vehicle traffic. For much of the winter, plovers are free of any significant human related disturbance. CALO may be far more important as a migratory stop over and wintering area than as a nesting area for piping plovers.

**Figure 1. Piping Plover Nests at Cape Lookout National Seashore
2001**



Plot date: October 25, 2001 c:\my documents\gis\piping plover\plover_01.apr

APPENDIX I. PIPING PLOVER NEST DATA

North Core Banks

Nest #	SITE	MILE	DATE FOUND	CLUTCH SIZE	EXCLOSURE	HATCH DATE	EGGS HATCHED	# FLEDGED
1	PF	2.0	2-May	4	2-May	24-May	4	0
2	PF	2.2	3-May	3	4-May	n/a	0	0
3	KJ	6.5	10-May	3	n/a	n/a	0	0
4	PF	2.5	14-May	1	n/a	n/a	0	0
5	PF	3.4	15-May	3	15-May	n/a	0	0
6	PF	1.6	15-May	4	15-May	11-Jun	3	0
7	PF	1.8	23-May	3	23-May	n/a	0	0
8	KJ	6.5	26-May	3	1-Jun	22-Jun	2	2
9	PF	2.0	27-May	4	1-Jun	n/a	0	0
10	PF	3.1	26-May	4	n/a	n/a	0	0
11	PF	3.0	5-Jun	1	n/a	n/a	0	0
12	PF	1.8	12-Jun	4	12-Jun	9-Jul	4	0
13	PF	1.7	26-Jun	4	26-Jun	n/a	0	0
14	ND	21.2	4-Jun	4	n/a	unknown	at least 1	unknown
15	ND	21.4	4-Jun	4	n/a	n/a	0	0

South Core Banks

Nest #	SITE	MILE	DATE FOUND	CLUTCH SIZE	EXCLOSURE	HATCH DATE	EGGS HATCHED	# FLEDGED
1	ND	22.5	30-Apr	3	1-May	19-May	3	1
2	ND	22.4	3-May	4	9-May	27-May	4	2
3	PI	23.6	14-May	4	14-May	n/a	0	0
4	ND	22.5	25-May	4	28-May	24-June ?	3	0

Appendix II- 2001 PIPING PLOVER WINDOW CENSUS

2001 Piping plover breeding census results: June 3-5

North Core Banks: 9 nesting pairs

Portsmouth Flats 8 Pairs

Kathryne Jane 1 Pair

Old Drum Inlet 0 Pair

Middle Core Banks: 2 nesting pairs

New Drum Inlet 2 Pairs

South Core Banks: 4 nesting pairs

New Drum Inlet 2 Pairs and 1 unpaired male

Mile 23.6 1 Pair

Spit 0 Pairs

Shackleford Banks: No birds present

Total for Cape Lookout National Seashore: 15 Nesting Pairs.