PERFORMANCE REPORT

STATE: New Jersey **PROJECT NUMBER:** E-1-26

PROJECT TYPE: Research and/or Management

PROJECT TITLE: Endangered and Threatened Wildlife Conservation

STUDY NUMBER AND TITLE: IV - Vertebrate Wildlife Conservation

JOB NUMBER AND TITLE: 2-B Piping Plover Population Survey

PERIOD COVERED: September 1, 2001 to August 31, 2002

JOB OBJECTIVE: To determine statewide and site specific piping plover populations, nesting success and productivity.

SUMMARY:

One hundred thirty-eight (138) nesting piping plover pairs were counted at 28 sites in New Jersey in 2002, representing a 13% increase in the number of nesting pairs compared with 2001 numbers. The number of active nesting sites increased by 3, including the addition of 5 new or repopulated sites and the loss of 2 sites that were no longer active this year. Seventeen (17) of the 28 active New Jersey nesting sites were monitored by the New Jersey Division of Fish and Wildlife (NJDFW) – Endangered and Nongame Species Program (ENSP). These sites accounted for 68 of the statewide number of nesting piping plovers pairs, an increase of 11 pairs (19%) compared with 2001. A date-restricted piping plover survey was conducted 1-9 June. The count of nesting pairs and total adults during this period was less than the final-season count (128 pairs, 267 adults vs. 138 pairs, 281 adults).

Productivity information is reported only for NJDFW-monitored sites. Productivity at those sites was 1.00 fledglings per nesting pair. This was notably less than productivity in 2001 (1.37 fledglings/pair) but somewhat above the average for the period 1987-2002 (0.95 fledglings/pair). For the first time since 1997, productivity dropped below the 1.24

level established by the U.S. Fish and Wildlife Service as the minimum level necessary for population stability (USFWS 1996).

Pair-nest success was 0.71, down from 0.77 in 2001 but still slightly higher than the average for the period 1987-2002 (0.70). The successful pair fledge rate was 1.42 fledglings per successful pair, down from 1.77 in 2001, but somewhat higher than the average for the period 1987-2002 (1.36).

Relatively high productivity from 1998-2001 has likely been responsible for the fact that New Jersey's piping plover population has increased steadily since 1998. Although this year's lower productivity level could slow or reverse future population growth in the state, the previous four years of higher productivity (all above the 1.24 level needed to sustain population levels) may be enough to hold off a population drop, as long as the moderate productivity experienced in 2002 is not followed by moderate or poor productivity in future years.

SIGNIFICANT DEVIATIONS: None

RECOMMENDATIONS: Continue intensive statewide monitoring of populations and breeding success based on nest site visits at least 3 times weekly.

COST: $6,666.50 ($6,000.00 federal share, $666.50 state share)

BACKGROUND:

The piping plover (*Charadrius melodus)* was listed as endangered by the New Jersey Department of Environmental Protection in 1979. In January 1986, the U.S. Fish and Wildlife Service included the piping plover on the Federal Endangered Species list and classified the Atlantic coast population as Threatened. ENSP has directed local and statewide assessment of population trends since 1976. Statewide surveys were conducted in 1980, and 1984 - 2002, with limited surveys in 1976 and 1983. The comprehensive surveys conducted since 1986 have included additional nesting habitat, confirmation of actual nest locations, and assessment of breeding success.

Since this Job (IV-A) began, statewide piping plover numbers in New Jersey have varied considerably. Starting with 97 pairs in 1987, the number rose to 134 pairs in 1992 and remained fairly stable until 1995. In 1996, a steep decline began that reached its lowest level at 93 pairs in 1998. Since that time the population has been steadily increasing to its present level of 138 pairs, the most recorded in New Jersey since intensive surveying began. This report presents statewide numbers of nesting piping plovers as well as nesting sites. The 2002 nesting success and productivity are included for only those sites monitored by NJDFW.

PROCEDURES:

Nesting activity was monitored at all identified nesting sites following nesting survey guidelines published in the Atlantic Coast Piping Plover Recovery Plan (USFWS 1996). NJDFW visited all recently active nesting areas at least 3 times weekly and typically more frequently, to search for active nests and pairs on territories. Once located, nests were checked 3 to 5 times a week to monitor breeding progress and outcome.

The staff of the U.S. Park Service, Gateway National Recreation Area, provided data for Sandy Hook. The staff of the U.S. Fish and Wildlife Service, Forsythe National Wildlife Refuge, provided data for Holgate and Little Beach. The staff of U.S. Fish and Wildlife Service, Cape May Wildlife Refuge, provided data for U.S. Coast Guard – EECEN. Staff of The Nature Conservancy's Delaware Bayshores Office provided data for Cape May Meadows. Each used methodology similar to those described above, except that Little Beach was visited less frequently due to inaccessibility, and Cape May Meadows received daily on-site monitoring.

Nesting success and productivity calculations were made only for nesting areas monitored by the NJDFW. Pair-nest success (the proportion of nesting pairs for which at least 1 nesting attempt produced at least 1 chick) was calculated by dividing the number of pairs with known successful nesting attempts by the number of nesting pairs known to be present at each nesting area. By calculating pair success as opposed to nest success, the

bias associated with the lower probability of locating nests that fail early in incubation (Mayfield 1961 and 1975) is reduced, although not eliminated. In addition, because nests with unknown outcome (i.e. nests that disappear within 1-2 days of expected hatching and nests that disappear for which we were unable to predict a hatch date) are counted as failed, this method may underestimate pair-nest success. This approach has been applied consistently since 1989, so comparisons among New Jersey sites and between years are probably valid. Caution should be used, however, in comparisons with other states or regions outside of New Jersey that may use different approaches to calculating nest success (or pair success).

Productivity (fledglings per nesting pair) was calculated for NJDFW-monitored sites by dividing the number of chicks at least 25 days old (or chicks able to fly greater than 10 meters) by the total number of nesting pairs present. As a measure of chick survival useful for comparisons among sites and years, fledging rates were reported for successful pairs (number of chicks fledged ÷ number of pairs that hatched any eggs).

Date-restricted survey. During the 2002 Piping Plover Census survey window (1-9 June), all sites where piping plovers have nested in the past 10 years (if suitable habitat still existed) were checked using methodology described by the USFWS (1996). Additional beach habitat that could potentially support nesting plovers was also checked. NJDFW adjusted the date-restricted counts to include pairs that were discovered after the survey window that, based on nesting phenology, were necessarily present during the survey period (e.g. a pair found with a complete clutch <4 days after end of survey or a pair found after the survey window with a nest hatching date <25 days after the survey window).

FINDINGS:

A total of 138 nesting pairs were counted at 28 sites statewide (Table 1, Figure 1). The number of nesting pairs in the state was up from 122 pairs (13%) in 2001 (Figure 2). Five (5) new (i.e. not active in 2001) nesting sites were utilized, including Sandy Hook – South

Gunnison, Brigantine Inlet (Cove) and Whale Beach, which had not been active since 1998, 1995 and 1998, respectively, and Sea Girt – NGTC and North Wildwood – Hereford Inlet, where nesting had not been recorded since statewide surveys began in 1987. Two sites, Sea Isle - South and Avalon – North, were deserted (i.e. active in 2001 but not active in 2002). The total number of adult piping plovers counted on all New Jersey beaches, including both nesting and non-nesting individuals, was 281 adults. The final-season total adult count exceeded the final-season nesting pair count by only 5 birds.

Of the 28 New Jersey nesting sites, 17 were monitored by NJDFW. Sixty-eight (68) nesting piping plover pairs were present at NJDFW-monitored sites, an increase of 11 pairs (13%) compared with 2001 (Jenkins et. al. 2001). This was above the average figure of 61 pairs for the period from 1987 – 2002 (Appendix A). The number of nesting pairs increased at 10 (59%) of the 17 active NJDFW-monitored sites (Table 2). Nesting pairs decreased at 3 sites (18%) and remained unchanged at 4 sites (23%). The largest increase in nesting pairs occurred at North Brigantine Natural Area, Avalon – Dunes and North Wildwood – Hereford Inlet, each of which experienced an increase of 3 pairs since 2001.

Increases in nesting pairs occurred in 5 of 6 management regions (Table 2). Regions 2 and 7 gained the most nesting pairs (6 and 4 pairs, respectively) when compared to 2001. Regions 3, 4 and 6 made smaller gains (1, 3 and 2 pairs, respectively). Region 5 remained unchanged.

Date-restricted survey. Statewide, 267 adult piping plovers, including 128 nesting pairs, were counted during the census window conducted 1-9 June (Table 3). These totals were less than the final-season count (281 total adults, including 138 nesting pairs), which is typical in New Jersey. The difference between the two counts is largely the result of birds that nest before or after the census window, which are not necessarily counted as pairs during the census but are counted in the final-season tally. The census window pair count represented 93% of the final-season pair count in 2002 (Table 3). The two counts were closer to one another than in most years, however, the difference between the two

counts in 2002 was similar to the differences reported for the entire U.S. Atlantic Coast population in recent years (USFWS 2002).

Reproductive success. Data relating to reproductive success was measured only for sites that were monitored by NJDFW. Fifty (50) of 102 nesting attempts (49%) at NJDFW-monitored sites were known to have successfully hatched at least 1 chick (Jenkins et al. 2002). The 102 nesting attempts resulted from 68 nesting pairs, yielding a pair-nest success of 0.71. This figure was down from 0.77 in 2001 but very close to the average of 0.70 for the period 1987-2002 (Table 4, Figure 3 and Appendix A).

Piping plover pairs nesting on NJDFW-monitored sites produced an average of 1.00 fledglings per nesting pair. Although productivity dropped sharply compared to the previous four years when productivity ranged from 1.34-1.46, it was above the 0.95 average for the period 1987-2002 (Table 4, Figure 3, Appendix A).

The fledging rate for pairs that hatched at least 1 chick (fledglings per successful pair), a function of chick survival, averaged 1.42. This figure was markedly lower than the previous four years when the successful pair fledge rate ranged from 1.71-2.11, but was higher than the 1.36 average for the period 1987-2002 (Table 4, Figure 3, Appendix A).

Chick mortality (brood reduction) contributed more to determining final productivity than did nest failure in 2002. Based on an average clutch of 3.8 eggs, the 1.00 chicks fledged per nesting pair equates to nesting plovers attaining 26.4% of their maximum reproductive potential. The loss of 73.6% of reproductive potential breaks down as follows[1]: failure of pairs to hatch any eggs (pair-nest failure) accounted for 29.5%; disappearance or non-viability of individual eggs from ultimately successful nests accounted for approximately 8.1%; the remaining 36.0% loss was due to brood reduction (Table 5). There was a greater difference between 2001 and 2002 with respect to nest failure (22.6% vs. 29.5% of loss, respectively) than with brood reduction (37.4% vs. 36.0%

[1] To assess the role of nest failure, clutch reduction and chick mortality in the loss of reproductive potential, we assumed that any nests with an unknown outcome hatched if we knew that it had survived at least 25 days. Otherwise, it was counted as a nest failure.

of loss, respectively). The increase in the role of nest failure in 2002 was largely attributed to an increase in nest loss due to flooding (Jenkins et. al. 2002).

Evaluating hatching success on a pair as opposed to a nest basis effectively eliminates consideration of renesting and consequently understates the quantity of nest failures. If chicks hatched from second (and subsequent) nesting attempts experience lower survival than chicks from earlier nests, this bias may, in turn, undervalue the contribution of nest failure to overall productivity.

There is some evidence that later nesting attempts (most of which are probably renests) on average fledge fewer young than do earlier (initial) nests (Strauss 1990, Jenkins 1989). On NJDFW-monitored sites in 2002, the overall fledge rate and especially the successful-pair fledge rate were higher for early nests (hatched or predicted to hatch on or before June 25th) than with later nests (hatched or were predicted to hatch after June 25th) (Table 6). On the other hand, nesting success (based on nesting attempts) and pair-nest success were slightly higher for later nests. Higher nest success among later nests may be, in part, a function of the fact that later nests are largely renests and by definition occur because a nest failed earlier in the season. In 2002, the lower nest success of early nests was also because flooding (the leading cause of nest failure for the season as a whole -- Jenkins et. al. 2002) was more prevalent in the early part of the season. The fact that later nests were more successful (in hatching) but produced markedly lower fledge rates, further reinforces the importance of early season nest success in overall reproductive success.

DISCUSSION AND CONCLUSIONS:

New Jersey's nesting piping plover population rose for the fourth consecutive year and is now at the highest level (138 pairs) since intensive surveying began in New Jersey in 1987. Furthermore, the population level has fully rebounded from the record low (93 pairs) recorded in 1998.

The census window survey conducted mid-season (1-9 June) indicates slightly less pairs (128) for 2002. However, due to the likelihood that some nesting pairs go undetected during the date-restricted survey, NJDFW believes the final-season count is a better representation of the statewide population. Other state coordinators concur with this conclusion in their states, although the U.S. Fish and Wildlife Service believes final-season counts may double-count some birds that renest, therefore, the actual nesting population probably lies between the census and final-season counts (USFWS 2002). Due to intensive monitoring at all sites (except Little Beach), NJDFW believes double-counting is minimal in New Jersey. Pairs that move within a specific site are likely counted as renests not as new or additional pair. Pairs that move between sites, however, may be counted twice.

All of the key measures of reproductive success, including pair-nest success, fledge rate and successful-pair fledge rate dropped compared to 2001. In addition, the fledge rate and successful-pair fledge rate, declined notably compared to the previous four years, when these rates were the highest we have recorded in New Jersey. Despite these decreases, all reproductive measures remained slightly above average for the period 1987-2002.

Weather related factors, especially flooding due to storms and wind-aided high tides; but probably also long spells of very hot weather, drought that may have reduced alternative feeding habitat at some locations, and severe localized thunderstorms; accounted for the much of the drop in reproductive success. Flooding played a key role in both decreased nest success and decreased chick survival. A more detailed examination of the factors affecting productivity and descriptions of management programs are provided in Job IV-C, Piping Plover Threat Assessment and Management (Jenkins et al. 2002).

For the first time since 1997, New Jersey's piping plover productivity rate dropped below the level believed to be necessary for population maintenance (1.24) and well below the rate believed to be necessary to effect significant population growth (1.50) as established by the U.S. Fish and Wildlife Service. This is significant since NJDFW

believes that recent population growth in the state is the result of relatively high productivity over the period from 1998-2001. This has enabled New Jersey to begin to contribute to regional and population-wide piping plover recovery goals (USFWS 2002).

Whether population growth will continue in New Jersey will depend, in part, on whether the level of productivity experienced in the best years can be sustained. These years of higher productivity are necessary to balance years of low or average productivity. By all reproductive measures, 2002 was merely an average year for New Jersey's piping plovers. Even so, NJDFW remains optimistic given that the drop in reproductive success was largely the result of weather related factors beyond the reach of our management actions and unlikely to occur every year. NJDFW believes recent improvements in productivity at least partially reflect the success of our overall management program (Jenkins et al. 2001). Therefore, continued intensive monitoring and management practices should contribute to better productivity in future years and population growth will hopefully continue.

FAIRS ACTIVITY CODES: 1450, 1460.

LITERATURE CITED

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Table 1. Piping plover population figures for New Jersey: 1985-2002.

Year	# Nesting Pairs	# Active Nesting Areas	# New Nesting Areas[1]	# Deserted Nesting Areas[2]
1985	103	27		
1986	99	27	2	2
1987	97	28	3	2
1988	106	26	3	5
1989	128	25	2	3
1990	126	23	2	4
1991	126	23	1	1
1992	134	22	2	3
1993	127	22	2	2
1994	124	26	4	0
1995	132	25	1	2
1996	127	24	0	1
1997	114	23	3	4
1998	93	21	3	5
1999	107	20	2	3
2000	112	22	2	0
2001	122	25	3	0
2002	138	28	5	2

[1] Nesting areas not occupied in the previous year but occupied in the current year.
[2] Nesting areas occupied in the previous year but not occupied in the current year.

Table 2. Number of pairs of piping plovers at New Jersey nesting sites and management regions: 1992-2002.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Sandy Hook NRA:											
Coast Guard	*3*	*6*	*10*	*10*	*10*	*11*	*7*	*9*	*5*	*6*	*7*
North Beach	*8*	*9*	*10*	*12*	*14*	*13*	*10*	*11*	*12*	*11*	*9*
North Gunnison	*0*	*1*	*3*	*4*	*7*	*8*	*4*	*3*	*3*	*3*	*4*
South Gunnision	*4*	*4*	*8*	*11*	*7*	*4*	*3*	*0*	*0*	*0*	*1*
Critical Zone	*5*	*5*	*5*	*6*	*2*	*0*	*0*	*0*	*0*	*1*	*2*
Hidden Beach	*1*	*0*	*0*	*0*	*0*	*6*	*4*	*4*	*3*	*3*	*5*
Fee Beach	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*2*	*6*	*7*	*7*
Sea Bright North	0	0	0	0	0	0	2	4	3	3	5
Monmouth Beach North	0	0	0	0	0	1	2	3	4	4	3
Monmouth Beach South	0	0	0	0	0	0	0	0	1	1	1
Sea Girt - NGTC	0	0	0	0	0	0	0	0	0	0	1
Region 2 subtotal	**21**	**25**	**36**	**43**	**40**	**43**	**33**	**36**	**37**	**39**	**45**
Mantoloking	6	4	5	4	3	1	0	0	0	0	0
Barnegat Light	9	12	9	6	5	5	2	4	3	2	3
Loveladies	0	0	1	1	1	0	0	0	0	0	0
Region 3 subtotal	**15**	**16**	**15**	**11**	**9**	**6**	**2**	**4**	**3**	**2**	**3**
Holgate	*22*	*14*	*15*	*10*	*11*	*11*	*17*	*24*	*19*	*19*	*14*
Little Beach	*15*	*19*	*10*	*15*	*13*	*8*	*8*	*7*	*8*	*12*	*17*
North Brigantine N. A.	0	0	0	1	5	8	8	6	11	12	15
Region 4 subtotal	**37**	**33**	**25**	**26**	**29**	**27**	**33**	**37**	**38**	**43**	**46**
Brigantine Beach	10	8	4	5	5	2	0	0	0	0	0
Brigantine - Inlet (Cove)	2	0	1	1	0	0	0	0	0	0	1
Ocean City - North	0	1	2	3	4	4	3	4	5	8	8
Ocean City - Center	0	0	3	3	5	5	6	7	8	9	8
Region 5 subtotal	**12**	**9**	**10**	**12**	**14**	**11**	**9**	**11**	**13**	**17**	**17**
Corson's Inlet State Park	7	5	5	3	2	3	0	1	1	1	1
Strathmere	5	6	3	2	1	0	0	0	0	0	0
Whale Beach	6	4	4	5	2	2	1	0	0	0	1
Sea Isle - North	4	3	2	2	3	1	0	0	0	0	0
Sea Isle - South	4	3	4	3	3	2	0	0	0	1	0
Townsend's Inlet	3	1	1	0	0	0	0	0	0	1	1
Avalon – North	4	5	4	3	2	3	1	1	1	1	0
Avalon - Dunes	5	3	1	2	4	3	2	4	3	4	7
Region 6 subtotal	**38**	**30**	**24**	**20**	**17**	**14**	**4**	**6**	**5**	**8**	**10**
Stone Harbor Point	0	0	0	0	0	0	0	3	5	5	6
N. Wildwood - Hereford Inl.	0	0	0	0	0	0	0	0	0	0	3
N. Wildwood - Oceanfront	3	5	2	2	1	0	0	0	0	0	0
Wildwood Crest	0	0	0	0	0	0	1	0	0	0	0
Coast Guard - EECEN[1]	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*2*
Coast Guard - TRACEN	6	6	7	6	7	3	3	5	5	2	3
Cape May City	0	0	0	0	0	1	1	1	1	2	1
Cape May Meadows	*2*	*3*	*4*	*12*	*10*	*9*	*7*	*4*	*4*	*3*	*2*
Region 7 subtotal	**11**	**14**	**14**	**20**	**18**	**13**	**12**	**13**	**16**	**13**	**17**
Total Pairs	**134**	**127**	**124**	**132**	**127**	**114**	**93**	**107**	**112**	**122**	**138**
Pairs at NJDFW sites	**74**	**66**	**59**	**52**	**53**	**44**	**32**	**43**	**52**	**57**	**68**

[1] Prior to 2002, this site was monitored by NJDFW.
Note: Sites in italics monitored by agencies other than NJDFW.

Table 3. New Jersey piping plover window census results: 2002.

	Census Count			Final Count		
	# Pairs	# Unpaired Adults	# Total Adults	# Pairs	# Unpaired Adults	# Total Adults
Sandy Hook Coast Guard	7	0	14	7	0	14
Sandy Hook North Beach	9	0	18	9	0	18
Sandy Hook North Gunnison	3	0	6	4	0	8
Sandy Hook South Gunnision	2	0	4	1	0	2
Sandy Hook Critical Zone	2	0	4	2	0	4
Sandy Hook Hidden Beach	3	0	6	5	0	10
Sandy Hook Fee Beach	6	0	12	7	0	14
Sea Bright North	5	0	10	5	0	10
Monmouth Beach North	2	1	5	3	0	6
Monmouth Beach South	1	0	2	1	0	2
Sea Girt - NGTC	1	1	3	1	1	3
Region 2 subtotal	**41**	**2**	**84**	**45**	**1**	**91**
Mantoloking	0	0	0	0	0	0
Island Beach S.P. - Oceanfront	0	0	0	0	0	0
Island Beach S.P. - Inlet Spit	0	0	0	0	0	0
High Bar	0	0	0	0	0	0
Barnegat Light	3	1	7	3	1	7
Region 3 subtotal	**3**	**1**	**7**	**3**	**1**	**7**
Holgate	12	5	29	14	0	28
Little Beach	16	0	32	17	0	34
North Brigantine N. A.	14	0	28	15	0	30
Region 4 subtotal	**42**	**5**	**89**	**46**	**0**	**92**
Brigantine Beach	0	0	0	0	0	0
Brigantine - Inlet (Cove)	1	0	2	1	0	2
Longport Sodbanks	0	0	0	0	0	0
Ocean City - North	9	0	18	8	0	16
Ocean City - Center	8	0	16	8	0	16
Region 5 subtotal	**18**	**0**	**36**	**17**	**0**	**34**
Corson's Inlet State Park	1	1	3	1	1	3
Strathmere	0	0	0	0	0	0
Whale Beach	0	0	0	1	0	2
Sea Isle - North	0	0	0	0	0	0
Sea Isle - South	0	0	0	0	0	0
Townsend's Inlet	1	0	2	1	0	2
Avalon - North	0	0	0	0	0	0
Avalon - Dunes	7	0	14	7	0	14
Region 6 subtotal	**9**	**1**	**19**	**10**	**1**	**21**
Stone Harbor Point	6	0	12	6	0	12
N. Wildwood - Hereford Inlet	3	0	6	3	0	6
N. Wildwood - Oceanfront	0	0	0	0	0	0
Wildwood Crest	0	0	0	0	0	0
Coast Guard - EECEN	2	1	5	2	2	6
Coast Guard - TRACEN	3	0	6	3	0	6
Cape May City	0	0	0	1	0	2
Cape May Meadows	1	1	3	2	0	4
Region 7 subtotal	**15**	**2**	**32**	**17**	**2**	**36**
Total Pairs	**128**	**11**	**267**	**138**	**5**	**281**

Table 4. Piping plover reproductive success on NJDFW monitored beaches: 1992-2002.

Year	Pair Success[1] (pairs hatching/ # of pairs)	Fledging Rate (chicks fledge/ nesting pair)	Successful Pair Fledging Rate[2] (chicks fledge/ successful pair)
1992	0.58	0.76	1.30
1993	0.65	0.64	0.98
1994	0.71	1.02	1.43
1995	0.67	0.81	1.20
1996	0.49	0.77	1.58
1997	0.55	0.34	0.63
1998	0.72	1.34	1.87
1999	0.81	1.40	1.71
2000	0.69	1.46	2.11
2001	0.77	1.37	1.77
2002	0.71	1.00	1.42
Cumulative Average: 1992-2001	**0.66**	**0.96**	**1.46**
Cumulative Average: 1987-2002	**0.70**	**0.95**	**1.36**

[1] Pairs hatching any young.
[2] Fledging rate for pairs that hatched at least one egg.

Table 5. Fate of reproductive potential at NJDFW monitored sites: 1998-2002.

Fate	1998	1999	2000	2001	2002
Lost to nest failure	30.6%	19.6%	32.9%	22.6%	29.5%
Lost to clutch reduction	8.0%	5.3%	6.5%	4.1%	8.1%
Lost to brood reduction	23.0%	35.2%	18.8%	37.4%	36.0%
Fledglings	38.4%	39.9%	41.8%	35.9%	26.4%

Table 6. Comparison of fledging rates for initial nests and renests (late nests).

	Early Nests[1]	Late Nests[2]
Nesting Success ***(# of nests hatched/ # of nesting attempts)***	0.46	0.56
Pair Success ***(pairs hatched/ # of pairs)***	0.56	0.67
Fledging Rate ***(chicks fledge/ nesting pair)***	0.86	0.62
Successful Pair Fledging Rate ***(chicks fledge/ successful pair)***	1.55	0.94

[1]Early nests were those that hatched or were predicted to hatch on or before June 25th. Most, but not all, early nests were initial attempts by a nesting pair.
[2]Late nests were those that hatched or were predicted to hatch after June 25th. Most, but not all, late nests were renests (2nd or 3rd nesting attempts).

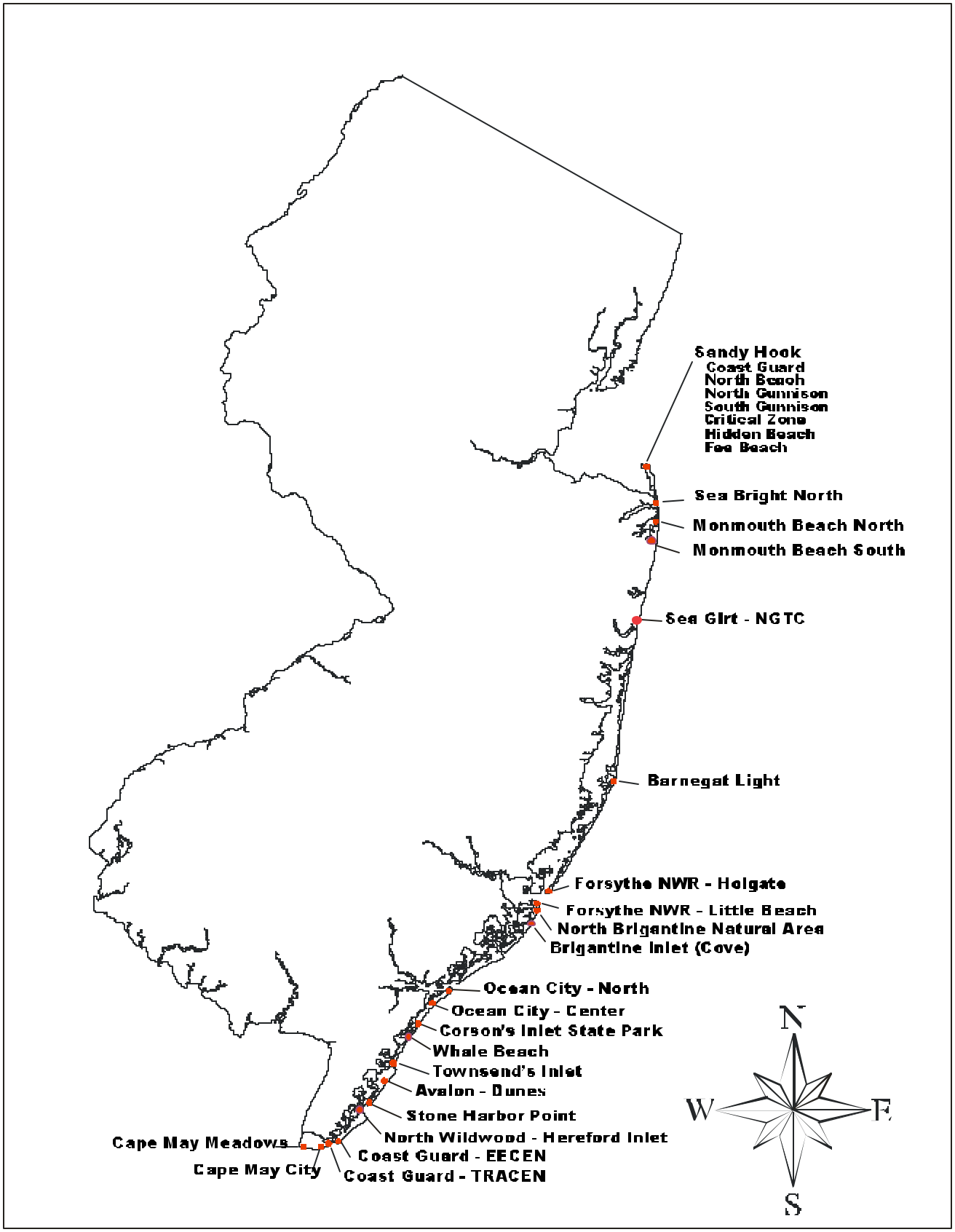

Figure 1. New Jersey piping plover nesting sites: 2002.

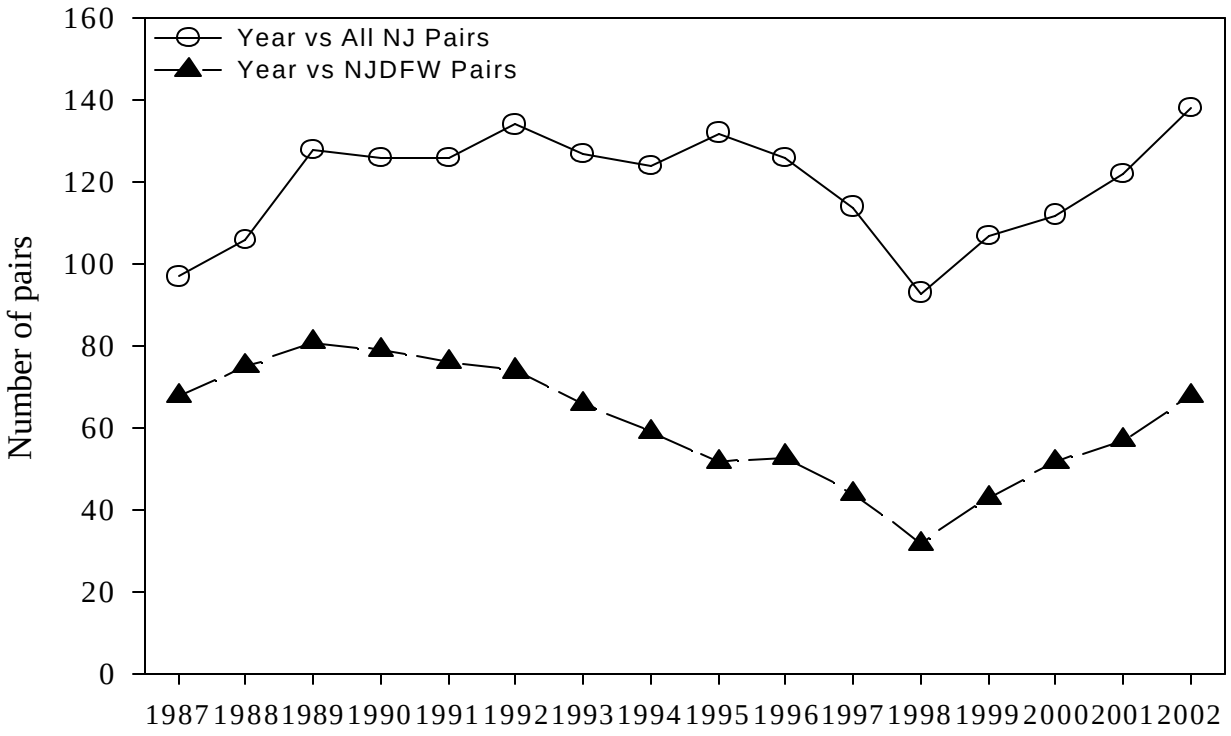

Figure 2. New Jersey piping plover population: 1987-2002.

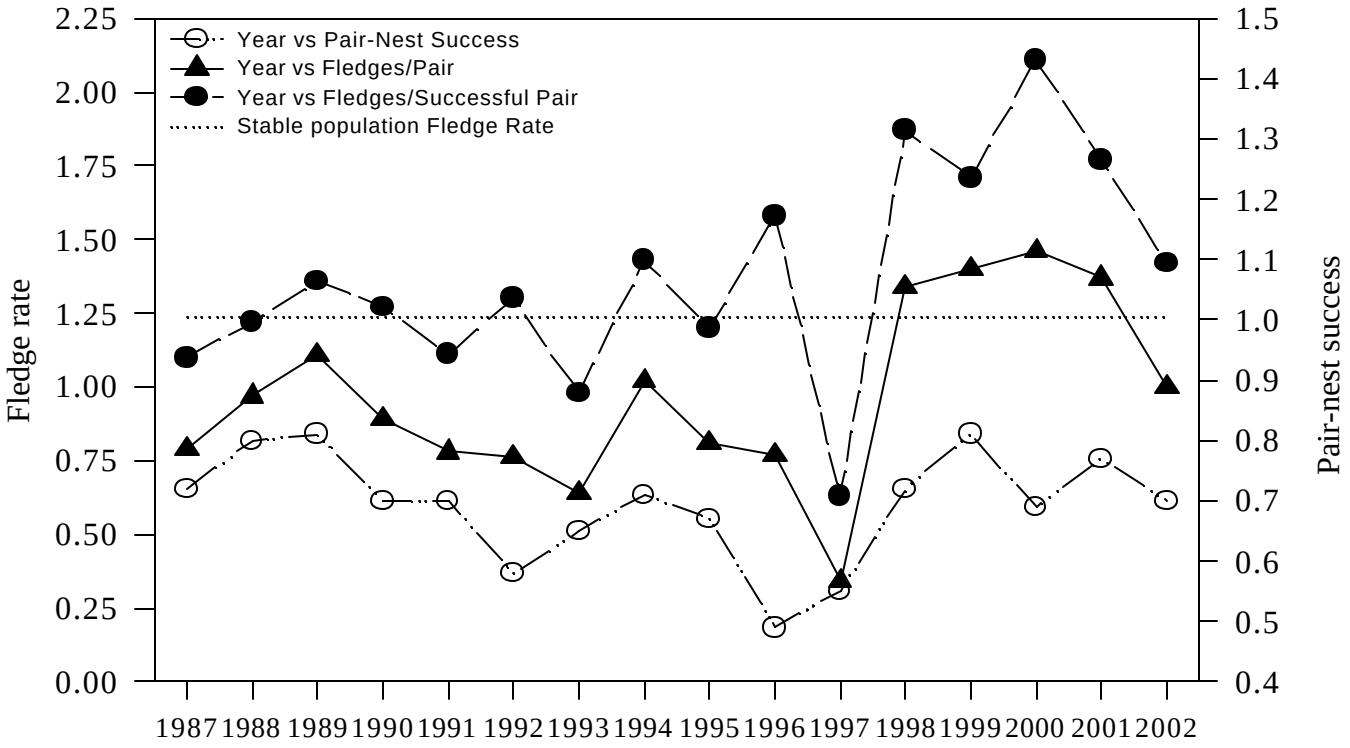

Figure 3. Piping plover nesting success and fledging rates: 1987-2002.

Appendix A. New Jersey piping plover nesting summary by site and region: 2000-2002 and averages: 1987-2002.

	2000					
SITE	**Pairs**	**Pairs Hatch**	**Chicks Fledge**	**Pair Success**	**Fledge Rate**	**SP Fldg Rate**
Sandy Hook Coast Guard	5	4	7			
Sandy Hook North Beach	12	11	23			
Sandy Hook N. Gunnison	3	3	4			
Sandy Hook S. Gunnison						
Sandy Hook Critical Zone						
Sandy Hook Hidden Beach	3	3	10			
Sandy Hook Fee Beach	6	6	7			
Sea Bright North	3	1	2	0.33	0.67	2.00
Monmouth Beach North	4	3	8	0.75	2.00	2.67
Monmouth Beach South	1	1	3	1.00	3.00	3.00
Sea Girt - NGTC						
Region 2 Subtotal	**37**	**32**	**64**	**0.86**	**1.73**	**2.00**
Mantoloking						
Island Beach State Park						
Barnegat Light	3	2	4	0.67	1.33	2.00
Highbar						
Loveladies						
Region 3 Subtotal	**3**	**2**	**4**	**0.67**	**1.33**	**2.00**
Holgate	19	13	19			
Little Beach	8	6	10			
North Brigantine N. A.	11	9	27	0.82	2.45	3.00
Region 4 Subtotal	**38**	**28**	**56**	**0.74**	**1.47**	**2.00**
Brigantine Beach						
Brigantine - Inlet (Cove)						
Longport Sodbanks						
Ocean City - North	5	5	11	1.00	2.20	2.20
Ocean City - Center	8	7	9	0.88	1.13	1.29
Region 5 Subtotal	**13**	**12**	**20**	**0.92**	**1.54**	**1.67**
Corson's Inlet State Park	1	1	2	1.00	2.00	2.00
Corson's Sodbank						
Strathmere						
Whale Beach						
Sea Isle City - North						
Sea Isle City - South						
Townsend's Inlet						
Avalon - North	1	1	1	1.00	1.00	1.00
Avalon - Dunes	3	1	1	0.33	0.33	1.00
Region 6 Subtotal	**5**	**3**	**4**	**0.60**	**0.80**	**1.33**
Stone Harbor Point	5	2	0	0.40	0.00	0.00
Champagne Island						
N. Wildwood - Hereford Inlet						
N. Wildwood - Oceanfront						
Wildwood Crest						
Coast Guard - EECEN	1	0	0	0.00	0.00	0.00
Coast Guard - TRACEN	5	2	5	0.40	1.00	2.50
Cape May City	1	1	3	1.00	3.00	3.00
Cape May Meadows	4	4	1			
Higbee/Magnesite						
Cape May Ferry						
Region 7 Subtotal	**16**	**9**	**9**	**0.56**	**0.56**	**1.00**
Total[1]	**52**	**36**	**76**	**0.69**	**1.46**	**2.11**
Total[2]	**112**	**86**	**157**			

[1] = only NJDFW monitored sites
[2] = all sites

Appendix A. New Jersey piping plover nesting summary by site and region: 2000-2002 and averages: 1987-2002.

	2001					
SITE	**Pairs**	**Pairs Hatch**	**Chicks Fledge**	**Pair Success**	**Fledge Rate**	**SP Fldg Rate**
Sandy Hook Coast Guard	6	6	11			
Sandy Hook North Beach	11	10	20			
Sandy Hook N. Gunnison	3	2	3			
Sandy Hook S. Gunnison						
Sandy Hook Critical Zone	1	1	1			
Sandy Hook Hidden Beach	3	2	6			
Sandy Hook Fee Beach	7	5	8			
Sea Bright North	3	1	4	0.33	1.33	4.00
Monmouth Beach North	4	3	2	0.75	0.50	0.67
Monmouth Beach South	1	1	4	1.00	4.00	4.00
Sea Girt - NGTC						
Region 2 Subtotal	**39**	**31**	**59**	**0.79**	**1.51**	**1.90**
Mantoloking						
Island Beach State Park						
Barnegat Light	2	1	4	0.50	2.00	4.00
Highbar						
Loveladies						
Region 3 Subtotal	**2**	**1**	**4**	**0.50**	**2.00**	**4.00**
Holgate	19	11	18			
Little Beach	12	7	11			
North Brigantine N. A.	12	11	26	0.92	2.17	2.36
Region 4 Subtotal	**43**	**29**	**55**	**0.67**	**1.28**	**1.90**
Brigantine Beach						
Brigantine - Inlet (Cove)						
Longport Sodbanks						
Ocean City - North	8	4	10	.50	1.25	2.50
Ocean City - Center	9	9	7	1.00	0.78	0.78
Region 5 Subtotal	**17**	**13**	**17**	**0.76**	**1.00**	**1.31**
Corson's Inlet State Park	1	1	3	1.00	3.00	3.00
Corson's Sodbank						
Strathmere						
Whale Beach						
Sea Isle City - North						
Sea Isle City - South	1	0	0	0.00	0.00	0.00
Townsend's Inlet	1	1	0	1.00	0.00	0.00
Avalon - North	1	1	1	1.00	1.00	1.00
Avalon - Dunes	4	4	8	1.00	2.00	2.00
Region 6 Subtotal	**8**	**7**	**12**	**0.88**	**1.50**	**1.71**
Stone Harbor Point	5	2	1	0.40	0.20	0.50
Champagne Island						
N. Wildwood - Hereford Inlet						
N. Wildwood - Oceanfront						
Wildwood Crest						
Coast Guard - EECEN	1	1	2	1.00	2.00	2.00
Coast Guard - TRACEN	2	2	4	1.00	2.00	2.00
Cape May City	2	2	2	1.00	1.00	1.00
Cape May Meadows	3	2	1			
Higbee/Magnesite						
Cape May Ferry						
Region 7 Subtotal	**13**	**9**	**10**	**0.69**	**0.77**	**1.11**
Total[1]	**57**	**44**	**78**	**0.77**	**1.37**	**1.77**
Total[2]	**122**	**90**	**157**			

[1] = only NJDFW monitored sites
[2] = all sites

Appendix A. New Jersey piping plover nesting summary by site and region: 2000-2002 and averages: 1987-2002.

	2002					
SITE	**Pairs**	**Pairs Hatch**	**Chicks Fledge**	**Pair Success**	**Fledge Rate**	**SP Fldg Rate**
Sandy Hook Coast Guard	7	7	8			
Sandy Hook North Beach	9	9	17			
Sandy Hook N. Gunnison	4	4	11			
Sandy Hook S. Gunnison	1	1	0			
Sandy Hook Critical Zone	2	2	3			
Sandy Hook Hidden Beach	5	5	10			
Sandy Hook Fee Beach	7	7	11			
Sea Bright North	5	4	10	0.80	2.00	2.50
Monmouth Beach North	3	2	2	0.67	0.67	1.00
Monmouth Beach South	1	1	4	1.00	4.00	4.00
Sea Girt - NGTC	1	0	0	0.00	0.00	0.00
Region 2 Subtotal	**45**	**42**	**76**	**0.93**	**1.69**	**1.81**
Mantoloking						
Island Beach State Park						
Barnegat Light	3	2	6	0.67	2.00	3.00
Highbar						
Loveladies						
Region 3 Subtotal	**3**	**2**	**6**	**0.67**	**2.00**	**3.00**
Holgate	14	11	15			
Little Beach	17	14	13			
North Brigantine N. A.	15	9	17	0.60	1.13	1.89
Region 4 Subtotal	**46**	**34**	**45**	**0.74**	**0.98**	**1.32**
Brigantine Beach						
Brigantine - Inlet (Cove)	1	1	1	1.00	1.00	1.00
Longport Sodbanks						
Ocean City - North	8	4	5	0.50	0.63	1.25
Ocean City - Center	8	5	1	0.63	0.13	0.20
Region 5 Subtotal	**17**	**10**	**7**	**0.59**	**0.41**	**0.70**
Corson's Inlet State Park	1	1	3	1.00	3.00	3.00
Corson's Sodbank						
Strathmere						
Whale Beach	1	0	0	0.00	0.00	0.00
Sea Isle City - North						
Sea Isle City - South						
Townsend's Inlet	1	1	2	1.00	2.00	2.00
Avalon - North						
Avalon - Dunes	7	7	9	1.00	1.29	1.29
Region 6 Subtotal	**10**	**9**	**14**	**0.90**	**1.40**	**1.56**
Stone Harbor Point	6	5	1	0.83	0.17	0.20
Champagne Island						
N. Wildwood - Hereford Inlet	3	3	4	1.00	1.33	1.33
N. Wildwood - Oceanfront						
Wildwood Crest						
Coast Guard - EECEN	2	2	3			
Coast Guard - TRACEN	3	3	3	1.00	1.00	1.00
Cape May City	1	0	0	0.00	0.00	0.00
Cape May Meadows	2	2	2	1.00	1.00	1.00
Higbee/Magnesite						
Cape May Ferry						
Region 7 Subtotal	**17**	**15**	**13**	**0.88**	**0.76**	**0.87**
Total[1]	**68**	**48**	**68**	**0.71**	**1.00**	**1.42**
Total[2]	**138**	**112**	**161**			

[1] = only NJDFW monitored sites
[2] = all sites

Appendix A. New Jersey piping plover nesting summary by site and region: 2000-2002 and averages: 1987-2002.

	1987-2002 Average					
SITE	**Pairs**	**Pairs Hatch**	**Chicks Fledge**	**Pair Success**	**Fledge Rate**	**SP Fldg Rate**
Sandy Hook Coast Guard	6.31	4.88	9.56			
Sandy Hook North Beach	9.81	7.69	14.75			
Sandy Hook N. Gunnison	4.00	2.40	4.80			
Sandy Hook S. Gunnison	4.54	2.54	4.85			
Sandy Hook Critical Zone	3.30	2.60	2.80			
Sandy Hook Hidden Beach	3.71	2.43	6.29			
Sandy Hook Fee Beach	4.60	4.00	6.00			
Sea Bright North	3.40	2.00	4.80	0.588	1.412	2.400
Monmouth Beach North	2.83	2.33	4.33	0.824	1.529	1.857
Monmouth Beach South	1.00	1.00	3.67	1.000	3.667	3.667
Sea Girt - NGTC	1.00	0.00	0.00	0.000	0.000	0.000
Region 2 Subtotal	**29.75**	**21.69**	**41.44**	**0.729**	**1.393**	**1.911**
Mantoloking	5.55	4.64	9.09	0.836	1.639	1.961
Island Beach State Park	1.00	0.33	0.00	0.333	0.000	0.000
Barnegat Light	5.13	3.25	5.44	0.634	1.061	1.673
Highbar	1.00	1.00	0.00	1.000	0.000	0.000
Loveladies	1.00	1.00	1.57	1.000	1.571	1.571
Region 3 Subtotal	**9.63**	**7.00**	**12.38**	**0.727**	**1.286**	**1.768**
Holgate	15.13	9.56	14.44			
Little Beach	10.88					
North Brigantine N. A.	6.27	4.73	10.64	0.754	1.696	2.250
Region 4 Subtotal	**30.31**					
Brigantine Beach	8.18	5.55	5.45	0.678	0.667	0.984
Brigantine - Inlet (Cove)	1.89	1.44	2.56	0.765	1.353	1.769
Longport Sodbanks	1.50	0.50	1.50	0.333	1.000	3.000
Ocean City - North	3.69	2.62	3.62	0.708	0.979	1.382
Ocean City - Center	6.00	4.11	3.11	0.685	0.519	0.757
Region 5 Subtotal	**13.25**	**9.13**	**10.06**	**0.689**	**0.759**	**1.103**
Corson's Inlet State Park	4.20	3.00	3.13	0.714	0.746	1.044
Corson's Sodbank	1.00	1.00	0.00	1.000	0.000	0.000
Strathmere	4.00	2.20	1.60	0.550	0.400	0.727
Whale Beach	6.38	4.38	4.77	0.687	0.747	1.088
Sea Isle City - North	3.91	2.45	4.45	0.628	1.140	1.815
Sea Isle City - South	2.90	2.00	1.60	0.690	0.552	0.800
Townsend's Inlet	2.30	1.90	2.20	0.826	0.957	1.158
Avalon - North	2.21	2.00	2.57	0.903	1.161	1.286
Avalon - Dunes	3.81	2.38	3.19	0.623	0.836	1.342
Region 6 Subtotal	**23.38**	**16.06**	**18.69**	**0.687**	**0.799**	**1.163**
Stone Harbor Point	4.75	2.75	1.25	0.579	0.263	0.455
Champagne Island	1.00	0.50	2.00	0.500	2.000	4.000
N. Wildwood - Hereford Inlet	3.00	3.00	4.00	1.000	1.333	1.333
N. Wildwood - Oceanfront	3.00	2.13	0.75	0.708	0.250	0.353
Wildwood Crest	1.00	1.00	0.00	1.000	0.000	0.000
Coast Guard - EECEN	1.89	1.00	0.89			
Coast Guard - TRACEN	3.81	2.63	3.69	0.689	0.967	1.405
Cape May	1.17	1.00	1.33	0.857	1.143	1.333
Cape May Meadows	4.63	3.75	3.50			
Higbee/Magnesite	1.00	1.00	0.00	1.000	0.000	0.000
Cape May Ferry	1.00	0.00	0.00	0.000	0.000	0.000
Region 7 Subtotal	**13.19**	**9.44**	**9.38**	**0.716**	**0.711**	**0.993**
Total[1]	**61.19**	**42.63**	**57.94**	**0.697**	**0.947**	**1.359**
Total[2]	**119.50**					

[1] = only NJDFW monitored sites
[2] = all sites

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