Piping Plover Nesting Results in New Jersey:2022

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Seaside Park fledglings
Photo courtesy of Teri Bowers

SUMMARY OF FINDINGS:

One hundred and eighteen (118) pairs of piping plovers nested in New Jersey in 2022, a 14% decrease in population size compared to 2021 (137 pairs). The population was slightly above the statewide long-term average (117 pairs) and was the second highest recorded pair number over the last decade. Statewide productivity in 2022 (0.85 fledglings/pair) was below the long-term average (1.04 fledglings/pair) and below the federal recovery goal (1.50 fledglings/pair). This was the second consecutive year statewide productivity dipped below 1.00 fledglings/pair since 2013.

The total number of adults recorded for the entire nesting season (246) was much the same as the total number of adults recorded during the date-restricted Atlantic Coast census survey conducted June 1-9 (242). The final number of pairs for the season (118) increased from the pair number tallied during the date-restricted census period (113). Ten unpaired adults were recorded this season. Four of the last six years have featured higher than typical numbers of unpaired adults in the population (17 in 2017, 10 in 2019, 23 in 2020, 10 in 2022). These adults exhibit breeding behavior, but no mate or nest is observed even though there is intense monitoring at all sites.

The Holgate and Little Beach units of E.B. Forsythe National Wildlife Refuge continued as the stronghold of the state's population with the largest percentage of pairs (54 pairs or 46%). Combined with the state's North Brigantine Natural Area, these three sites connect a large portion of New Jersey's undeveloped coastline and play a critical role in the recovery of this species in the state (55 pairs or 47%). The northern Monmouth County region maintained a substantial portion of the state's population (39 pairs or 33%). The region of southern Monmouth County and central Ocean County accounted for 11% of the statewide total (13 pairs). Cape May County and southern Atlantic County accounted for 9% of the statewide total (11 pairs).

On an individual site level, significant declines occurred in nearly every region in the state. Sandy Hook, the former state powerhouse for piping plovers, declined 11% this year continuing a worrisome trend for the northern region of the state (37 pairs in 2021, 33 pairs in 2022). Sea Bright, once a municipal beach stronghold, suffered an 86% decrease in pairs (7 in 2021, 1 in 2022). Little Beach and North Brigantine Natural Area pair numbers both declined over 50% in 2022. Additionally, Stone Harbor Point in Cape May County declined 67% in pair numbers (6 pairs in 2021, 2 pairs in 2022). Modest pair increases were observed at Island Beach State Park (2 pairs in 2021, 3 pairs in 2022), Barnegat Light (6 pairs in 2021, 7 pairs in 2022), Holgate (46 pairs in 2021, 48 pairs in 2022), and North Ocean City (3 pairs in 2021, 4 pairs in 2022) and they were not significant enough to overcome the losses elsewhere in the state.

Pairs nested at 26 sites statewide in 2022 with three sites gained and five sites lost from 2021. Long Branch and Deal in Monmouth County, which have not been known to routinely host piping plovers, were active breeding sites this year. New Jersey Fish and Wildlife (NJFW) monitored 15 active nesting sites (58% of the sites statewide), accounting for 31 nesting pairs (26% of the nesting pairs statewide). The percentage of statewide pairs at NJFW-monitored sites dropped in 2022 (41 pairs, 30% of the statewide total in 2021). However, 31 pairs is the second highest pair number at NJFW-monitored sites over the last decade. Pair dispersal across these state and municipal beaches continues to oscillate and remains well-below the peak of 70 pairs at NJFW-monitored sites (2003). The majority of pairs remain on federal property (87 pairs or 74% of the statewide total).

Pair-nest success (the percentage of pairs that successfully hatch at least one nest) was considerably low this year (59%). Since state-wide monitoring began in 1987, the pair-nest success rate has dipped below 60% only five other times. In 2022, pair-nest success fell well-below the long-term average (69%). At NJFW-monitored sites, pair-nest success was the same compared to last year (61% in 2021, 2022) but is down considerably from previous years (83% in 2020, 73% in 2019). Continued struggles with predators and predator exclosures at all sites statewide resulted in low pair-nest success.

The cause of nest failure was determined in 85 of the 94 failed nesting attempts statewide. Depredation remained the leading cause of nest failure (54 or 57%) for the tenth consecutive year. Of the depredated nests, over three quarters (41 or 76%) were lost to mammals and the majority of those were lost to opossum (16 or 39%). The remainder of mammalian depredated nests were lost to red fox (9 or 22%), undetermined mammal species (5 or 12%), raccoon (1 or 2%), and coyote (1 or 2%). Avian depredation represented only two nest losses in 2022 (2 or 4%) and one nest was depredated by ghost crab (1 or 2%). The remaining nests were depredated by undetermined predator species (19%). Nest abandonment was concerningly high this year (18 or 19%). Nest abandonments are closely correlated with an adult mortality so the potential loss of 18 adults from an already struggling population is a grim consideration. It should be noted that not all abandonments result in a mortality event as other factors such as high disturbance at a nest could also cause adults to abandon. Flooding was responsible for nine nest losses or 10% of nest failures, a marked decline from 2021 (36%). Nest loss due to eggs being blown over or buried led to four failures (4%). The remaining causes of nest failure could not be determined in nine nest losses (10%).

The statewide fledgling rate was 0.85 fledglings/pair. Statewide productivity fell below the productivity goal (1.50 fledglings/pair) established by the USFWS Recovery Plan for Atlantic coast piping plovers. Statewide productivity remains below the 1.245 fledglings/pair range-wide threshold for population maintenance also established in the Recovery Plan. NJFW-monitored sites (0.74 fledglings/pair) were below both recovery goals and below the statewide long-term average (0.96 fledglings/pair). New Jersey has long struggled to maintain consistent productivity with highs up to 1.51 fledglings/pair (2019) and lows down to 0.39 fledglings/pair (1997). While chick loss remains a difficult mystery to solve as scant evidence is typically available, low chick hatch years also correlate to low productivity years indicating the state has challenges hatching and fledging chicks.

Productivity varied considerably by individual site and region. Sites that have typically been able to produce some fledges were beset with low to no hatch success and therefore were unable to produce fledglings. Northern Monmouth County declined again in productivity (0.74 fledglings/pair in 2022, 0.88 fledglings/pair in 2021). While Sandy Hook declined in 2022, this regional decline is mostly attributed to the low pair number and zero productivity at Sea Bright. Southern Monmouth County and Ocean County saw higher levels of success at Seaside Park (4.00 fledglings/pair) and Barnegat Light (1.29 fledglings/pair) but other sites failed to produce any fledglings (Island Beach State Park, Sea Girt – Wreck Pond, and National Guard Training Center). Holgate was one of the few sites to see an increase in productivity (1.02 fledglings/pair in 2022, 0.93 fledglings/pair in 2021). Additionally, Holgate contributed 49% of the total chicks fledged statewide in 2022.

Cape May County and southern Atlantic County productivity was considerably higher than it has been in recent years (0.82 fledglings/pair in 2022, 0.50 fledglings/pair in 2021).

DISCUSSION

After a promising increase in 2021 (137 pairs), New Jersey's piping plover population decreased 14% in 2022 (118 pairs). This was not unexpected considering poor productivity in 2021 (0.85 fledglings/pair). Pair numbers declined in nearly every region in the state but was most noticeable in Monmouth County. After a peak of 53 pairs in 2015, the collection of premiere nesting beaches that make up Gateway National Recreation Area's Sandy Hook Unit, has seen an almost annual decrease in pair number. The productivity average for Sandy Hook (1.27 fledglings/pair) since federal listing is well-above the statewide average (1.04 fledglings/pair) and the site has enjoyed many years of promising fledgling numbers. The causes of this recent pair decline are largely unknown but certain limiting factors (predator pressure, high exclosure abandonment rates) may be contributing to lower return rates of experienced breeding adults. In other areas of Monmouth County, declines appear to be explained by habitat loss due to erosion (like the 85% population decrease at Sea Bright) and high rates of predator pressure (at sites like Monmouth Beach).

The state's breeding pairs produced 0.85 fledglings per pair, failing to meet the recovery goal of 1.50 fledglings/pair. New Jersey has reached the recovery goal only once in 35 years of intensive management. The relationship between productivity and pair numbers is difficult to understand when considering long-term trends in the state. As expected, poor productivity lowered the population the following year, but seasons when productivity was high did not always translate into expected population increases. Factors such as juvenile and adult fitness impact survival (Stantial 2020) and may be further limiting the state's population. Fledglings from sites with less recreational disturbance (Holgate, Barnegat Light Restoration Area) can focus their attention on foraging (i.e. increasing fitness) and return to breed at higher rates the following season (Stantial 2020). Additionally, mortality of adults at predator exlosures may be further limiting the population and may explain some of the patterns observed when looking at the relationship of reproductive success and population growth(Stantial 2020). More research is needed on this topic.

The majority of the state's population (74% in 2022) breed on the federal lands of Sandy Hook and the Holgate and Little Beach units of E.B. Forysthe National Wildlife Refuge. One of a few marginal pair increases this year was noted at Holgate. Holgate has had exceptional success since Superstorm Sandy created pristine overwash habitat in 2012. The overwash has degraded moving from optimal open sandy nesting habitat to more mature dunes and encroaching vegetation. Although this habitat is considered past its peak, it remains the best available habitat in New Jersey. The unit to the south, Little Beach, experienced a 54% decrease in pair number and was plagued by high abandonment and predation rates in 2022. Additionally, North Brigantine Natural Area, which is adjacent to Little Beach and creates a unique stretch of unaltered, natural coastline in New Jersey, suffered another decline in pair numbers and has long struggled to retain pairs. Pair declines at North Brigantine Natural Area and Little Beach are mostly attributed to habitat loss due to erosion and vegetation encroachment. Federal lands appear to be under threat from habitat degradation and high abandonment rates resulting in adult mortalities. With the state and municipal sites failing to host and maintain significant pair numbers, decline of suitable habitat on the federal sites could become particularly worrying in the future.

Habitat restoration projects have aimed to improve habitat suitability and increase pair dispersal statewide. The Barnegat Light Restoration Area project was an attempt to increase pair numbers and fledgling potential in a struggling portion of the state. Now in its fourth season post-construction, the site remains highly suitable (thanks to vegetation management by USFWS, Rutgers University, and Conserve Wildlife Foundation of NJ) and continues to provide optimal, low disturbance foraging habitat for chicks. Chicks were observed utilizing the alternative foraging features in 85% of all recorded observations in 2022: this is the highest percentage use since the foraging features were completed in 2019. Challenges remain to keep the habitat open for nesting and

foraging use by limiting encroaching vegetation. Long-term maintenance is required for this project and any similar restoration projects in the future. Cape May Meadows underwent a large-scale habitat project (a side benefit to the sand transfer the U.S. Army Corps of Engineers completed to meet their shore protection goals) in 2020 with 164,000 cubic yards of sand removed from the site. While piping plovers have been noted on site exhibiting breeding behavior, none have been confirmed nesting there over the last two seasons. The lack of a true source population for Cape May County may be limiting population growth, including at this site.

Two strong storm events have highlighted the last two breeding seasons – the 2021 Memorial Day storm and the 2022 Mother's Day storm. Both strong nor'easters brought high winds, cold rains, and coastal flooding for multiple days. While 2021 saw nearly two-thirds of all nests lost with only about half choosing to renest, 2022 was spared slightly. Nest losses were observed but they were early enough that adults could reasonably rebound and nest again. These storms underscore the role of climate change as rising sea-levels and extreme storm-related tides erode portions of New Jersey's coastline resulting in repeated needs for beach renourishment. The impact of beach fills on the coastal ecosystem, particularly on shorebird foraging habitat, are largely unknown and understudied. Beach fills do create habitat and opportunities for breeding piping plovers and have had promising results on the population. Sites that had little to no sand, like Deal and Long Branch, attracted piping plovers for the first time in nearly 20 years. It appears to be a delicate balance between habitat creation and potentially detrimental impacts on foraging quality, but more research on beach fill impacts is necessary.

Managers across the range have long struggled with the tenuous relationship between predator exclosures and nest-hatch success. Predator exclosures are a management tool that New Jersey has utilized since intensive management began in 1987. While exclosures generally increase nest-hatch success, they can also lead to a mortality event of one or both adults and are likely limiting population growth in the state (Stantial 2020). Documented kills by peregrine falcon, great-horned owl, and red fox have been regularly observed at almost every breeding site in the state. The statewide abandonment rate has fluctuated year to year, likely due to the dynamic nature of predator communities on the coast and an individual predator's learned behavior equating exclosures to food resources. Over the last decade, the abandonment rate average has been 17% of all nest failures. In 2022, the abandonment rate was 19% of all nest failures. Considering nest-hatch success at exclosures in 2022 was relatively low (49% of all exclosed nests hatched), managers in the state must closely consider the trade-offs of exclosure use and explore utilizing analysis tools such as PiperEx (a range-wide decision support tool for exclosure use) to a greater degree to guide decision making.

CONCLUSION

The pattern in prior years has demonstrated that when pair numbers are down in one area of the state, another area is up. The population in the mid-nineties to mid-2000's saw a shift in the majority of the population moving south to north. However, this does not appear to be the present situation. Declining trends in the northern population of the state did not result in increases in other portions of the state. A significant proportion of the population is now relying on habitat at Holgate, which is not guaranteed to stay suitable in the long term. Managers and stakeholders in the state must closely consider habitat restoration, address the dynamic nature and ever-present role of coastal predator populations, examine the use of exclosures, and look further into other limiting factors such as prey availability in response to beach renourishment. Increasing staffing and enforcement resources must also be considered to control and limit disturbance at highly recreated municipal and state-owned sites. Recovery goals continue to evade New Jersey but NJFW remains committed to guiding the state towards achievable goals and supporting projects to promote a healthy population of piping plovers.

LITERATURE CITED:

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Table 1. Number of pairs of Piping Plovers at New Jersey nesting sites: 2013-2022

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Sandy Hook NRA	43	47	53	51	40	38	41	40	37	33
Coast Guard	3	4	3	5	3	3	3	2	2	1
North Beach	13	14	15	14	13	11	10	11	11	10
North Beach Recreational	0	0	0	1	1	1	3	2	1	0
North Gunnison	8	8	10	8	6	6	8	8	10	7
South Gunnison	7	9	8	7	5	3	3	4	4	4
D-Lot	0	0	0	0	0	0	0	0	0	1
E-Lot	0	0	0	0	0	0	1[1]	0	0	0
Visitor Center	0	0	0	1	0	0	1[1]	0	0	0
Critical Zone	5	4	7	6	5	6	6	6	3	5
Hidden Beach	3	4	4	4	3	3	1	0	1	1
B-Lot	0	0	0	0	0	0	1[1]	0	0	0
Fee Beach	4	4	6	4	3	3	5[1]	4	3	3
South Fee Beach	0	0	0	1	1	2	1	3	2	1
Sea Bright - North	0	0	1	6	10	10	10	6	7[1]	1
Monmouth Beach - North[2]	2	1	1[1]	5	3	3	4[1]	2	5[1]	3
Monmouth Beach - South	0	0	0	0	0	1	0	0	0	0
Seven Presidents Park	0	1	1[1]	1	1	0	2[1]	0	0	0
Long Branch	0	0	0	0	0	0	0	0	0	1
Deal	0	0	0	0	0	0	0	0	0	1
Region 2 subtotal	**45**	**49**	**55**	**63**	**54**	**52**	**56**	**48**	**48**	**39**
Belmar – Shark River Inlet	0	1	0	0	0	1	1	0	0	0
Sea Girt – Wreck Pond	0	0	0	0	0	0	1[1]	0	1	1
Sea Girt – NGTC	0	0	0	0	0	0	2[1]	1	1	1
Mantoloking	0	0	0	0	0	0	0	0	1[1]	0
Seaside Park	0	0	0	0	0	0	0	0	2[1]	1
Island Beach SP NNA	0	0	0	0	0	4	4	4	2	3
Island Beach SP SNA	0	0	0	1	1	0	1[1]	0	0	0
Barnegat Light	2	1	1	3	5	3	3[1]	2	6	7
Loveladies	0	0	0	0	0	0	1	0	0	0
Region 3 subtotal	**2**	**2**	**1**	**4**	**6**	**8**	**11**	**7**	**12**	**13**
Long Beach Township	0	0	0	0	1[1]	0	0	0	0	0
EB Forsythe NWR	35	26	38	37	37	31	40	39	59	54
Holgate	12	12	24	25	22[1]	18	29[1]	29	46	48
Little Beach	23	14	14	12	15	13	12[1]	10	13[1]	6
North Brigantine NA	6	3	5	5	4	2	2	2	3[1]	1
Region 4 subtotal	**41**	**29**	**43**	**42**	**41**	**33**	**42**	**41**	**61**	**55**
Seaview Harbor Marina	1	0	1[1]	0	0	0	0	0	0	0
Malibu WMA	0	1	1[1]	0	0	0	0	0	1	1
Ocean City – North	0	0	0	0	0	0	0	2	3[1]	4
Region 5 subtotal	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**4**	**5**
Corson's Inlet SP	0	0	0	0	0	0	2	2	3[1]	3
Strathmere NA	2[1]	1	0	0	0	0	0	0	1	1
Strathmere (Upper Twp.)	4[1]	2	0	0	0	0	0	0	1	0
Avalon - Dunes	3	3[1]	2[1]	1	1	0	0	0	0	0
Region 6 subtotal	**8**	**6**	**2**	**1**	**1**	**0**	**2**	**2**	**4**	**4**
Stone Harbor Point	6	4[1]	6[1]	5	3	3	3	2	6	2
N. Wildwood - Hereford	1	1	1	0	0	0	0	0	0	0
Two Mile Beach	0	0	0	0	0	0	0	0	2	0
Cape May NWR	0	0	0	0	0	0	0	0	1	0
Coast Guard - LSU	0	0	0	0	0	0	0	0	1	0
Coast Guard - TRACEN	1[1]	0	0	0	0	0	0	1	0	0
Cape May City	1[1]	0	0	0	0	0	0	0	0	0
Cape May Meadows	3	1	0	0	0	0	0	0	0	0
The Nature Conservancy	1	0	0	0	0	0	0	0	0	0
Cape May Point SP	2	1	0	0	0	0	0	0	0	0
Region 7 subtotal	**11**	**6**	**6**	**5**	**3**	**3**	**3**	**3**	**8**	**2**
Total Pairs	**108**	**92**	**108**	**115**	**105**	**96**	**114**	**103**	**137**	**118**
Pairs at NJFW sites	**29**	**19**	**17**	**27**	**29**	**27**	**33**	**24**	**41**	**31**

[1] This site includes Sea Bright – South and Monmouth Beach - North

Table 2. New Jersey Piping Plover window census results: June 1-9, 2022

	State Census Count			Final Season Count		
	# Pairs	# Unpaired Adults[1]	# Total Adults	# Pairs	# Unpaired Adults[1]	# Total Adults
Sandy Hook Coast Guard	1	0	2	1	0	2
Sandy Hook North Beach	10	1	21	10	0	20
Sandy Hook North Beach Recreational	0	0	0	0	0	0
Sandy Hook North Gunnison	6	0	12	7	0	14
Sandy Hook Gunnison Recreational	0	2	2	0	0	0
Sandy Hook South Gunnison	3	0	6	4	0	8
Sandy Hook E-Lot	0	0	0	0	0	0
Sandy Hook Visitor Center	0	0	0	0	0	0
Sandy Hook D-Lot	1	0	2	1	0	2
Sandy Hook Critical Zone	4	0	8	5	0	10
Sandy Hook Hidden Beach	1	0	2	1	0	2
Sandy Hook B-Lot	1	0	2	0	0	0
Sandy Hook Fee Beach	1	0	2	3	0	6
Sandy Hook South Fee Beach	1	0	2	1	0	2
Sea Bright North	0	1	1	1	0	2
Monmouth Beach North[1]	3	1	7	3	0	6
Monmouth Beach South	0	0	0	0	0	0
Seven Presidents Park	0	0	0	0	0	0
Long Branch	1	0	2	1	0	2
Deal	1	0	2	1	0	2
Region 2 subtotal	**34**	**5**	**73**	**39**	**0**	**78**
Avon-by-the-Sea	0	0	0	0	0	0
Belmar - Shark River Inlet	0	0	0	0	0	0
Sea Girt - Wreck Pond	1	0	2	1	0	2
Sea Girt - NGTC	0	2	2	1	1	3
Mantoloking	0	0	0	0	0	0
Seaside Park	2	0	4	1	0	2
Island Beach SP – Northern NA	2	0	4	3	1	7
Island Beach SP – Southern NA	0	0	0	0	2	2
Barnegat Light	6	2	14	7	1	15
Loveladies	0	0	0	0	0	0
Region 3 subtotal	**11**	**4**	**26**	**13**	**5**	**31**
Long Beach Township	0	0	0	0	0	0
Holgate	51	0	102	48	1	97
Little Beach	6	1	13	6	0	12
North Brigantine NA	1	0	2	1	0	2
Region 4 subtotal	**58**	**1**	**117**	**55**	**1**	**111**
Brigantine Beach	0	0	0	0	0	0
Brigantine - Inlet (Cove)	0	0	0	0	0	0
Seaview Harbor Marina	0	0	0	0	0	0
Malibu WMA	1	1	3	1	0	2
Ocean City - North	4	0	8	4	0	8
Ocean City - Center	0	0	0	0	0	0
Region 5 subtotal	**5**	**1**	**11**	**5**	**0**	**10**
Corson's Inlet SP	3	2	8	3	0	6
Strathmere Natural Area	1	0	2	1	0	2
Strathmere (Upper Twp.)	0	0	0	0	0	0
Whale Beach	0	0	0	0	0	0
Townsend's Inlet	0	0	0	0	0	0
Sea Isle	0	0	0	0	0	0
Avalon - North	0	0	0	0	0	0
Avalon - Dunes	0	1	1	0	1	1
Stone Harbor - Oceanfront	0	0	0	0	0	0
Region 6 subtotal	**4**	**3**	**11**	**4**	**1**	**9**
Stone Harbor Point	1	1	3	2	1	5
N. Wildwood - Hereford Inlet	0	0	0	0	0	0
2-Mile Beach - USFWS	0	1	1	0	1	1
2-Mile Beach - LSU	0	0	0	0	0	0
Coast Guard - TRACEN	0	0	0	0	0	0
Cape May City	0	0	0	0	0	0
Cape May Meadows - TNC	0	0	0	0	1	1
Cape May Meadows - CMPSP	0	0	0	0	0	0
Cape May Point Borough	0	0	0	0	0	0
Region 7 subtotal	**1**	**2**	**4**	**2**	**3**	**7**
Total	**113**	**16**	**242**	**118**	**10**	**246**

[1]This site includes Sea Bright – South and Monmouth Beach – North

Table 3. New Jersey Piping Plover nesting summary by sites: 2022

SITE	Pairs	Pairs Hatched	Chicks Fledged	Pair Success	Fledge Rate	SP Fledge Rate
Sandy Hook NRA	33	21	28	0.64	0.85	1.33
Coast Guard	*1*	*1*	*3*	1.00	3.00	3.00
North Beach	*10*	*9*	*11*	0.90	1.10	1.22
North Gunnison	*7*	*3*	*3*	0.43	0.43	1.00
South Gunnison	*4*	*3*	*4*	0.75	1.00	1.33
D-Lot	*1*	*0*	*0*	0.00	0.00	0.00
Critical Zone	*5*	*3*	*6*	0.60	1.20	1.20
Hidden Beach	*1*	*0*	*0*	0.00	0.00	0.00
Fee Beach	*3*	*1*	*0*	0.33	0.00	0.00
South Fee Beach	*1*	*1*	*1*	1.00	1.00	1.00
Sea Bright - North	1	0	0	0.00	0.00	0.00
Monmouth Beach – North[1]	3	3	1	1.00	0.33	0.33
Long Branch	1	0	0	0.00	0.00	0.00
Deal	1	0	0	0.00	0.00	0.00
Region 2 Subtotal	**39**	**24**	**29**	**0.62**	**0.74**	**1.21**
Sea Girt – Wreck Pond	1	0	0	0.00	0.00	0.00
Sea Girt - NGTC	1	1	0	1.00	0.00	0.00
Seaside Park	1	1	4	1.00	4.00	4.00
Island Beach SP NNA	3	1	0	0.33	0.00	0.00
Barnegat Light[2]	7	5	9	0.71	1.29	1.80
Region 3 Subtotal	**13**	**8**	**13**	**0.62**	**1.00**	**1.63**
EB Forsythe NWR	54	30	49	0.56	0.91	1.63
Holgate	*48*	*30*	*49*	0.63	1.02	1.63
Little Beach	*6*	*0*	*0*	0.00	0.00	0.00
North Brigantine NA	1	0	0	0.00	0.00	0.00
Region 4 Subtotal	**55**	**30**	**49**	**0.55**	**0.89**	**1.63**
Malibu Beach WMA	1	1	1	1.00	1.00	1.00
Ocean City North	4	3	3	0.75	0.75	1.00
Region 5 Subtotal	**5**	**4**	**4**	**0.80**	**0.80**	**1.00**
Corson's Inlet SP	3	2	4	0.67	1.33	2.00
Strathmere NA	1	1	1	1.00	1.00	1.00
Region 6 Subtotal	**4**	**3**	**5**	**0.75**	**1.25**	**1.67**
Stone Harbor Point	2	1	0	0.50	0.00	0.00
Region 7 Subtotal	**2**	**1**	**0**	**0.50**	**0.00**	**0.00**
NJFW sites TOTAL	**31**	**19**	**23**	**0.61**	**0.74**	**1.21**
All NJ sites TOTAL	**118**	**70**	**100**	**0.59**	**0.85**	**1.43**
# Active Sites	**26**					

[1]This site includes Sea Bright – South and Monmouth Beach – North
[2] This site includes Borough of Barnegat Light and Barnegat Light Restoration Area (BLRA). BLRA fledge rate was 1.60 fledglings/pair

Pair Success equals the percentage of pairs that hatched young (at least one chick observed).
Fledge Rate equals the number of chicks fledged per pair.
Successful Pair (SP) Fledge Rate equals the number of chicks fledged per pair that successfully hatched young.

Table 4. New Jersey Piping Plover nesting summary: 1987-2022

Site	Pairs	Pairs Hatch	Chicks Fledge	Pair Success	Fledge Rate	SP Fldg Rate
Sandy Hook Coast Guard	4.92	3.75	7.06	0.79	1.45	1.85
Sandy Hook North Beach	10.39	7.97	14.08	0.76	1.35	1.79
Sandy Hook North Beach Recreational	1.29	1.29	1.29	0.86	0.93	0.93
Sandy Hook North Gunnison	6.10	4.83	7.47	0.75	1.13	1.42
Sandy Hook South Gunnison	4.42	3.13	4.94	0.68	1.06	1.40
Sandy Hook - E-Lot	0.25	0.25	0.25	0.50	0.50	0.50
Sandy Hook Visitor's Center	0.29	0.14	0.00	0.33	0.00	0.00
Sandy Hook D-Lot	0.29	0.14	0.29	0.50	1.00	1.00
Sandy Hook Skeleton Hill Island	0.14	0.00	0.00	0.00	0.00	0.00
Sandy Hook Critical Zone	4.20	3.20	3.80	0.75	0.92	1.24
Sandy Hook Hidden Beach	3.11	2.04	4.15	0.62	1.22	1.71
Sandy Hook - B-Lot	0.25	0.00	0.00	0.00	0.00	0.00
Sandy Hook Fee Beach	4.12	2.88	4.44	0.68	1.09	1.43
Sandy Hook South Fee Beach	1.31	1.00	2.19	0.82	1.81	2.10
Sea Bright North	5.35	3.57	6.96	0.56	1.12	1.70
Monmouth Beach North	2.63	1.88	3.25	0.77	1.31	1.64
Monmouth Beach South	0.44	0.44	1.33	0.80	2.40	2.00
Seven Presidents Park	1.28	1.00	1.83	0.71	1.33	1.37
Long Branch	0.29	0.14	0.14	0.50	0.50	0.50
Deal	0.20	0.00	0.00	0.00	0.00	0.00
Region 2 Subtotal	**39.75**	**29.58**	**50.17**	**0.74**	**1.27**	**1.73**
Belmar - Shark River Inlet	0.43	0.14	0.29	0.25	0.50	0.50
Sea Girt - Wreck Pond	0.75	0.50	0.83	0.57	1.29	1.29
Sea Girt - NGTC	0.88	0.75	1.00	0.80	1.40	0.60
Mantoloking	3.65	3.00	5.88	0.68	1.19	1.34
Seaside Park	0.50	0.50	1.33	1.00	3.00	3.00
Island Beach SP - Northern Natural Area	2.22	1.88	1.88	0.69	0.54	0.54
Island Beach SP - Southern Natural Area	0.43	0.29	0.43	0.50	0.75	0.75
Island Beach SP - Dike	0.78	0.22	0.33	0.21	0.29	0.75
Barnegat Light	3.97	2.83	4.75	0.77	1.38	1.83
Highbar	0.14	0.14	0.00	0.50	0.00	0.00
Loveladies	0.62	0.62	1.00	0.89	1.44	1.44
Region 3 Subtotal	**7.31**	**5.47**	**9.25**	**0.75**	**1.32**	**1.77**
Long Beach Township	0.17	0.17	0.67	0.50	2.00	2.00
Holgate	17.42	11.75	18.39	0.66	1.05	1.67
Little Beach	12.61	7.29	11.14	0.60	0.91	1.50
North Brigantine N. A.	5.84	3.65	7.16	0.61	1.20	1.41
Region 4 Subtotal	**35.03**	**22.00**	**35.50**	**0.62**	**1.01**	**1.61**
Brigantine Beach	5.29	3.59	3.53	0.53	0.52	0.67
Brigantine - Inlet (Cove)	1.13	0.87	1.53	0.73	1.53	1.78
Longport Sodbanks	0.38	0.13	0.38	0.17	0.50	1.00
Malibu Wildlife Management Area	0.64	0.64	0.73	1.00	1.14	1.14
Seaview Harbor Marina	0.25	0.25	0.50	0.67	1.33	1.33
Ocean City - North	2.77	1.95	2.64	0.71	0.85	1.23
Ocean City - Center	3.96	2.61	1.87	0.64	0.37	0.55
Region 5 Subtotal	**7.47**	**5.17**	**5.53**	**0.69**	**0.80**	**1.03**
Corson's Inlet State Park	3.11	2.21	2.32	0.74	0.95	0.95
Corson's Sodbank	0.14	0.14	0.00	0.50	0.00	0.00
Strathmere NA	0.77	0.46	0.77	0.61	1.06	1.00
Strathmere	2.29	1.42	1.04	0.67	0.47	0.65
Whale Beach	4.37	3.00	3.26	0.52	0.59	0.91
Sea Isle City - North	2.53	1.59	2.88	0.61	1.21	1.78
Sea Isle City - South	1.81	1.25	1.00	0.54	0.45	0.60
Townsend's Inlet	1.37	1.16	1.37	0.79	0.92	1.04
Avalon - North	1.55	1.40	1.80	0.89	1.10	1.14
Avalon - Dunes	3.44	2.14	2.36	0.62	0.79	1.04
Region 6 Subtotal	**13.53**	**9.28**	**10.39**	**0.72**	**0.83**	**1.10**
Stone Harbor Point	7.17	3.21	2.63	0.48	0.35	0.70
Champagne Island	0.58	0.25	0.33	0.29	0.57	0.67
N. Wildwood - Hereford Inlet	1.40	0.90	0.60	0.51	0.31	0.33
N. Wildwood - Oceanfront	1.71	1.21	0.43	0.61	0.19	0.25
Wildwood Crest	0.14	0.14	0.00	0.50	0.00	0.00
USFWS - Cape May NWR	0.29	0.29	0.14	0.67	0.33	0.33
Coast Guard - LSU	1.19	0.67	0.52	0.44	0.36	0.46
Coast Guard - TRACEN	2.53	1.70	2.17	0.61	0.83	1.10
Cape May	0.69	0.56	0.69	0.56	0.44	0.44
Cape May Meadows	4.14	3.54	3.89	0.79	0.92	1.10
The Nature Conservancy	3.30	2.79	2.97	0.86	0.97	1.03
Cape May Point SP	1.48	1.24	1.48	0.66	0.76	0.79
Higbee/Magnesite	0.14	0.14	0.00	0.50	0.00	0.00
Cape May Ferry	0.25	0.00	0.00	0.00	0.00	0.00
Region 7 Subtotal	**13.72**	**9.06**	**8.83**	**0.63**	**0.59**	**0.85**
Total NJDFW only	**49.36**	**33.14**	**44.89**	**0.68**	**0.96**	**1.38**
Total State	**116.67**	**80.56**	**119.67**	**0.69**	**1.04**	**1.48**

Figure 1. New Jersey Piping Plover population and productivity: 1987-2022

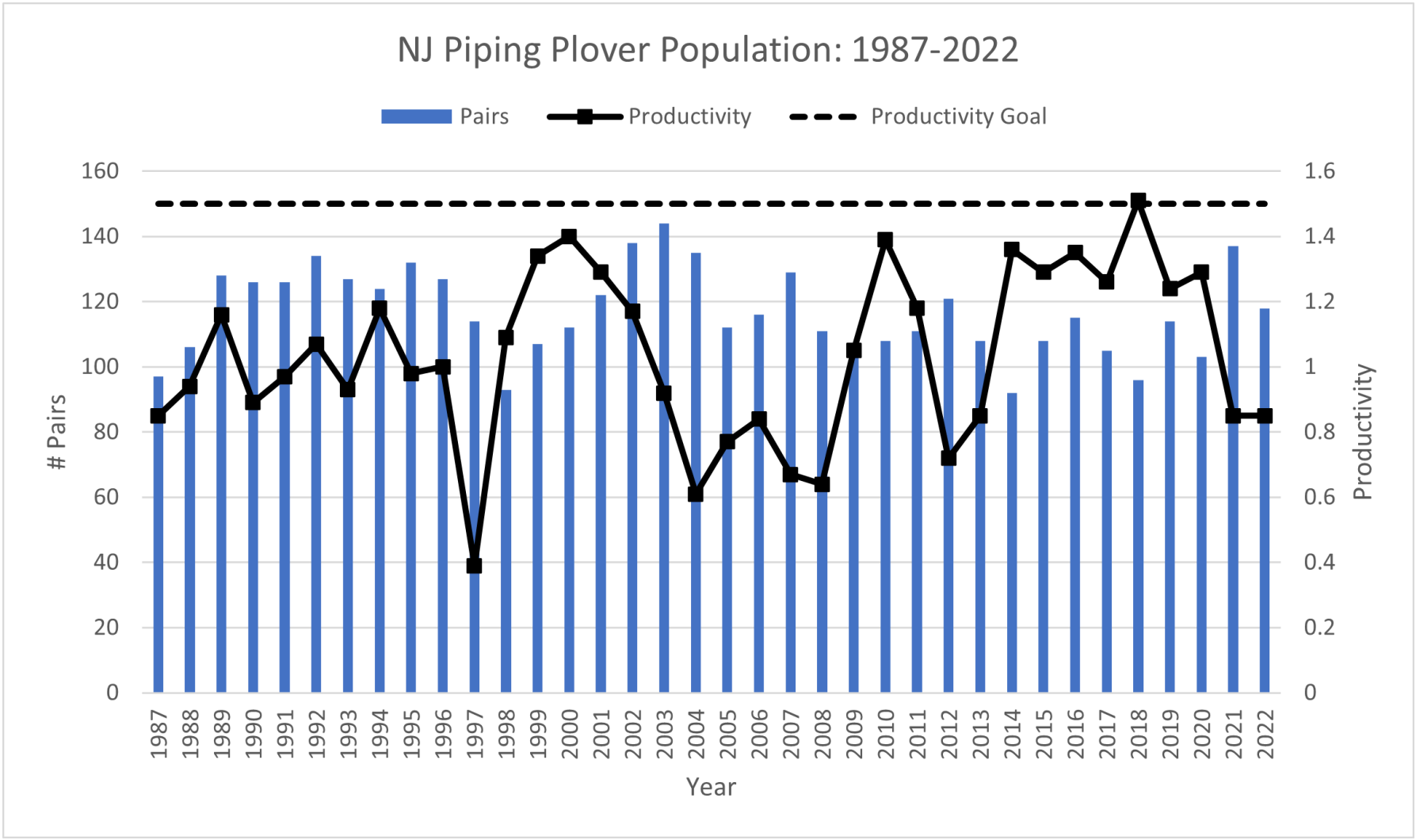

Figure 2. Causes of Piping Plover nest failure in New Jersey, all sites: 2022