

Piping Plover Nesting Results in New Jersey:2021

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Photo Courtesy of Northside Jim

SUMMARY OF FINDINGS:

One hundred thirty-seven (137) pairs of piping plovers nested in New Jersey in 2021, an astounding 33% population increase compared to 2020 (103 pairs). Statewide productivity in 2021 (0.85 fledglings/pair) was below the long-term average (1.04 fledglings/pair) and below the federal recovery goal (1.50 fledglings/pair). Statewide productivity had not dipped below 1.00 fledglings/pair since 2013.

The total number of adults recorded for the entire nesting season (277) was higher than the number of adults recorded during the date-restricted Atlantic coast census survey conducted June 1-9 (267). The final number of pairs for the season (137) also increased from the pair number tallied during the date-restricted census period (124). A small number of unpaired adults were recorded this season (3) as compared to prior years (16 in 2017, 23 in 2020). It is not fully understood why some years result in more unpaired adults than others, however years in which an abundance of unpaired adults remain on sites are typically years where the pair number is lower.

For the last 15 years, the northern Monmouth County region has maintained the highest number of pairs per region. In 2021, the Holgate and Little Beach units of E.B. Forsythe National Wildlife Refuge became the stronghold of the state's population with the largest percentage of pairs (59 pairs or 43% of the statewide total). Combined with the state's North Brigantine Natural Area, 44% of the statewide population nested between these three sites, which connect a significant portion of New Jersey's undeveloped coastline. The northern Monmouth County region maintained a significant portion of the statewide total (48 pairs or 35%). Sandy Hook accounted for 37 pairs or 27% of the statewide total. The region consisting of southern Monmouth County and central Ocean County accounted for 9% of the statewide total (12 pairs). Southern Atlantic County accounted for 1% of the statewide total (1 pair). Cape May County, the region consisting of Ocean City to Cape May, accounted for 11% of the statewide total (15 pairs).

Looking at individual sites, the most significant shift in 2021 occurred in Cape May County where the population increased 114% as compared to 2020. Four historic nesting sites were revived in the county. Stone Harbor Point saw a 200% increase in pair numbers in 2021 which primarily drove the county's overall pair increase. The Holgate and Little Beach Units of E.B. Forsythe NWR added an impressive 20 pairs to their population (39 pairs in 2020, 59 pairs in 2021). The majority of additional pairs were located at Holgate. The Barnegat Light population also increased 200% (two pairs in 2020, six pairs in 2021). The remainder of the state's population increased at almost all active sites except for Sandy Hook, Sea Girt – National Guard Training Center, and Island Beach State Park.

Pairs nested at 28 sites statewide in 2021 with nine sites gained and one site lost. Several nesting sites had not been active in many years including Mantoloking (last active in 1997), Malibu Beach Wildlife Management Area (last active in 2015), Strathmere (last active in 2014), and Two-Mile Beach (last active in 2010). Seaside Park was active this year and it had not historically been known to host piping plovers. New Jersey Division of Fish and Wildlife (NJDFW) monitored 16 of the active nesting sites (57% of the sites statewide), accounting for 41 nesting pairs (30% of the nesting pairs statewide). While NJDFW typically monitors approximately half of the state's nesting sites, the total number of active pairs increased significantly (24 pairs monitored in 2020, 41 pairs monitored in 2021). NJDFW last monitored that number of pairs over a decade ago. Although pair dispersal across state and municipal beaches increased this year, the majority of the population remains on federal property (98 pairs or 72% of the statewide total).

Pair-nest success (the percentage of pairs that successfully hatch at least one nest) was low this year (64%). This was a considerable drop from prior year highs in 2018 (91%) and 2019 (83%). Statewide pair-nest success fell below the long-term average (70%). At NJDFW-monitored sites, pair-nest success (61%) was down significantly from 2020 (83%) and 2019 (73%) and was below the long-term average (68%). Low pair-nest success is primarily the result of the Memorial Day weekend nor'easter that destroyed approximately two-thirds of the state's nests at the time, and subsequent re-nests were lost to additional weather-related events and predators.

The cause of nest failure was determined in 156 of the 165 nesting attempts statewide (95%). Depredation remains the leading cause of nest failure (76 or 46%) statewide for the ninth consecutive year. Of the depredated nests, more than half (43 or 57%) were lost to mammals and the majority of those (29 or 68%) were lost to coyote. The remainder of mammalian depredated nests were lost to red fox (12 or 28%), mink (one or 2%), and an undetermined mammal species (one or 2%). Avian depredation by crow, gull, and undetermined avian species was the cause of seven nest losses (9%). The remaining depredated nests were lost to ghost crab (one or 1%) or unknown predator species (25 or 33%). Flooding was responsible for 60 nest losses or 36% of the total failed nesting attempts. This is markedly higher than recent years and is mostly attributed to the Memorial Day weekend nor'easter. Nest abandonment was low to moderate in 2021 (16 or 13%) compared to prior years. Nest loss due to eggs being blown over or buried led to one failure (<1%). The cause of nest failure could not be determined in nine (5%) nest losses.

The statewide fledgling rate, which includes data collected and provided by all state cooperators, was 0.85 fledglings/pair. Productivity fell below the 1.245 fledglings/pair range-wide threshold for population maintenance and below the productivity goal (1.50 fledglings/pair) established by the USFWS Recovery Plan for Atlantic coast piping plovers. Looking at long-term trends, statewide productivity had remained above 1.00 fledglings/pair for seven consecutive years prior to 2021. NJDFW-monitored sites were well below 2020 (1.54 fledglings/pair) with a productivity of 0.71 fledglings/pair and below the long-term average (0.96 fledglings/pair). While this decline in productivity is troubling, it is not wholly unexpected in New Jersey with historic productivity dipping as low as 0.39 fledglings/pair (1997). Causes of chick mortality remained difficult to address. Identifying chick predators is often based solely on suspicion, with scant evidence left behind.

As is typical, productivity varied by individual site and region. Productivity was considerably lower at sites that have recently performed well. Northern Monmouth County continued its downward productivity trend, influencing the rates in the region (0.88 fledglings/pair in 2021, 0.99 fledglings/pair in 2020, 1.23 fledglings/pair in 2019). Sea Bright declined significantly with only one chick fledged for seven pairs (0.14 fledglings/pair) as compared to prior year highs (2.17 fledglings/pair in 2020). Fortunately, Sandy Hook's productivity increased (1.08 fledglings/pair in 2021 versus 0.78 fledglings/pair in 2020) and contributed 34% of the total fledged chicks in 2021. Southern Monmouth County and Ocean County saw the highest levels of productivity statewide. This is surprising considering the higher levels of recreation at most of these municipal and state-owned sites. Sea Girt (Wreck Pond and National Guard Training Center) had the highest productivity

in the state (3.50 fledglings/pair). Seaside Park, a new site for the state, had considerably higher productivity when compared to the rest of the state (2.00 fledglings/pair). Island Beach State Park Northern Natural Area did not fledge any chicks, a first for this site since nesting began there in 2018. Barnegat Light saw a decline in productivity compared to 2020 but overall had one of the higher productivity rates statewide (1.50 fledglings/pair). The region consisting of Holgate, Little Beach, and North Brigantine Natural Area saw a drastic decline in productivity (0.77 fledgling/pair in 2021 versus 1.68 fledglings/pair in 2020). Nonetheless, Holgate and Little Beach contributed 40% of the total fledged chicks in 2021. While Cape May County saw a considerable pair increase in 2021, those pairs struggled to fledge chicks. Productivity remained low in the county (0.53 fledglings/pair).

DISCUSSION and CONCLUSION:

New Jersey's statewide breeding piping plover population saw an unprecedented 33% increase in pair number in 2021 (137 pairs) compared to 2020 (103 pairs). This is the third highest pair number noted since intensive monitoring and management began in 1986 after federal listing. Pair numbers increased in nearly every region of the state outside of Sandy Hook and Monmouth Count, where it plateaued. The factors contributing to this pair increase are not fully understood and do not appear to be solely linked to productivity. Increased pair numbers are certainly a welcome reversal from dipping to historic lows (92 pairs in 2014) but managers are still struggling to understand the variables behind these boom and bust years. The reasons behind a 33% population increase likely include dispersal by fledglings produced in neighboring states, like Delaware, which has recorded extraordinarily high productivity rates over multiple years. Managers have also considered whether COVID-19 restrictions on breeding and wintering grounds may have impacted disturbance and ultimately resulted in higher survival rates. The number of unpaired adults in the state also seem to correlate to pair increases over time. In years when pair number is low, a particularly high number of unpaired adults is noted (2020 – 103 pairs, 23 unpaired adults). In years when pair number increases, the number of unpaired adults is typically low (2021 – 137 adults, 3 unpaired adults). It is often observed that these unpaired adults are males lacking females, suggesting a possible unbalanced ratio of males to females in the population in some years.

For the first time in seven years, New Jersey's productivity dipped below 1.00 fledglings/pair. The state has long struggled to meet the productivity goal (1.50 fledglings/pair) established in the Recovery Plan, but in recent years has mostly been able to achieve 1.245 fledglings/pair for population maintenance. Looking at long-term trends, the state has often seen periods of low productivity in years where pair number increases, which proportionally makes sense. The more pairs there are, the more fledglings are needed to meet productivity goals. Historically, productivity above 1.00 fledglings/pair has generally resulted in population increases but that was not necessarily the case over the last seven years when productivity was well above 1.00 fledglings/pair and some years experienced decreases. A dramatic rise in pair number in 2021 when productivity was moderate (but not high) in 2019 and 2020 was another example of this imperfect relationship between local productivity and pairs in New Jersey. This suggests there are other variables at play, such as factors contributing to fitness and survival on both wintering and breeding grounds. Managers anticipate the pair number to decline in 2022 since population maintenance and recovery goals were not achieved.

Over the last decade, federal lands such as Gateway National Recreation Area's Sandy Hook Unit and E.B. Forsythe National Wildlife Refuge's Holgate and Little Beach Units have maintained the majority of the state's population (72% in 2021). In addition to hosting the largest percentage of the state's population, federal sites also produced 75% of all fledged chicks. In particular, Holgate added 17 pairs, or a 59% pair increase compared to 2020. Holgate has provided premiere nesting and chick-rearing habitat since Hurricane Sandy in 2012 and plays a critical role in the state's recovery efforts. State-owned and municipal beaches played an important role this year for increasing nesting capacity. Recreational beaches in the southern Monmouth and Ocean County region had the highest fledge rates of any site in the state. Seaside Park was an especially notable surprise to managers where two pairs fledged four chicks at a site with no nesting history, and at one of

the most popular recreational beaches in the state. While some sites, like those in Strathmere, were revived for the first time in a number of years, they failed to produce chicks. Problems at sites like Strathmere, and other recreational beaches that have remained inactive for longer periods of time, can become larger issues the longer birds are absent. In particular, dog-walking (on- and off-leash) becomes problematic as town ordinances related to dog-walking are often not upheld when NJDFW staff is not present. Without staff and resources on-hand to address problems, the worse they appear to get over time and become hurdles in addressing when birds are present. Municipalities and other state partners need to ensure conservation measures remain in place during species' absence to maintain site viability. While the pair increase in 2021 was a welcome reversal from pair declines, staffing resources remained at the same level as previous years. This is a challenging issue for managers to address, as these unpredictable sharp increases and decreases in the population make it challenging to predict staffing needs.

The biggest issue faced by managers in the state was the Memorial Day weekend nor'easter. With normal spring temperatures and fair weather conditions, pairs returned and began breeding at their expected time throughout most of the state (mid-to-late April). A three-day storm event brought high winds, lower-than-average temperatures, heavy rain, and some minor coastal flooding. The storm destroyed approximately 57% of all active nests along the coast. A handful of nests were in the process of hatching and chicks perished due to prolonged exposure, as did most chicks that had hatched prior to the storm. The majority of pairs re-nested but were plagued by predator events, which is typical as a nesting season progresses. First nesting attempts usually have a higher success rate than re-nest attempts. In addition to total nest loss, the storm may have impacted adult and chick fitness. A higher than usual number of unhatched eggs were recorded in 2021 (23% in 2021 vs. 8% in 2020). The number of hatched chicks (260) was low when considering the high number of nesting pairs, and overall chick survival was lower than the previous four years (45% in 2021, 55% in 2020, 49% in 2019, 50% in 2018, 50% in 2017).

While the storm was a devastating blow this season, other nest-loss related events continued to trouble managers. The abandonment rate in 2021 increased (12%), as was anticipated considering the low-level (5%) in 2020 due to COVID-19 related challenges with deploying exclosures. At NJDFW-monitored sites, 40% of exclosed nest failures were due to abandonment. Half of those exclosed nest failures were storm-related and an adult mortality event was not noted as marked adults were observed nesting again. At least one exclosed nest failure was attributed to an adult mortality event by red fox as was shown on a nest camera. Managers continue to struggle with decision-making on exclosure use each year. This year felt particularly pressing with a high rate of first nest attempts lost to flooding (36% of total failed nests) and increased predator pressure as the season progressed. Mammalian predators, particularly coyote, played the primary role in nest loss. Persistent red fox remained an issue at some northern sites but were largely missing where coyote dominated the landscape. All cooperators and managers in the state have difficulty addressing predator issues in-season, as logistical constraints reduce the ability to effectively manage this threat. Additional resources are needed to readily address predators as exclosure use alone is not a sound solution and has some negative net effect on adult survival.

Habitat manipulation experiments continued in 2021. The Barnegat Light Restoration Project is now in its second-year post-construction. The project was a phased approach to habitat restoration and was fully completed with alternate foraging features in 2019. Broods responded well in 2020 recording high use (78% of all observations) of the constructed foraging ponds. Pair numbers declined last year, and the nesting locations were largely on the outskirts of the newly restored habitat. This season proved productive with high pair recruitment and all nesting locations were well within the restored area, suggesting the site is now mimicking optimal nesting habitat. Broods were noted utilizing the foraging features at a lower rate (59% of all observations) but considering the higher pair number, competition for foraging areas also increased. Cape May Meadows underwent a large-scale habitat change in 2020. The elevation of the site has increased significantly

over the last 15 years and coupled with predator issues, the site no longer hosts nesting pairs. The Army Corps of Engineers removed approximately 164,000 cubic yards of sand from the site and significantly decreased the elevation to suitable levels for piping plovers. While pairs have yet to respond to the site, other beach-nesting bird species have started to recolonize, and two plovers were at observed resting in the habitat this spring. The increase in pairs and productivity directly across the bay in Delaware gives managers hope that recruitment may be on the horizon for Cape May Meadows in future seasons.

New Jersey's population has long been in flux, rising and falling with no clear indication of cause. This season was a welcome change with a near record number of pairs observed but highlights the complexity of factors contributing to population instability. Biologists in the state believe productivity is linked to pair increases but that there must be other variables driving this metric each year. It is likely that productivity, foraging quality, disturbance rates, immigration/emigration, and survival are all linked to New Jersey's population trends. Addressing all of these challenges remains complex, and likely unrealistic in a single season. Distribution throughout the state increased slightly but the bulk of the population remains on federal lands where managers can better protect piping plovers and their habitats from high disturbance levels. Municipal and state-owned sites struggle with mimicking highly suitable habitat while balancing recreational needs of the public. For New Jersey to move towards recovery, continued research addressing pair instability is needed and additional resources will be needed to aid managers with dispersal into highly recreated nesting habitats. New Jersey Division of Fish and Wildlife remains committed to recovering piping plovers throughout the state.

LITERATURE CITED:

U.S. Fish & Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, MA. 258 pp.

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Table 1. Number of pairs of piping plovers at New Jersey nesting sites: 2012-2021

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Sandy Hook NRA	50	43	47	53	51	40	38	41	40	37
<i>Coast Guard</i>	4	3	4	3	5	3	3	3	2	2
<i>North Beach</i>	14	13	14	15	14	13	11	10	11	11
<i>North Beach Recreational</i>	0	0	0	0	1	1	1	3	2	1
<i>North Gunnison</i>	13	8	8	10	8	6	6	8	8	10
<i>South Gunnison</i>	5	7	9	8	7	5	3	3	4	4
<i>E-Lot</i>	0	0	0	0	0	0	0	1 ¹	0	0
<i>Visitor Center</i>	0	0	0	0	1	0	0	1 ¹	0	0
<i>Critical Zone</i>	6	5	4	7	6	5	6	6	6	3
<i>Hidden Beach</i>	4	3	4	4	4	3	3	1	0	1
<i>B-Lot</i>	0	0	0	0	0	0	0	1 ¹	0	0
<i>Fee Beach</i>	3	4	4	6	4	3	3	5 ¹	4	3
<i>South Fee Beach</i>	1	0	0	0	1	1	2	1	3	2
Sea Bright - North	2	0	0	1	6	10	10	10	6	7 ¹
Monmouth Beach - North ²	0	2	1	1 ¹	5	3	3	4 ¹	2	5 ¹
Monmouth Beach - South	0	0	0	0	0	0	1	0	0	0
Seven Presidents Park	0	0	1	1 ¹	1	1	0	2 ¹	0	0
Region 2 subtotal	52	45	49	55	63	54	52	56	48	48
Belmar – Shark River Inlet	0	0	1	0	0	0	1	1	0	0
Sea Girt – Wreck Pond	1	0	0	0	0	0	0	1 ¹	0	1
Sea Girt – NGTC	0	0	0	0	0	0	0	2 ¹	1	1
Mantoloking	0	0	0	0	0	0	0	0	0	1 ¹
Seaside Park	0	0	0	0	0	0	0	0	0	2 ¹
Island Beach SP NNA	0	0	0	0	0	0	4	4	4	2
Island Beach SP SNA	0	0	0	0	1	1	0	1 ¹	0	0
Barnegat Light	1	2	1	1	3	5	3	3 ¹	2	6
Loveladies	0	0	0	0	0	0	0	1	0	0
Region 3 subtotal	2	2	2	1	4	6	8	11	7	12
Long Beach Township	0	0	0	0	0	1 ¹	0	0	0	0
EB Forsythe NWR	32	35	26	38	37	37	31	40	39	59
<i>Holgate</i>	14	12	12	24	25	22 ¹	18	29 ¹	29	46
<i>Little Beach</i>	18	23	14	14	12	15	13	12 ¹	10	13 ¹
North Brigantine NA	8	6	3	5	5	4	2	2	2	3 ¹
Region 4 subtotal	40	41	29	43	42	41	33	42	41	61
Seaview Harbor Marina	1	1	0	1 ¹	0	0	0	0	0	0
Malibu WMA	0	0	1	1 ¹	0	0	0	0	0	1
Ocean City – North	0	0	0	0	0	0	0	0	2	3 ¹
Region 5 subtotal	1	1	1	1	0	0	0	0	2	4
Corson's Inlet SP	0	0	0	0	0	0	0	2	2	3 ¹
Strathmere NA	1	2 ¹	1	0	0	0	0	0	0	1
Strathmere (Upper Twp.)	2	4 ¹	2	0	0	0	0	0	0	1
Avalon - Dunes	5	3	3 ¹	2 ¹	1	1	0	0	0	0
Region 6 subtotal	8	8	6	2	1	1	0	2	2	4
Stone Harbor Point	9	6	4 ¹	6 ¹	5	3	3	3	2	6
N. Wildwood - Hereford	1	1	1	1	0	0	0	0	0	0
Two Mile Beach	0	0	0	0	0	0	0	0	0	2
<i>Cape May NWR</i>	0	0	0	0	0	0	0	0	0	1
<i>Coast Guard - LSU</i>	0	0	0	0	0	0	0	0	0	1
<i>Coast Guard - TRACEN</i>	2	1 ¹	0	0	0	0	0	0	1	0
<i>Cape May City</i>	0	1 ¹	0	0	0	0	0	0	0	0
<i>Cape May Meadows</i>	6	3	1	0	0	0	0	0	0	0
<i>The Nature Conservancy</i>	3	1	0	0	0	0	0	0	0	0
<i>Cape May Point SP</i>	3	2	1	0	0	0	0	0	0	0
Region 7 subtotal	18	11	6	6	5	3	3	3	3	8
Total Pairs	121	108	92	108	115	105	96	114	103	137
Pairs at NJDFW sites	36	29	19	17	27	29	27	33	24	41

¹ The same pair nested at two nearby sites. Therefore “subtotals” and “totals” are less than sum of individual sites.

² This site includes Sea Bright – South and Monmouth Beach – North

Table 2. New Jersey piping plover window census results: June 1-9, 2021

	State Census Count			Final Season Count		
	# Pairs	# Unpaired Adults ¹	# Total Adults	# Pairs	# Unpaired Adults ¹	# Total Adults
Sandy Hook Coast Guard	2	0	4	2	0	4
Sandy Hook North Beach	8	2	18	11	0	22
Sandy Hook North Beach Recreational	1	0	2	1	0	2
Sandy Hook North Gunnison	9	3	21	10	0	20
Sandy Hook South Gunnison	3	2	8	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 Critical Zone	3	0	6	3	0	6
Sandy Hook Hidden Beach	0	0	0	1	0	2
Sandy Hook B-Lot	0	0	0	0	0	0
Sandy Hook Fee Beach	2	1	5	3	0	6
Sandy Hook South Fee Beach	2	0	4	2	0	4
Sea Bright North	6	1	13	7 ¹	1	15
Monmouth Beach North ²	4	0	8	5 ¹	0	10
Monmouth Beach South	0	0	0	0	0	0
Seven Presidents Park	0	0	0	0	0	0
Long Branch	0	0	0	0	0	0
Region 2 subtotal	40	9	89	48	1	97
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	1	0	2	1	0	2
Mantoloking	0	0	0	1 ¹	0	2
Seaside Park	2	0	4	2 ¹	0	4
Island Beach SP – Northern NA	2	1	5	2	0	4
Island Beach SP – Southern NA	0	0	0	0	0	0
Barnegat Light	6	1	13	6	1	13
Loveladies	0	0	0	0	0	0
Region 3 subtotal	12	2	26	12	1	25
Long Beach Township	0	0	0	0	0	0
Holgate	46	2	94	46	0	92
Little Beach	13	2	28	13 ¹	0	26
North Brigantine NA	1	1	3	3 ¹	0	6
Region 4 subtotal	60	5	125	61	0	122
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	1	3
Ocean City - North	2	2	6	3 ¹	0	6
Ocean City - Center	0	0	0	0	0	0
Region 5 subtotal	3	3	9	4	1	9
Corson's Inlet SP	2	0	4	3 ¹	0	6
Strathmere Natural Area	1	0	2	1	0	2
Strathmere (Upper Twp.)	1	0	2	1	0	2
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	0	0	0	0	0
Stone Harbor - Oceanfront	0	0	0	0	0	0
Region 6 subtotal	4	0	8	4	0	8
Stone Harbor Point	4	0	8	6	0	12
N. Wildwood - Hereford Inlet	0	0	0	0	0	0
2-Mile Beach - USFWS	0	0	0	1	0	2
2-Mile Beach - LSU	1	0	2	1	0	2
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	0	0
Cape May Meadows - CMPSP	0	0	0	0	0	0
Cape May Point Borough	0	0	0	0	0	0
Region 7 subtotal	5	0	10	8	0	16
Total	124	19	267	137	3	277

¹ "Unpaired Adults" includes adults engaged in breeding behavior, sometimes with other adults, but are never confirmed with a nest

² This site includes Sea Bright – South and Monmouth Beach - North

Table 3. New Jersey piping plover nesting summary by sites: 2021

SITE	2021					
	Pairs	Pairs Hatched	Chicks Fledged	Pair Success	Fledge Rate	SP Fledge Rate
Sandy Hook NRA	37	26	40	0.70	1.08	1.54
<i>Coast Guard</i>	2	1	1	0.50	0.50	1.00
<i>North Beach</i>	11	7	14	0.64	1.27	2.00
<i>North Beach Recreational</i>	1	1	1	1.00	1.00	1.00
<i>North Gunnison</i>	10	9	13	0.90	1.30	1.44
<i>South Gunnison</i>	4	2	0	0.50	0.00	0.00
<i>Critical Zone</i>	3	3	6	1.00	2.00	2.00
<i>Hidden Beach</i>	1	0	0	0.00	0.00	0.00
<i>Fee Beach</i>	3	1	2	0.33	0.67	2.00
<i>South Fee Beach</i>	2	2	3	1.00	1.50	1.50
Sea Bright - North	7 ¹	3	1	0.43	0.14	0.33
Monmouth Beach – North ²	5 ¹	1	1	0.20	0.20	1.00
Region 2 Subtotal	48	30	42	0.63	0.88	1.40
Sea Girt – Wreck Pond	1	1	4	1.00	4.00	4.00
Sea Girt - NGTC	1	1	3	1.00	3.00	3.00
Mantoloking	1 ¹	0	0	0.00	0.00	0.00
Seaside Park	2 ¹	2	4	1.00	2.00	2.00
Island Beach SP NNA	2	1	0	0.50	0.00	0.00
Barnegat Light	6	5	9	0.83	1.50	1.80
Region 3 Subtotal	12	10	20	0.83	1.67	2.00
EB Forsythe NWR	59	35	47	0.59	0.80	1.34
<i>Holgate</i>	46	26	43	0.57	0.93	1.65
<i>Little Beach</i>	13 ¹	9	4	0.69	0.31	0.44
North Brigantine NA	3 ¹	0	0	0.00	0.00	0.00
Region 4 Subtotal	61	35	47	0.57	0.77	1.34
Malibu Beach WMA	1	1	1	1.00	1.00	1.00
Ocean City North	3 ¹	3	2	1.00	0.67	0.67
Region 5 Subtotal	4	4	3	1.00	0.75	0.75
Corson’s Inlet SP	3 ¹	2	3	0.67	1.00	1.50
Strathmere NA	1	0	0	0.00	0.00	0.00
Strathmere Upper Twp	1	1	0	1.00	0.00	0.00
Region 6 Subtotal	4	3	3	0.75	0.75	1.00
Stone Harbor Point	6	3	1	0.50	0.17	0.33
Two-Mile Beach	2	2	1	1.00	0.50	0.50
<i>Cape May NWR</i>	1	1	1	1.00	1.00	1.00
<i>Coast Guard – LSU</i>	1	1	0	1.00	0.00	0.00
Region 7 Subtotal	8	5	2	0.63	0.25	0.40
NJDFW sites TOTAL	41	25	29	0.61	0.71	1.16
All NJ sites TOTAL	137	87	117	0.64	0.85	1.34
# Active Sites	28					

¹The same pair nested at two nearby sites. Therefore “subtotals” and “totals” are less than sum of individual sites.

²This site includes Sea Bright – South and Monmouth Beach - North

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: 1986-2021

Site	AVG 87-21					
	Pairs	Pairs Hatch	Chicks Fledge	Pair Success	Fledge Rate	SP Fldg Rate
Sandy Hook Coast Guard	5.03	3.83	7.17	0.78	1.41	1.82
Sandy Hook North Beach	10.40	7.94	14.17	0.75	1.36	1.81
Sandy Hook North Beach Recreational	1.50	1.50	1.50	1.00	1.08	1.08
Sandy Hook North Gunnison	6.07	4.90	7.62	0.76	1.15	1.43
Sandy Hook South Gunnison	4.43	3.13	4.97	0.67	1.06	1.40
Sandy Hook - E-Lot	0.33	0.33	0.33	1.00	1.00	1.00
Sandy Hook Visitor's Center	0.33	0.17	0.00	0.50	0.00	0.00
Sandy Hook D-Lot	0.17	0.17	0.33	1.00	2.00	2.00
Sandy Hook Skeleton Hill Island	0.17	0.00	0.00	0.00	0.00	0.00
Sandy Hook Critical Zone	4.17	3.21	3.72	0.76	0.91	1.21
Sandy Hook Hidden Beach	3.19	2.12	4.31	0.64	1.27	1.78
Sandy Hook - B-Lot	0.33	0.00	0.00	0.00	0.00	0.00
Sandy Hook Fee Beach	4.17	2.96	4.63	0.69	1.14	1.49
Sandy Hook South Fee Beach	1.33	1.00	2.27	0.81	1.87	2.18
Sea Bright North	5.55	3.73	7.27	0.59	1.18	1.79
Monmouth Beach North	2.61	1.83	3.35	0.76	1.36	1.70
Monmouth Beach South	0.50	0.50	1.50	1.00	3.00	2.40
Seven Presidents Park	1.35	1.06	1.94	0.76	1.43	1.46
Long Branch	0.17	0.17	0.17	1.00	1.00	1.00
Region 2 Subtotal	39.77	29.74	50.77	0.75	1.28	1.74
Belmar - Shark River Inlet	0.50	0.17	0.33	0.33	0.67	0.67
Sea Girt - Wreck Pond	0.73	0.55	0.91	0.67	1.50	1.50
Sea Girt - NGTC	0.86	0.71	1.14	0.75	1.75	0.75
Mantoloking	3.88	3.19	6.25	0.74	1.29	1.45
Seaside Park	0.67	0.67	1.33	1.00	2.00	2.00
Island Beach SP - Northern Natural Area	2.13	2.00	2.14	0.75	0.63	0.63
Island Beach SP - Southern Natural Area	0.50	0.33	0.50	0.67	1.00	1.00
Island Beach SP - Dike	0.88	0.25	0.38	0.28	0.39	1.00
Barneгат Light	3.89	2.77	4.63	0.77	1.38	1.83
Highbar	0.17	0.17	0.00	1.00	0.00	0.00
Loveladies	0.67	0.67	1.08	1.00	1.63	1.63
Region 3 Subtotal	7.14	5.40	9.14	0.76	1.33	1.77
Long Beach Township	0.20	0.20	0.80	1.00	4.00	4.00
Holgate	16.54	11.23	17.51	0.66	1.05	1.67
Little Beach	12.80	7.50	11.47	0.62	0.94	1.55
North Brigantine N. A.	6.00	3.77	7.40	0.63	1.24	1.45
Region 4 Subtotal	34.46	21.77	35.11	0.62	1.01	1.61
Brigantine Beach	5.63	3.81	3.75	0.58	0.57	0.73
Brigantine - Inlet (Cove)	1.21	0.93	1.64	0.81	1.70	2.00
Longport Sodbanks	0.43	0.14	0.43	0.25	0.75	1.50
Malibu Wildlife Management Area	0.60	0.60	0.70	1.00	1.17	1.17
Seaview Harbor Marina	0.29	0.29	0.57	1.00	2.00	2.00
Ocean City - North	2.71	1.90	2.62	0.70	0.86	1.24
Ocean City - Center	4.14	2.73	1.95	0.67	0.39	0.58
Region 5 Subtotal	7.54	5.20	5.57	0.69	0.80	1.04
Corson's Inlet State Park	3.11	2.22	2.26	0.74	0.93	0.91
Corson's Sodbank	0.17	0.17	0.00	1.00	0.00	0.00
Strathmere NA	0.75	0.42	0.75	0.56	1.06	1.13
Strathmere	2.39	1.48	1.09	0.71	0.50	0.69
Whale Beach	4.61	3.17	3.44	0.56	0.63	0.98
Sea Isle City - North	2.69	1.69	3.06	0.66	1.32	1.95
Sea Isle City - South	1.93	1.33	1.07	0.59	0.50	0.66
Townsend's Inlet	1.44	1.22	1.44	0.85	0.99	1.12
Avalon - North	1.63	1.47	1.89	0.96	1.18	1.22
Avalon - Dunes	3.54	2.20	2.43	0.64	0.82	1.07
Region 6 Subtotal	13.80	9.46	10.54	0.72	0.82	1.09
Stone Harbor Point	7.39	3.30	2.74	0.47	0.37	0.73
Champagne Island	0.64	0.27	0.36	0.33	0.67	0.80
N. Wildwood - Hereford Inlet	1.47	0.95	0.63	0.54	0.33	0.36
N. Wildwood - Oceanfront	1.85	1.31	0.46	0.69	0.21	0.28
Wildwood Crest	0.17	0.17	0.00	1.00	0.00	0.00
USFWS - Cape May NWR	0.33	0.33	0.17	1.00	0.50	0.50
Coast Guard - LSU	1.25	0.70	0.55	0.47	0.38	0.50
Coast Guard - TRACEN	2.62	1.76	2.24	0.63	0.86	1.14
Cape May	0.73	0.60	0.73	0.63	0.50	0.50
Cape May Meadows	4.26	3.65	4.00	0.82	0.95	1.14
The Nature Conservancy	3.41	2.88	3.06	0.92	1.04	1.10
Cape May Point SP	1.54	1.29	1.54	0.69	0.80	0.83
Higbee/Magnesite	0.17	0.17	0.00	1.00	0.00	0.00
Cape May Ferry	0.29	0.00	0.00	0.00	0.00	0.00
Region 7 Subtotal	14.06	9.29	9.09	0.63	0.61	0.87
Total NJDFW only	49.89	33.54	45.51	0.68	0.96	1.39
Total State	116.63	80.86	120.23	0.70	1.04	1.48

Figure 1. New Jersey piping plover population and productivity: 1986-2021

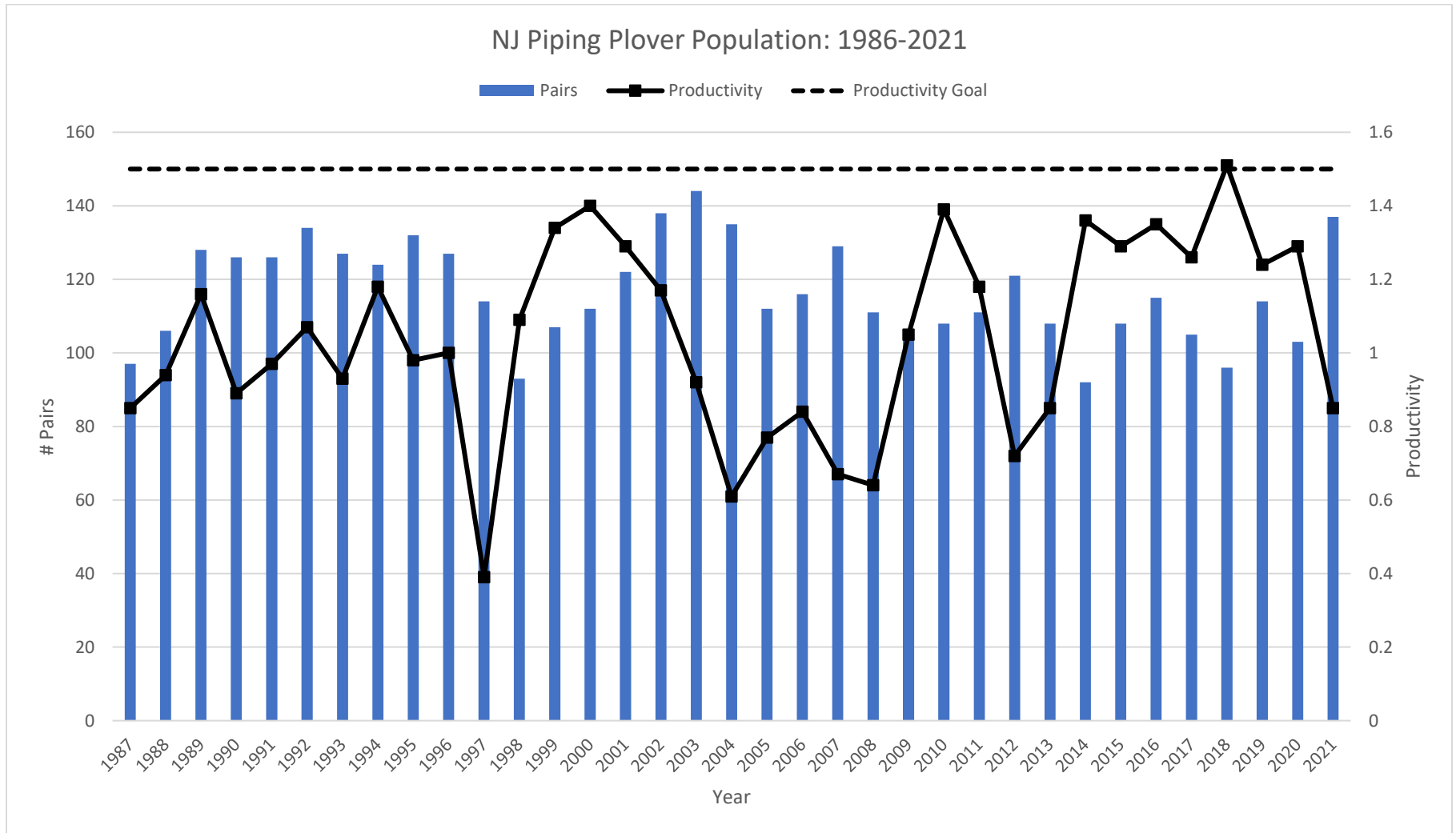


Figure 2. Causes of piping plover nest failure in New Jersey, all sites: 2021

