

# Piping Plover Nesting Results in New Jersey: 2018

Prepared by

Emily Heiser, Wildlife Biologist  
Conserve Wildlife Foundation of New Jersey  
and

Christina Davis, Environmental Specialist II  
New Jersey Division of Fish and Wildlife  
Endangered and Nongame Species Program



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## SUMMARY OF FINDINGS:

Ninety-six (96) pairs of piping plovers nested in New Jersey in 2018, a 9% decrease compared to 2017 (105 pairs) and the second consecutive year for a decline in the statewide pair number (115 in 2016). The 2018 population is well below the long-term average (117 pairs) and is the third lowest pair number recorded since federal listing in 1986. In contrast, statewide productivity (1.51 fledglings/pair) in 2018 was the highest recorded since federal listing and well above the long-term average (1.02 fledglings/pair).

The total number of adults recorded for the entire nesting season (195) was moderately higher than the number of adults recorded during the date-restricted Atlantic Coast census survey conducted June 1-9 (184). Likewise, the number of pairs tallied during the date-restricted census (87) increased 10% by the end of the nesting season (96). The date-restricted pair and adult counts are typically below the final season adult counts from year to year in New Jersey.

Regionally, northern Monmouth County remained the stronghold of the state's population with the largest percentage of pairs (52 pairs or 54% of the statewide total). Sandy Hook maintained the highest number of pairs per site (38) in the state but suffered a decline in pair numbers for the second year in a row (11 pair decrease in 2017, 2 pair decrease in 2018). Sea Bright, south of Sandy Hook, maintained the highest number of pairs per municipal beach in the state (10). Additionally, two historic nesting sites – Monmouth Beach South and Belmar-Shark River Inlet - were revived this season in Monmouth County with nesting for the first time since 2004 and 2014, respectively. Island Beach State Park and Barnegat Light accounted for 7% of the statewide total (7 pairs) and was the only area in 2018 that saw an increase in pair number (1 pair). The Holgate and Little Beach units of E.B. Forysthe National Wildlife Refuge, combined with the state's North Brigantine Natural Area, maintained a significant portion of the statewide total (33 pairs or 34%). Cape May County, the regions consisting of Ocean City to Cape May, had just 3 nesting pairs accounting for a 93% decrease in pair number since its peak in 2002 (43 pairs).

On a site level, the most significant shifts in 2018 occurred in Ocean and Atlantic Counties. In northern Ocean County, Island Beach State Park experienced a loss of 1 pair in the Southern Natural Area but gained 4 pairs in the Northern Natural Area where nesting had not previously been observed. The region comprised of Holgate, Little Beach, and North Brigantine Natural Area

decreased 20% (8 pairs) since last year. Slight gains and losses were made elsewhere in the state. In southern Cape May County, Stone Harbor Point stabilized at 3 pairs this season after a decade of continued loss. Elsewhere in the county, Avalon was lost as a nesting site.

Pairs nested at 19 sites statewide in 2018 with 3 sites gained and 4 sites lost. New Jersey Division of Fish and Wildlife (NJDFW) monitored 8 of the active nesting sites (42% of the sites statewide). NJDFW-monitored sites accounted for 27 nesting pairs (28% of the nesting pairs statewide). This is down slightly from 29 pairs in 2017 and on par with 27 pairs in 2016. NJDFW regularly monitored 9 other potential breeding sites with historic nesting records and/or highly suitable habitat. Although pair numbers at NJDFW-monitored sites appear stable in recent years, the majority (72%) of pairs continue to occupy nesting areas within federally managed lands in New Jersey. That number has drastically shifted in thirty-two years since federal listing when 70% of the state's population was monitored and managed on state or municipal beaches.

Statewide pair-nest success (the percentage of pairs that successfully hatch at least one nest) was the highest recorded since federal listing (91%), remains above the long-term average (69%), and was high across all sites statewide. Looking at just NJDFW-monitored sites, pair-nest success (96%) was also the highest recorded since federal listing and well above the long-term average for NJDFW-monitored sites (67%).

The cause of nest failure was determined in 31 of the 34 failed nest attempts statewide (91%). Depredation continues to be the leading cause of nest failure (18 or 53%) in the state for the sixth consecutive year. Of the depredated nests, half (9 or 50%) were lost to mammals and the majority of those (7 or 78%) were lost to red fox. The remainder of mammalian depredated nests were lost to American mink (1 or 11%) and opossum (1 or 11%). Avian depredation by crow, gull, and great-horned owl was found to be the cause of 4 nest losses (22%). The remaining depredated nests (5 or 28%) were lost to unknown predator species. Flooding (7 or 21%) and abandonment (6 or 18%) contributed to about equal nest loss statewide. The cause of nest failure could not be determined in 3 (9%) nest losses. Identifying factors contributing to chick mortality continues to be difficult as chicks disappear quickly, generally occurs while monitors are not on-site, and scant evidence is left behind. In one instance a volunteer documented a herring gull take a chick at Barnegat Light.

The statewide fledgling rate, which includes data collected and provided by all state cooperators, was 1.51 fledglings/pair. This is the first time since federal listing in 1986 that New Jersey has reached and exceeded the productivity recovery goal (1.50 fledglings/pair) established by the USFWS Recovery Plan for Atlantic Coast Piping Plovers. Additionally, 2018 productivity was well above the 1.245 fledglings/pair range-wide threshold for population maintenance (also established in the Recovery Plan) for the fifth consecutive year. Statewide productivity also remained well above the long-term average since listing (1.02 fledglings/pair). NJDFW-monitored sites fared well this season with a productivity of 1.59 fledglings/pair. This fell below the high productivity rate of 1.79 fledglings/pair from the 2017 season but remains well above the long-term average of 0.90 fledglings/pair at NJDFW-monitored sites. NJDFW fledge rates continue to run higher than the statewide average, whereas historically it typically fell short.

Individual site and regional productivity varied considerably. Overall, Monmouth County maintained the highest productivity rate statewide fledging 85 chicks for 52 pairs (1.63 fledglings/pair). Sandy Hook's productivity increased significantly this season compared to last year (1.55 fledglings/pair in

2018 versus 1.13 fledglings/pair in 2017). The other Monmouth County sites (Sea Bright, Monmouth Beach, and Belmar) saw a moderate decrease in productivity (1.86 fledglings/pair in 2018 versus 2.07 fledglings/pair in 2017), but overall maintained a sustainable productivity rate. Sea Bright matched its pair total from last season (10 pairs) and was overall the most productive municipal site statewide (2.10 fledglings/pair). Ocean County was the only area to see an increase in pair numbers in 2018. Barnegat Inlet hosted 7 pairs between Island Beach State Park and Barnegat Light, fledging 1.29 chicks/pair. The Holgate, Little Beach, and North Brigantine Natural Area region showed moderate growth in productivity (1.42 fledglings/pair in 2018 versus 1.24 fledglings/pair in 2017) despite an alarming 21% decrease in pair number (33 pairs in 2018 versus 42 pairs in 2017). Pair numbers declined at all three nesting sites. Cape May County observed a small uptick in productivity (0.67 in 2018 versus 0.25 in 2017), but pair numbers continue to be depressed, and productivity again fell well below the long-term statewide average (1.02 fledglings/pair).

Twenty-five adults have been outfitted with GPS tags during the 2017 and 2018 field seasons (in a novel attachment method for this species via leg harnesses) through a project partially supported by NJDFW and led by State University of New York - College of Environmental Science and Forestry (SUNY-ESF). In 2018, three of the ten adults outfitted with transmitters returned to breed in New Jersey with the loggers still attached (two others were observed on their wintering grounds but did not return to breed). The loggers were retrieved, the data downloaded, and it is currently being reviewed by the principal investigator. An additional 15 tags were deployed in the 2018 field season at various locations throughout the state, namely in Monmouth County where little to no marked plover data was available in previous seasons. Short-term deployments were also made in the 2018 field season and no adverse behaviors were observed in any of those cases.

### **CONCLUSION and DISCUSSION:**

In 2018, New Jersey's statewide piping plover breeding population decreased 9% compared to 2017 and was the third lowest pair number recorded since federal listing in 1986. Unlike historic norms when low population could be correlated to poor productivity, the last five years have yielded robust productivity (1.36 in 2014, 1.29 in 2015, 1.35 in 2016, 1.29 in 2017, 1.51 in 2018). Paradoxically, and without explanation, in the last two years statewide pair numbers have decreased (115 in 2016, 105 in 2017, 96 in 2018). The population remains below the long-term statewide average (117 pairs) and well below the peak of 144 pairs in 2003. Pair numbers must increase for New Jersey to move towards recovery.

The state's breeding pairs produced 1.51 fledglings/pair, marking this a historic year for recovery efforts in New Jersey. This was the first year since federal listing that New Jersey reached and exceeded the federal productivity recovery goal (1.50 fledglings/pair) established in the USFWS Recovery Plan. While it is an encouraging sign that piping plovers in the state are producing record levels of fledglings, the continual decline of pair numbers is deeply concerning to state coordinators.

New Jersey continues to see a high concentration of the breeding population within federally protected lands such as Gateway National Recreation Area's Sandy Hook Unit and E.B. Forsythe's Holgate and Little Beach Units. These areas have either little to no recreational use during the breeding season or that use is highly managed. The habitat itself is largely left to its own devices (i.e. no direct beachfills, seawalls or other stabilizing features), which has resulted in the creation of highly suitable habitat. Historically, plovers in New Jersey primarily nested on municipal and state

managed lands. But pairs often experienced poor productivity at those sites due to intense recreational disturbance and regular encounters with human-subsidized predators. Piping plovers are philopatric to their natal sites and with low to no productivity in these areas, there has been no “feeder” population to maintain a nesting population at these historic breeding sites.

The statewide population has also seen a marked shift from south to north with more plovers colonizing habitats in Monmouth and Ocean Counties and deserting those in Cape May County. The reasons for this change in distribution are not fully understood but are at least partly due to the continued success and high productivity on federally protected lands. With marked plovers in the statewide population, it has been observed that some of the first-year breeding adults are colonizing sites such as Island Beach State Park. In contrast, reports from other parts of the range – New York, Delaware, Maryland, and Virginia – indicate that a portion of the population is leaving the state to breed elsewhere. Compounding this situation, the quality of habitat at some of the southern sites has declined (with sites experiencing a combination of erosion or over-vegetation related to abnormal elevation) and other factors such as interspecific competition and depredation are seemingly playing a larger role than in the central and northern parts of the state.

New Jersey has entered uncharted territory regarding the piping plover population in New Jersey. Since monitoring began in the mid-eighties, New Jersey has not witnessed a decline in nesting pairs when high productivity was recorded the previous breeding season but that was the case in both 2017 and 2018. Historic nesting sites continue to “blink off the map”, notably this season with the loss of Avalon where for the first time in 30+ years no piping plovers nested on site. Habitat loss can be attributed to pair declines elsewhere, such as North Brigantine Natural Area, a site which once hosted 17 pairs at its peak in 2003 and has since declined to host only 2 pairs in 2018. Multi-scale, artificial habitat restoration projects must be pursued and allowances for storm-related habitat creation must be made as species managers grapple with the formidable task of stabilizing the population and moving towards recovery.

Although pair numbers declined throughout the state, productivity soared. This is much attributed to the strong monitoring and management programs and partnerships on the state, federal, non-profit, and university levels. Several partners continued to efficiently and effectively collect and share data in real-time through NestStory, an innovative and advanced smartphone app. On-going research through SUNY-ESF is looking at survival rates of adults and chicks in New Jersey while continuing to aid in the state’s efforts to address hard-to-tackle issues such as peregrine-plover interactions. The future of piping plovers in New Jersey is uncertain and reliant on numerous factors including habitat loss, management of predator populations, sea-level rise, human alteration of the coastline, and increased recreational usage of habitats. NJDFW is hopeful that through increased monitoring, management, and research of piping plovers, a sustainable population can be regained, and continual robust productivity can be maintained.

### **LITERATURE CITED:**

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

### **ACKNOWLEDGEMENTS:**

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**Table 1. Number of pairs of piping plovers at New Jersey nesting sites: 2009-2018.**

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Sandy Hook NRA	35	45	49	50	43	47	53	51	40	38
<i>Coast Guard</i>	4	5	4	4	3	4	3	5	3	3
<i>North Beach</i>	9	13	14	14	13	14	15	14	13	11
<i>North Beach Recreational</i>	0	0	0	0	0	0	0	1	1	1
<i>North Gunnison</i>	9	9	9	13	8	8	10	8	6	6
<i>South Gunnison</i>	5	5	4	5	7	9	8	7	5	3
<i>Visitor Center</i>	0	0	0	0	0	0	0	1	0	0
<i>D-Lot</i>	0	0	1	0	0	0	0	0	0	0
<i>Skeleton Hill Island</i>	0	0	1	0	0	0	0	0	0	0
<i>Critical Zone</i>	2	6	5	6	5	4	7	6	5	6
<i>Hidden Beach</i>	3	3	5	4	3	4	4	4	3	3
<i>Fee Beach</i>	3	3	5	3	4	4	6	4	3	3
<i>South Fee Beach</i>	0	1	1	1	0	0	0	1	1	2
Sea Bright North	6	3	2	2	0	0	1	6	10	10
Monmouth Beach North <sup>2</sup>	1	2	0	0	2	1	1 <sup>1</sup>	5	3	3
Monmouth Beach South	0	0	0	0	0	0	0	0	0	1
Seven Presidents Park	2	2	2	0	0	1	1 <sup>1</sup>	1	1	0
<b>Region 2 subtotal</b>	<b>44</b>	<b>52</b>	<b>53</b>	<b>52</b>	<b>45</b>	<b>49</b>	<b>55</b>	<b>63</b>	<b>54</b>	<b>52</b>
Belmar – Shark River Inlet	0	0	0	0	0	1	0	0	0	1
Sea Girt - Wreck Pond	1	0	0	1	0	0	0	0	0	0
Island Beach SP SNA	0	0	0	0	0	0	0	1	1	0
Island Beach SP NNA	0	0	0	0	0	0	0	0	0	4
Barnegat Light	1	3	3	1	2	1	1	3	5	3
<b>Region 3 subtotal</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>4</b>	<b>6</b>	<b>8</b>
Long Beach Township	0	0	0	0	0	0	0	0	1 <sup>1</sup>	0
EB Forsythe NWR	17	23	23	32	35	26	38	37	37	31
<i>Holgate</i>	7	10	6	14	12	12	24	25	22 <sup>1</sup>	18
<i>Little Beach</i>	10	13	17	18	23	14	14	12	15	13
North Brigantine NA	6	3	5	8	6	3	5	5	4	2
<b>Region 4 subtotal</b>	<b>23</b>	<b>26</b>	<b>28</b>	<b>40</b>	<b>41</b>	<b>29</b>	<b>43</b>	<b>42</b>	<b>41</b>	<b>33</b>
Seaview Harbor Marina	0	0	1	1	1	0	1 <sup>1</sup>	0	0	0
Malibu WMA	0	0	0	0	0	1	1 <sup>1</sup>	0	0	0
Ocean City - Center	1	0	1	0	0	0	0	0	0	0
<b>Region 5 subtotal</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
Corson's Inlet SP	2	0	0	0	0	0	0	0	0	0
Strathmere NA	0	1	1	1	2 <sup>1</sup>	1	0	0	0	0
Strathmere (Upper Twp.)	0	1	2	2	4 <sup>1</sup>	2	0	0	0	0
Avalon - Dunes	4	5	5	5	3	3 <sup>1</sup>	2 <sup>1</sup>	1	1	0
<b>Region 6 subtotal</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>6</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>0</b>
Stone Harbor Point	15	9	10	9	6	4 <sup>1</sup>	6 <sup>1</sup>	5	3	3
Champagne Island	0	0	0	0	0	0	0	0	0	0
N. Wildwood - Hereford	2	2	1	1	1	1	1	0	0	0
Two-Mile Beach	0	1	0	0	0	0	0	0	0	0
<i>Coast Guard - LSU</i>	0	1	0	0	0	0	0	0	0	0
Coast Guard - TRACEN	0	0	0	2	1 <sup>1</sup>	0	0	0	0	0
Cape May City	1	0	0	0	1 <sup>1</sup>	0	0	0	0	0
Cape May Meadows	11	8	6	6	3	1	0	0	0	0
<i>The Nature Conservancy</i>	7	5	4	3	1	0	0	0	0	0
<i>Cape May Point SP</i>	4	3	2	3	2	1	0	0	0	0
<b>Region 7 subtotal</b>	<b>29</b>	<b>20</b>	<b>17</b>	<b>18</b>	<b>11</b>	<b>6</b>	<b>6</b>	<b>5</b>	<b>3</b>	<b>3</b>
<b>Total Pairs</b>	<b>105</b>	<b>108</b>	<b>111</b>	<b>121</b>	<b>108</b>	<b>92</b>	<b>108</b>	<b>115</b>	<b>105</b>	<b>96</b>
<b>Pairs at NJDFW sites</b>	<b>46</b>	<b>34</b>	<b>35</b>	<b>36</b>	<b>29</b>	<b>19</b>	<b>17</b>	<b>27</b>	<b>29</b>	<b>27</b>

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

<sup>2</sup> This site includes Sea Bright – South and Monmouth Beach - North

**Table 2. New Jersey piping plover window census results: June 1-9 2018.**

	State Census Count			Final Season Count		
	# Pairs	# Unpaired Adults	# Total Adults	# Pairs	# Unpaired Adults	# Total Adults
Sandy Hook Coast Guard	3	0	6	3	0	6
Sandy Hook North Beach	11	0	22	11	0	22
Sandy Hook North Beach Recreational	1	0	2	1	0	2
Sandy Hook North Gunnison	5	0	10	6	0	12
Sandy Hook South Gunnison	3	0	6	3	0	6
Sandy Hook Visitor Center	0	0	0	0	0	0
Sandy Hook Critical Zone	6	0	12	6	0	12
Sandy Hook Hidden Beach	1	0	2	3	0	6
Sandy Hook Fee Beach	3	0	6	3	0	6
Sandy Hook South Fee Beach	2	0	4	2	0	4
Sea Bright North	10	0	20	10	0	20
Monmouth Beach North	3	0	6	3	0	6
Monmouth Beach South	1	0	2	1	0	2
Seven Presidents Park	0	0	0	0	0	0
Long Branch	0	0	0	0	0	0
<b>Region 2 subtotal</b>	<b>49</b>	<b>0</b>	<b>98</b>	<b>52</b>	<b>0</b>	<b>104</b>
Belmar - Shark River Inlet	1	0	2	1	0	2
Sea Girt - Wreck Pond	0	0	0	0	0	0
Sea Girt - NGTC	0	0	0	0	0	0
Island Beach SP – Northern NA	3	1	7	4	0	8
Island Beach SP – Southern NA	0	0	0	0	1	1
Barneгат Light	3	0	6	3	0	6
<b>Region 3 subtotal</b>	<b>7</b>	<b>1</b>	<b>15</b>	<b>8</b>	<b>1</b>	<b>17</b>
Long Beach Township	0	0	0	0	0	0
Holgate	15	4	34	18	0	36
Little Beach	11	3	25	13	0	26
North Brigantine NA	2	0	4	2	0	4
<b>Region 4 subtotal</b>	<b>28</b>	<b>7</b>	<b>63</b>	<b>33</b>	<b>0</b>	<b>66</b>
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	0	0	0	0	0	0
Ocean City - North	0	0	0	0	0	0
Ocean City - Center	0	0	0	0	0	0
<b>Region 5 subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Corson's Inlet SP	0	0	0	0	0	0
Strathmere Natural Area	0	0	0	0	0	0
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	0	0	0	0	0
Stone Harbor - Oceanfront	0	0	0	0	0	0
<b>Region 6 subtotal</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Stone Harbor Point	3	1	7	3	1	7
N. Wildwood - Hereford Inlet	0	0	0	0	0	0
2-Mile Beach - USFWS	0	0	0	0	0	0
2-Mile Beach - LSU	0	1	1	0	1	1
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
<b>Region 7 subtotal</b>	<b>3</b>	<b>2</b>	<b>8</b>	<b>3</b>	<b>2</b>	<b>8</b>
<b>Total</b>	<b>87</b>	<b>10</b>	<b>184</b>	<b>96</b>	<b>3</b>	<b>195</b>

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

**Table 3. New Jersey piping plover nesting summary by sites: 2018.**

SITE	2018					
	Pairs	Pairs Hatched	Chicks Fledged	Pair Success	Fledge Rate	SP Fledge Rate
Sandy Hook NRA	38	36	59	0.95	1.55	1.64
<i>Coast Guard</i>	3	3	7	1.00	2.33	2.33
<i>North Beach</i>	11	10	13	0.91	1.18	1.30
<i>North Beach Recreational</i>	1	1	1	1.00	1.00	1.00
<i>North Gunnison</i>	6	6	9	1.00	1.50	1.50
<i>South Gunnison</i>	3	3	8	1.00	2.67	2.67
<i>Critical Zone</i>	6	6	6	1.00	1.00	1.00
<i>Hidden Beach</i>	3	3	8	1.00	2.67	2.67
<i>Fee Beach</i>	3	3	5	1.00	1.67	1.67
<i>South Fee Beach</i>	2	1	2	0.50	1.00	2.00
Sea Bright - North	10	10	21	1.00	2.10	2.10
Monmouth Beach – North <sup>1</sup>	3	3	4	1.00	1.33	1.33
Monmouth Beach - South	1	1	1	1.00	1.00	1.00
<b>Region 2 Subtotal</b>	<b>52</b>	<b>50</b>	<b>85</b>	<b>0.96</b>	<b>1.63</b>	<b>1.70</b>
Belmar - Shark River Inlet	1	1	2	1.00	2.00	2.00
Island Beach SP NNA	4	4	4	1.00	1.00	1.00
Barnegat Light	3	3	5	1.00	1.67	1.67
<b>Region 3 Subtotal</b>	<b>8</b>	<b>8</b>	<b>11</b>	<b>1.00</b>	<b>1.38</b>	<b>1.38</b>
EB Forsythe NWR	31	25	43	0.81	1.39	1.72
<i>Holgate</i>	18	13	26	0.72	1.44	2.00
<i>Little Beach</i>	13	12	17	0.92	1.31	1.42
North Brigantine NA	2	2	4	1.00	2.00	2.00
<b>Region 4 Subtotal</b>	<b>33</b>	<b>27</b>	<b>47</b>	<b>0.82</b>	<b>1.42</b>	<b>1.74</b>
Stone Harbor Point	3	2	2	0.67	0.67	1.00
<b>Region 7 Subtotal</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>0.67</b>	<b>0.67</b>	<b>1.00</b>
<b>NJDFW sites TOTAL</b>	<b>27</b>	<b>26</b>	<b>43</b>	<b>0.96</b>	<b>1.59</b>	<b>1.65</b>
<b>All NJ sites TOTAL</b>	<b>96</b>	<b>87</b>	<b>145</b>	<b>0.91</b>	<b>1.51</b>	<b>1.67</b>
<b># Active Sites</b>	<b>19</b>					

<sup>1</sup>This site includes Sea Bright – South and Monmouth Beach – North

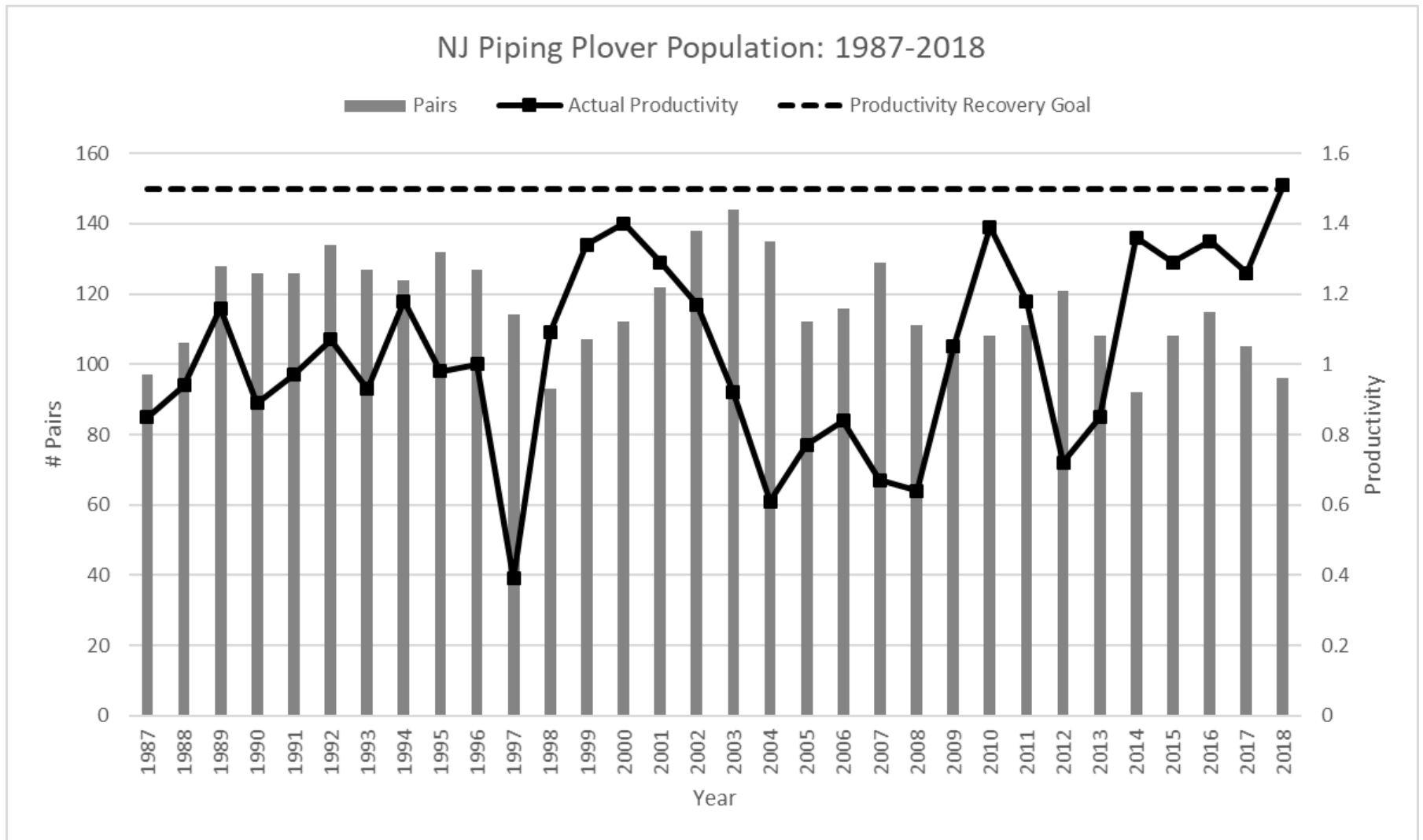
**Pair Success** equals the percentage of pairs that hatched young (at least one chick observed).

**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.



Figure 1. New Jersey piping plover population and productivity: 1987-2018.



**Figure 2. Causes of piping plover nest failure in New Jersey: 2018**

