**State of Washington** **May 2018**

# Washington State Snowy Plover Population Monitoring, Research, and Management: 2017 Nesting Season Research Progress Report

**Anthony Novack, Cyndie Sundstrom, Scott F. Pearson, & William Ritchie**

Cover Photo by Judy Rowe Taylor of rehabilitated plover on initial release back into the wild 2018.

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# Washington State Snowy Plover Population Monitoring, Research, and Management: 2017 Nesting Season Research Progress Report

Anthony Novack[1], Cyndie Sundstrom[1], Scott F. Pearson[1], & William Ritchie[2]

May 2018

[1]Washington Department of Fish and Wildlife
Wildlife Program
48 Devonshire Road
Montesano, WA 98563
Anthony.Novack@dfw.wa.gov

[2]U.S. Fish and Wildlife Service
Willapa National Wildlife Refuge
3888 SR 101
Ilwaco, WA 98624

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# OVERVIEW

During the 2017 western snowy plover (*Charadrius nivosus nivosus*) nesting season, we monitored breeding phenology, nest success, fledging success and number of nesting adult snowy plovers in Washington. Field monitoring and research was conducted by Cyndie Sundstrom, William Ritchie, Alison Fox, Stephen Roethle, Larissa Ritzman, with assistance from Warren Michaelis. Management activities included restricting human access to nesting sites, predator management, and restoring nesting habitat. A summary of some of our 2017 activities and results:

Breeding Phenology

- Clutches were initiated between 27th of March and 12 July (Figure 2). Note - very early nests could have gone undetected because intensive surveys did not start until early April.
- The first chick was known to have fledged around 14 June and the last chick fledged around 12 September.
- There was a late season peak in both clutch initiation and fledging.

Breeding Range

- We conducted 22 surveys at 10 sites between 15 May and 23rd of June 2017 to either assess site occupancy status or to count the number of adults.
- Snowy plovers were found nesting on Leadbetter Point, Midway Beach, and Graveyard Spit.

Number of Breeding Adults

- The mean 2017 Washington breeding adult population was 78 (Range: 70-86). Breeding adults were observed on Leadbetter Point, Midway Beach, Graveyard Spit
- From 2006-2009 the Washington snowy plover population declined annually and precipitously.
- From 2009-2012, the adult breeding population was fairly stable at around 31-36 birds. Since 2013, the population has more than doubled

Nest success

- Sixtyeight nests were discovered and monitored at Midway Beach/Graveyard Spit, and Leadbetter Point. At least four nests went undiscovered because we observed broods not associated with known nests. Another two nests were found after they were depredation.
    - Individual nests that are not observed more than once after discovery are removed our analysis of nesting success.
- The percent of nests that survived from egg laying through hatching during the 2017 nesting season was approximately 54% (74 total nests of which 39 hatched). When accounting for exposure, nest success was 64% (Mayfield Method). Wire cages have not been placed around nests to exclude predators (exclosures) since 2013. This extremely high nest success rate for unexclosed nests is likely attributable to USDA Wildlife Service's ongoing predator management on Leadbetter Point and Midway Beach.
- Wind-blown sand and human activities were the primary sources of nest failure. For the fourth consecutive year, nest predation was not the primary source of nest failure.
- Where nest-predation occurred, Corvids were identified as the primary nest predators followed by mammals.
    - For the first time in Washington a bobcat was identified as having depredated the eggs from a plover nest.

Fledging Success

- The average number of young fledged per adult male on the three Washington nesting sites was 1.7 (1.55-1.83). Population viability analyses has indicated that, on average, at least one young must fledge per adult male to have a stable population (Nur et al. 1999). The fledging rate for the past five years has been approximately 1.0 or greater which suggests a stable to growing population.

Management Actions

- *Nest exclosures*: No nests were exclosed in 2017.
- *Signing*: In an effort to protect nests from human activities, approximately 8.0 miles of beach at Leadbetter Point and approximately 1.3 miles of both private and publicy owned beach at Midway Beach were signed to restrict human access to critical nesting areas. Access restrictions on private land at Midway Beach occurred when permitted by the land owner.
- *Clam tides*: Washington Department of Fish and Wildlife coordinated most law enforcement activities especially during clam tides. Additional enforcement activity was provided by Washinton State Parks and US Fish and Wildife Service.
    - Long Beach: Clam digging was prohibited during most of the season due to high levels of the toxin domoic acid. A total of 20 days were open to recreational razor clamming at Long Beach in 2017, eleven of which overlapped with plover breeding season. Clam digs occurred on 10 days in April and 1 day in May. A bonus limit for clams was allowed, going up from 15 clams to 25, for late April/early May. Portable toilets were again placed on the beach at Leadbetter to minimize intrusions into the closed nesting habitat.
    - Midway Beach: Clam digging occurred on 15 days during the plover breeding season in April
- *Nest Predation:* Predator management was conducted by wildlife specialists with USDA APHIS Wildlife Services on both Leadbetter Point and Midway/Grayland Beach in 2017. Predator management consisted of dispersing birds or performing targeted lethal removal of known nest predators (corvids) in or adjacent to the plover nesting areas. Results suggest that this activity is successful in increasing nest hatching rates and fledging rates.
- *Restoration:* The Willapa NWR habitat restoration area (HRA) increased by 100 acres via bulldozer and discing.
    - A 200 meter wide strip of pine forest, totaling 70 acres was removed adjacent to the HRA

# INTRODUCTION

The Pacific coastal population of the western snowy plover (*Charadrius nivosus nivosus*) is listed as Threatened under the Endangered Species Act, and is listed as Endangered by Washington State. The current Pacific coast breeding population extends from Midway Beach, Washington, to Bahia Magdalena, Baja California, Mexico. The snowy plover winters in coastal areas from southern Washington to Central America. This coastal population nests above the high tide line on a variety of beach and dune types including coastal beaches, sand spits, dune-backed beaches, sparsely-vegetated dunes, beaches at creek and river mouths, and bluff-backed beaches (U.S. Fish and Wildlife Service 2007). In winter, snowy plovers are found on many of the beaches used for nesting as well as on beaches where they do not nest (U.S. Fish and Wildlife Service 2007).

According to the U.S. Fish and Wildlife Service (2007), "Habitat degradation caused by human disturbance, urban development, introduced beachgrass (*Ammophila* spp.), and expanding predator populations have resulted in a decline in active nesting areas and in the size of the breeding and wintering populations". In Washington, predators eating snowy plover eggs, adverse weather, shoreline modification, dune stabilization, and recreational activities have been attributed to reduced nest success and have been cited as the causes of local population declines (Washington Department of Fish and Wildlife 1995).

Historically, five known areas supported nesting snowy plovers in Washington (Washington Department of Fish and Wildlife 1995). During the 2006 nesting season, there were four nesting locations: Leadbetter Point, Midway Beach (Grayland vicinity), Graveyard Spit, and Damon Point. During the 2007 and 2008 nesting season, three nesting sites were occupied, Leadbetter Point, Midway Beach, and Graveyard Spit. However, because of the very close proximity of Graveyard Spit to Midway Beach, this could be considered one site for analyses. During the 2009-2017 nesting seasons, Leadbetter Point and Midway Beach were occupied and Graveyard Spit was occupied in 2012-2017, but not in 2009-2011.

According to the federal Recovery Plan for the western snowy plover, Washington and Oregon comprise Recovery Unit 1 (U.S. Fish and Wildlife Service 2007). The primary recovery criterion for this unit are maintaining 250 breeding adults for 10 years and a 5-year average productivity of at least 1.0 fledged chick per adult male (U.S. Fish and Wildlife Service 2007). The recovery plan calls for the development and implementation of mechanisms to assure long-term protection and management of breeding, wintering, and migration areas in Recovery Unit 1 (U.S. Fish and Wildlife Service 2007). This report describes progress on all of these criteria except the final one.

According to the Washington State Recovery Plan for the snowy plover (1995), the snowy plover will be considered for down listing to Threatened when the state supports a 4-year average of at least 25 breeding pairs that fledge at least one young per pair per year at two or more nesting areas with "secure" habitat. Delisting will be considered when the "average" population reaches 40 breeding pairs at three or more secure nesting areas.

Both the federal and state recovery plans require monitoring of breeding adults and monitoring of fledging success to assess progress toward these recovery goals. Monitoring is also necessary to evaluate the impact of conservation actions on snowy plover populations such as predator management and the effectiveness of habitat restoration efforts. To provide the information needed to assess recovery progress and to assess the effectiveness of conservation actions, Washington Department of Fish and Wildlife (WDFW) is coordinating its monitoring efforts with U.S. Fish and Wildlife Service (USFWS), and Oregon Department of Fish and Wildlife. This coordinated effort was initiated in 2006 although state-specific monitoring was initiated years before.

The primary objectives of our monitoring for the 2017 nesting season were:

- Conduct winter window surveys in conjunction with a range-wide survey effort.
- Conduct breeding window surveys in conjunction with a range-wide survey effort.
- Conduct unoccupied breeding site surveys at Copalis Spit, Connor Creek, and Damon Point/Oyhut Spit.
- Estimate hatching success rates and sources of nest mortality during the egg laying/incubation stage for all nest locations.
- Estimate fledging success and adult breeding snowy plover population size for Washington.
- Attempt to increase nest success through habitat restoration efforts, restricting human activities on nesting sites, predator management, and evaluate the effectiveness of these activities.
- Provide information to land management agencies during the field season to help them protect nesting snowy plovers from potential threats.
- Fund USDA APHIS Wildlife Services to conduct predator management activities.
- Produce a joint report with USFWS Willapa National Wildlife Refuge (Willapa NWR) that summarizes methods used, numbers of breeding adults, and hatching success (this report).
- Coordinate monitoring efforts with Oregon Department of Fish and Wildlife to produce consistent monitoring metrics for Recovery Unit 1 (Oregon and Washington). However, specific methods may differ between states.

This report summarizes the progress on all of these objectives.

# METHODS

## *Study Areas*

During the 2007 and 2008 nesting seasons, three sites were occupied by breeding snowy plovers, Leadbetter Point, Graveyard Spit, and Midway Beach (Table 1). During the 2009-2011 nesting seasons, snowy plovers nested at two sites, Leadbetter Point and Midway Beach. During the 2012-2017 field seasons, snowy plovers nested at Leadbetter Point, Graveyard Spit, Midway Beach. In 2016, they also nested on a small island off Leadbetter Point. The orthographic photos of the nest sites in Appendix I provide a pictorial overview of the primary areas used for nesting in the spring/summer of 2017. Leadbetter Point and Midway Beach are dune backed beaches and have an exceptionally wide area that is unvegetated or sparsely vegetated and is located between the mean high tide and the foredune. Snowy plovers also use the sparsely vegetated foredunes and areas behind the foredune. The snowy plover habitat at Midway Beach consists of swales, sparsely vegetated foredunes, and a large deflation plain with ephemeral dune ponds. Leadbetter Point is part of a very long sand spit or peninsula. The habitat at Leadbetter Point consists of unvegetated beach above the summer high tide line, sparsely vegetated foredunes, blowouts, and human modified habitat of sand and oyster shell landward of the foredune (habitat restoration area). Graveyard Spit is located on the north shore of Willapa Bay. The nesting habitat at this site consists of a sparsely vegetated low lying sand spit, with hummocks and swales, and unvegetated deflation plains adjacent to salt marsh communities. In both 2012 and 2013 sand was deposited to construct a shoreline protection berm on Graveyard by contractors working for the U.S. Army Corps of Engineers. For definitions of terms used to describe coastal sand dune morphology in this section, see Wiedemann (1984).

**Table 1. Approximate locations and land ownership/management of the 2017 snowy plover nesting localities in Washington.**

| Site | Approximate Location | Ownership/Management |
|---|---|---|
| Midway Beach | 46° 45’ 32”N, 124° 05’ 46”W | South Beach State Park, Private |
| Leadbetter Point | 46° 36’ 24”N, 124° 03’ 25”W | Leadbetter State Park, Willapa National Wildlife Refuge |
| Graveyard Spit | 46° 42’ 57”N, 124° 01’ 25”W | Shoalwater Bay Indian Reservation |

## *Site Occupancy*

Our goal was to determine snowy plover abundance and trend at sites that are currently occupied. For sites where we have failed to detect snowy plovers in the recent past, but are most likely to become re-occupied due to suitable habitat and relatively close proximity to occupied sites, we conducted surveys to assess site occupancy status. Wildlife species are rarely detected with perfect accuracy and non-detection does not necessarily mean that a species was absent from a site unless the probability of detecting the species (detectability) was 100%. This leads to a fundamental problem -- the measure of occupancy is confounded with the detectability of the species. Specifically, an observed “absence” occurs if either the species was present at the site but not detected, or the species was truly absent. Pearson et al. (2008), recommended three to four visits to a site to determine if it is being used as a nesting site and that those visits occur between early to mid-May and the end of the first week of July. Following that recommendation, there is an 87% - 99% probability of correctly determining site occupancy. Since 2012, all sites conformed to a protocol of 3 attempted surveys per season.

## *Adult Population Surveys*

### *Breeding window survey*

The breeding window survey occurs annually in late May along the entire U.S. Pacific coastline where snowy plovers are known to nest. The specific dates for a particular year are selected by the USFWS and all participants follow the methods of Elliot-Smith and Haig (2006a). In 2017, the window survey occurred between the 19th and 26th of May. We surveyed Connor Creek, Copalis Spit, Damon Point/Oyhut Spit, Midway Beach, Graveyard Spit, Leadbetter Point, Long Beach, Benson Beach, and the North Willapa Islands. Our primary intent during breeding window surveys was to count the adult population at occupied sites (Midway Beach, Leadbetter Point, Graveyard Spit) and sites that were historically occupied (Connor Creek, Copalis Spit, Damon Point/Oyhut Spit).

### *Estimating breeding adult population size*

In addition to the breeding window survey, we conducted two additional surveys at all occupied sites (Leadbetter Point, Midway Beach, and Graveyard Spit) and one additional survey at all non-occupied sites. We completed all surveys between 15th of May and 23rd of June following the breeding window methods (USFWS 2007 Appendix J-1). We conducted these surveys at a time of year when there was the least amount of immigration and emigration into and out of the Washington breeding sites. We used these three surveys to derive estimates of breeding adult abundance. In the Results & Discussion, we present the average of these three surveys and the range. We rounded all estimates to the nearest whole bird.

**Table 2. Starting and ending locations, survey types and number of surveyors for each survey site in Washington. The Leadbetter Point counts in the figures and tables that follow include birds detected in the Habitat Restoration Area (HRA), the Willapa NWR beach section (from the Willapa NWR land south of the HRA to the tip of the Peninsula and around), and the beach section of Leadbetter Point State Park (between Oysterville Road and the Willapa NWR boundary).**

| Site | Starting Point | Ending Point | Number of Surveyors | Survey Type |
|---|---|---|---|---|
| Copalis Spit | 47°07'16.5", 124° 10' 59.9" | 47° 08' 15.6", 124° 10' 58.4" | 1 | Foot |
| Connor Creek | 47° 04' 14", 124° 10' 24" | 47° 07' 16.5", 124° 10' 59.9" | 1 | Vehicle |
| Ocean City | 47° 04' 14.2", 124° 10 37.8 | 46° 57' 12.7", 124° 10' 31.8" | 1 | Vehicle |
| Damon Point | 46° 56' 05", 124° 09' 18" | 46° 56' 11", 124° 06' 18" | 1 or 2 | Foot |
| Midway Beach | 46° 47' 38", 124° 05' 55" | 46° 44' 07", 124° 05' 29" | 5 or 6 | Foot |
| Graveyard Spit | 46° 43' 33", 124° 03' 07" | 46° 42' 25", 124° 00' 36" | 5 or 6 | Foot |
| Willapa Bay Islands | Various | Various | 1-3 | Foot |
| Leadbetter Point North | 46° 37' 40.7", 124° 04' 17.4" | 46° 38' 50.5", 124° 03' 13.6" | 4-6 | Foot |
| Leadbetter Point HRA | 46° 37' 40.9", 124° 04' 07.8" | 46° 38' 30.4", 124° 04' 07.2" | 1 | Foot |
| Leadbetter Point South | 46° 32' 54.0", 124° 03' 40.8" | 46° 37' 40.7", 124° 04' 17.4" | 3 | Vehicle |
| Long Beach[1] (S. of Oysterville Rd. | 46° 32' 54.0", 124° 03' 40.8 | 46° 22' 03.8", 124° 03' 24.4" | 1 or 2 | Vehicle |

[1] This area includes surveys from Oysterville Road to North Head and from North Head to the Columbia River North Jetty. It includes Long Beach and Benson Beach.

### *Winter window survey*

The winter window survey occurs annually in January along the entire U.S. Pacific coastline where snowy plovers nest or historically nested. All sites are surveyed during a specific week and the USFWS selects the dates for any given year. All participants follow the methods of Elliot-Smith and Haig (2006b). In 2017, the

window survey occurred from 20-26 January. We surveyed Connor Creek, Copalis Spit, Damon Point, Oyhut, Ocean Shores/Ocean City, Midway Beach, Graveyard Spit, Leadbetter Point, South Long Beach and Benson Beach.

## *Nest phenology and success*

We visited Leadbetter Point, Midway Beach and Graveyard Spit approximately two to several times a week from early April through August to locate and monitor snowy plover nests. In many cases, we located nests by following snowy plover tracks to nests. We also located nests by observing scrape building by males, by locating adults incubating eggs, or by flushing incubating adults. We recorded date and status (presence of adults and eggs) of each nest approximately every 3-5 days.

Unless observed directly, we calculated clutch initiation date by backdating from known laying or hatching dates. Additionally, egg floating is used to backdate the initiation date. To backdate from hatch dates requires information on the time intervals associated with the egg laying and incubation stages. We used the following time intervals from California and reported in Page et al. (1995) to calculate clutch initiation dates: egg laying = 2.5 days between laying egg 1 and 2 and 2.3 days between laying eggs 2 and 3, incubation = 27 days or 32 days from the first egg laid until hatching. We calculated nest success using the Mayfield method (Mayfield 1961, 1975). We reported nest outcome as the number of; successful nests, nests that failed, nests lost to predation, nests abandoned, nests covered by drifting sand, nests lost to human activities (vehicles, walking, horseback riding, etc.) or unknown causes of failure.

### *Nest Exclosures*

We did not use nest exclosures in 2017.

## *Fledging Success*

Snowy plover chicks are precocial, leaving the nest within hours after hatching to search for food. They are not capable of sustained flight until approximately 4 weeks after hatching. Adult snowy plovers do not feed their chicks after hatching, but lead them to suitable feeding areas. They also "brood" their young for several days after hatching. Adults warn of approaching predators or other perceived threats and use distraction displays to lure predators and people away from chicks. Chicks fledge (i.e., are capable of sustained flight) at 28 to 33 days (mean equals 31 days) post hatching (Warriner et al. 1986). The Recovery Plan considers chicks fledged at 28 days post hatching (U.S. Fish and Wildlife Service 2007). According to the Recovery Plan, the productivity information most useful for determining recovery is the annual number of young fledged per adult male. Because males are responsible for post-hatching parental care (Warriner et al. 1986) and because male population trends and survivorship can be estimated with greater certainty than for females, they are used in determining this metric of reproductive success (U.S. Fish and Wildlife Service 2007). We estimated the number of young fledged per adult male for all active nesting sites combined by using the estimates of the number of breeding adult males from the adult surveys described above and by estimating the number of young fledged.

The USFWS uses the number of young fledged per adult male to determine whether or not the population is growing, stable, or decreasing (lambda). The threshold of 1.0 young fledged per adult male is based on the population viability analysis conducted by Nur et al. (1999). Their population modeling indicates that productivity of at least 1.0 chick fledged per breeding male per year should result in a stable population and productivity of 1.2 or more chicks fledged per breeding male should increase population size at a moderate pace.

Determining the number of young fledged requires following broods from hatch date to 28 days post hatching and determining their fate. To help us identify and follow individual broods, we attempted to

identify hatch dates for successful nests and then follow broods post hatching. We estimated hatch date by floating eggs following Hays and LeRoy (1971) or by counting forward from known egg laying dates. Regardless of the method used to estimate hatch dates, we checked nests daily or every other day around predicted hatching dates. For unbanded chicks, we used chick plumage and the size of chicks observed within a couple of days of hatching to narrow down the assignment of hatch date to plus or minus one day. For some nests, we determined the outcome of the brood because no other chicks were of similar age along a particular stretch of beach. In other cases, we were able to assign broods to a specific nest and hatch date because a banded adult male accompanied the chicks which, allowed us to accurately assign the chicks to a specific nest.

### *Nest Locations*

We photographed each nest and recorded its location using a hand held GPS unit. We used both a Trimble and Garmin GPS unit to document nest locations at Leadbetter Point and only a Garmin GPS unit at Midway Beach and Graveyard Spit. The Trimble Unit has approximately 1 m accuracy with post-processing and the Garmin is accurate to within 10 m.

### *Chick Banding*

We banded thirty-four (34) chicks from 16 nests located at either Graveyard Spit or Midway beach during the 2017 season. Tracking broods from hatch to fledge is a difficult task when multiple nests hatch in the same general area within a similar timeframe if the tending adults are not banded. The banding of chicks helps provide a better metric for fledging success (chicks fledged per male) and provides data on survivability, dispersal, site fidelity, and sex ratio in subsequent years. Twenty-seven (27) banded chicks were known to have fledged and one (1) was observed just prior to its fledge date (27 days old). Two newly hatched chicks were transported to Newport, Oregon for rehabilitation and banded as juveniles (at least 28 days old) before re-release into the wild. See Appendix II for more details.

## RESULTS & DISCUSSION

### *Breeding Window Survey*

We detected 84 adult snowy plovers in Washington during the 2017 breeding window survey with a 1 to 1 ratio of identified males to females (Table 3). Total numbers declined at all beaches compared to the previous year. The largest decline occurred at Leadbetter.

**Table 3. Breeding Window survey counts by site, sex, and age and counts of nests and broods between 2011 and 2017.**

| Site | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2017 | 2017 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Survey Dates | Adult Males | Adult Females | Adult Unknown |
| Copalis Spit | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 26 May | 0 | 0 | 0 |
| Conner Creek | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 May | 0 | 0 | 0 |
| Damon Point | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 May | 0 | 0 | 0 |
| Graveyard | 0 | 0 | 1 | 6 | 3 | 18 | 17 | 24 May | 6 | 10 | 1 |
| Midway Beach | 22 | 11 | 24 | 9 | 20 | 39 | 35 | 23 May | 18 | 16 | 1 |
| Leadbetter Pt. | 12 | 15 | 20 | 28 | 41 | 45 | 32 | 22 May | 16 | 15 | 1 |
| S. Long Beach | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 May | 0 | 0 | 0 |
| Total | 34 | 26 | 45 | 43 | 64 | 103 | 84 | | 40 | 41 | 3 |

## *Winter Window Survey*

We detected 66 adult snowy plovers on four sites during the January 2017 Winter Window Survey (Table 4).

**Table 4. Winter Window survey counts by site, sex, and year.**

| Site | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Survey Dates | 2017 Adult Males | 2017 Adult Females | 2017 Adult Unk. |
|---|---|---|---|---|---|---|---|---|---|---|
| Copalis Spit | 0 | 0 | 0 | 0 | 0 | 0 | 27 January | 0 | 0 | 0 |
| Conner Creek | 0 | 0 | 0 | 0 | 0 | 0 | 23 January | 0 | 0 | 0 |
| Damon Point | 0 | 0 | 0 | 0 | 0 | 0 | 23 January | 0 | 0 | 0 |
| Oyhut Spit | 0 | 0 | 0 | 0 | 0 | 0 | 23 January | 0 | 0 | 0 |
| Ocean Shores/Ocean City | - | - | - | - | - | 4 | 17 January | 1 | 0 | 3 |
| Graveyard | - | 0 | 0 | 0 | 0 | 0 | 26 January | 0 | 0 | 0 |
| Midway Beach | 22 | 24 | 22 | 22 | 31 | 22 | 24 January | 3 | 3 | 16 |
| Leadbetter Pt. | 12 | 6 | 45 | 0 | 28 | 34 | 24 January | 6 | 1 | 27 |
| S. Long Beach | 0 | - | 0 | - | 10 | 6 | 26 January | 0 | 0 | 6 |
| Benson Beach | - | - | 0 | 0 | 0 | 0 | 23 January | 0 | 0 | 0 |
| Total | 34 | 28 | 71 | 22 | 69 | 66 | | 10 | 4 | 52 |

## *Adult Surveys*

As indicated in Table 5, we conducted 22 surveys at 10 “sites” between 15 May and 23 June 2017. Note that the Willapa Bay survey included all exposed sand islands.

### *Site occupancy*

We conducted occupancy surveys at seven sites to assess snowy plover presence/absence on suitable and/or historically occupied sites (Table 5).

**Table 5. Snowy plover survey dates, number of surveys and surveyors and type of survey by site during the 2017 nesting season.**

| Site | Type of Survey | # Surveys | # Surveyors | Walking or Driving | Survey Dates |
|---|---|---|---|---|---|
| Midway | Breeding Adult/Window | 3 | 5-6 | foot & drive | 5/23, 6/06, 6/20 |
| Leadbetter Pt. | Breeding Adult/Window | 3 | 4-6 | foot & drive | 5/22, 6/05, 6/19 |
| Graveyard | Breeding Adult/Window | 3 | 5-6 | foot | 5/24, 6/07, 6/21 |
| Damon Pt. | Occupancy/Window | 2 | 1 | foot | 5/25, 6/23 |
| Connor Creek | Occupancy/Window | 1 | 1 | drive | 5/19 |
| Copalis Spit | Occupancy/Window | 2 | 1 | foot | 5/26, 6/23 |
| Long Beach (Oysterville to N. Head) | Occupancy/Window | 3 | 1-2 | drive | 5/25/ 6/08, 6/20 |
| Oyhut | Occupancy/Window | 2 | 1 | foot | 5/15, 6/23 |
| Willapa Bay islands | Occupancy/Window | 2 | 1-3 | foot | 5/24, 6/22 |
| Benson Beach | Occupancy/Window | 1 | 1 | foot | 5/21 |

### *Estimating Number of Adult Snowy Plovers*

We used the annual mean from the three surveys to estimate trends in the breeding adult population (Figure 1, Table 6). Adult population counts declinied precipitously from 2006 to 2011 then began increasing. The total population estimate had steadily increased since 2011. However, in 2017, the total population dropped compared to 2016 as a primary consequence of the reduced numbers encountered at Leadbetter (Table 6, Figure 1). Counts at both Midway and Graveyard in 2017 were comparable to those in 2016.

**Table 6. Mean counts (range) of the breeding adults at three nesting sites in Washington and the total population estimate for the State, 2006-2017.**

| Year | Midway | Graveyard | Leadbetter | Total |
|---|---|---|---|---|
| 2006 | 21 (14-28) | 2 (0-5) | 35 (26-45) | 59 (48-70)* |
| 2007 | 18 (14-21) | 2 (0-4) | 25 (20-30) | 44 (36-53) |
| 2008 | 14 (10-19) | 1 (0-2) | 32 (23-40) | 47 (33-60) |
| 2009 | 15 (13-17) | 0 | 17 (10-24) | 31 (23-39) |
| 2010 | 14 (11-18) | 0 | 21 (17-26) | 36 (33-38) |
| 2011 | 19 (8-30) | 0 | 12 (6-19) | 31 (15-47) |
| 2012 | 14 (5-23) | 2 (0-3) | 18 (6-29) | 33 (15-52) |
| 2013 | 20 (16-24) | 4 (1-6) | 20 (19-20) | 43 (41-45) |
| 2014 | 11 (9-13) | 7 (6-8) | 24 (21-28) | 41 (40-43) |
| 2015 | 24 (19-33) | 8 (3-11) | 43 (34-54) | 77 (65-98) |
| 2016 | 37 (33-40) | 21 (18-25) | 33 (25-32) | 93 (85-103) |
| 2017 | 36 (35-36) | 21 (18-24) | 21 (14-32) | 78 (70-86) |

* 2006 Total includes 1 adult (range 0-2) encountered at Damon Point

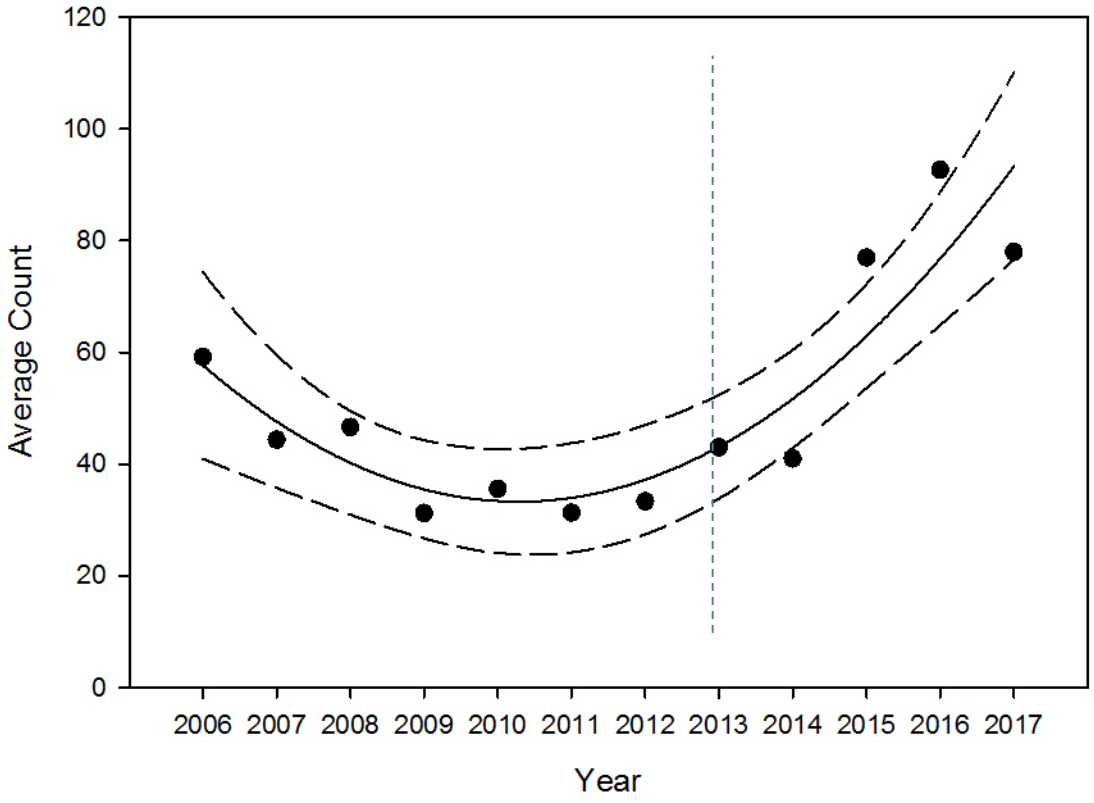
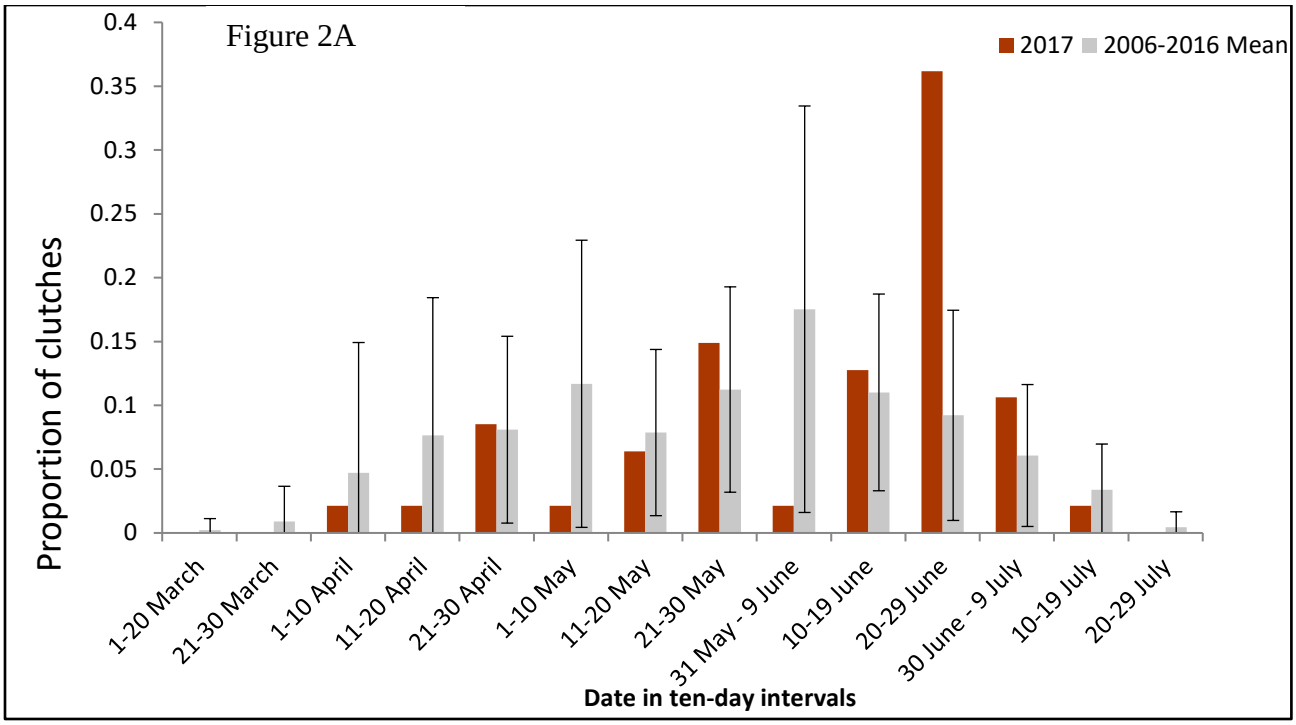



**Figure 1. Breeding adult snowy plover population trend. All Washington sites (2006 – 2017). The circles represent the average count (from three counts) for all sites combined and the dashed line represents the 95% confidence interval associated with the quadratic relationship (the curved solid line). Blue line indicates when predator management was initiated.**

## *Clutch Initiation Dates and Breeding Phenology*

The nesting season occurred between late March and mid-September in 2017. Clutches were initiated between March 27th and July 12th (Figure 2A) with a peak number initated (17 nests) between the intereval of 20-29th of June. Early nests could have gone undetected because we did not initiate intensive surveys until early April. The first chick fledged around 14 June and the last chick fledged around 12 September (Figure 2B). Overall, there was a right skewed distribution to clutch initiation with a trend to gradually increasing numbers of clutches which peaked in late June. This trend contrasts with the bimodal distribution of cluth initiations that occurred in 2016.



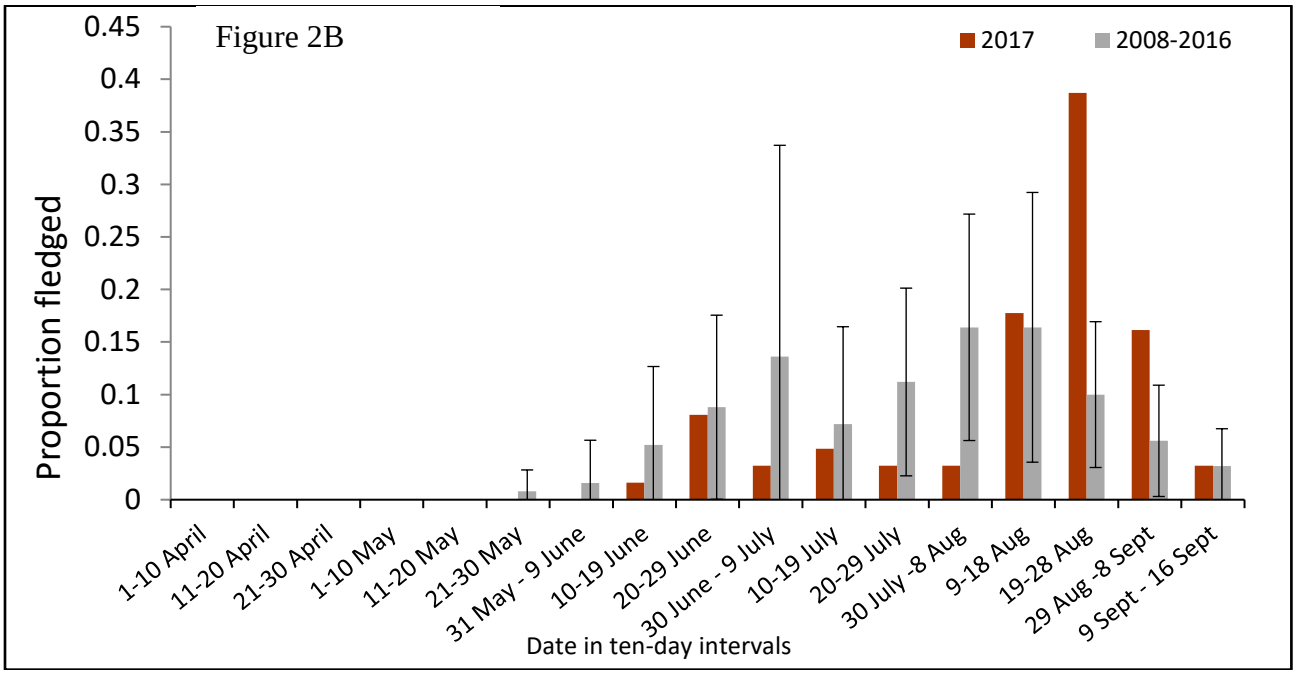




**Figure 2. Proportion of 2017 Snowy Plover clutches initiated in ten-day intervals compared to the mean initiated (±SD) between 2006-2016 (A) and proportion of 2017 chicks fledged compared to the mean (±SD) between 2008-2016 (B). Results are presented for all Washington nesting sites combined.**

## *Nest success*

We located 68 nests and determined that at least 6 other nests went undiscovered based on either the number of broods on the beach or nests found post-predation. Of the 68 nests located, we monitored 47. Of these 47 nests, 19 were found at Midway Beach, 23 at Graveyard Spit, and 5 at Leadbetter Point (Table 7). For a map of nest locations see Appendix I. Thirty-two (68%) of the 47 nests that we monitored hatched. For the fourth consecutive year, predation was not the primary source of nest failure (Table 8). At the four depredated nests, we observed only tracks of corvids. For the first time in Washington, a bobcat depredated a nest and consumed the eggs. However, that bobcat depredation is not included in the table do to a lack of exposure days.

In Table 9, we report Mayfield nest success estimates for the 2017 nesting season and compare these results to the previous nesting seasons. The probability of nest survivorship was 70% at Midway/Graveyard and 37% at Leadbetter Point. Exclosures have not been placed around any nests to exclude predators since 2013

Prior to the impmenetation of predator management, unexclosed nests success at Leadbetter Point was about 20% when nest success was optimal (late in the nesting season) and below 20% during the rest of the season. Nest success has been very high since predator management was implemented by USDA AHIS Wildlife Services (Figure 3).

**Table 7. Nest outcomes by snowy plover nesting locality in 2017. Outcomes include successful (hatched), failed, or unknown outcome. Nests without exposure days (found after success or failure) were excluded from all tables below.**

| | | Outcome | | |
|---|---|---|---|---|
| Site | # Nests | Hatch | Fail | Unknown |
| Midway | 19 | 14 | 4 | 1 |
| Graveyard | 23 | 18 | 5 | 0 |
| Leadbetter | 5 | 0 | 4 | 1 |
| Totals | 47 | 32 | 13 | 2 |

**Table 8. Sources of snowy plover nest failure in 2017 for nests that failed to hatch. Sources of failure include predators (common raven, unknown corvid, or unknown predator) eating eggs, or other sources of failure including Human activities, drifting Sand covering the nest, Abandoned nests and Unknown sources of failure.**

| | Nest Failures | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Predator | | | | | Other Sources | | | |
| Site | Crow | Raven | Corvid | Coyote | Unknown | Human | Sand | Abandon | Unknown |
| Midway | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| Graveyard | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 0 |
| Leadbetter | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 |
| Totals | 2 | 0 | 2 | 0 | 0 | 2 | 5 | 0 | 2 |

**Table 9. Mayfield estimates of nest survival by site from 2008 – 2017. We also include the percent of nests exclosed by site and year because of the large influence of exclosures on nest success.**

| Site | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|
| Midway and Graveyard | 0.25 | 0.15 | 0.20 | 0.26 | 0.26 | 0.35 | 0.52 | 0.38 | 0.61 | 0.70 |
| % Exclosed | 0.00 | 0.06 | 0.16 | 0.29 | 0.15 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 |
| Leadbetter | 0.54 | 0.44 | 0.83 | 0.33 | 0.17 | 0.79 | 0.64 | 0.46 | 0.76 | 0.37 |
| % Exclosed | 0.97 | 0.78 | 0.88 | 0.00 | 0.40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Washington Total (including exclosures) | 0.36 | 0.30 | 0.46 | 0.28 | 0.21 | 0.45 | 0.59 | 0.41 | 0.67 | 0.64 |

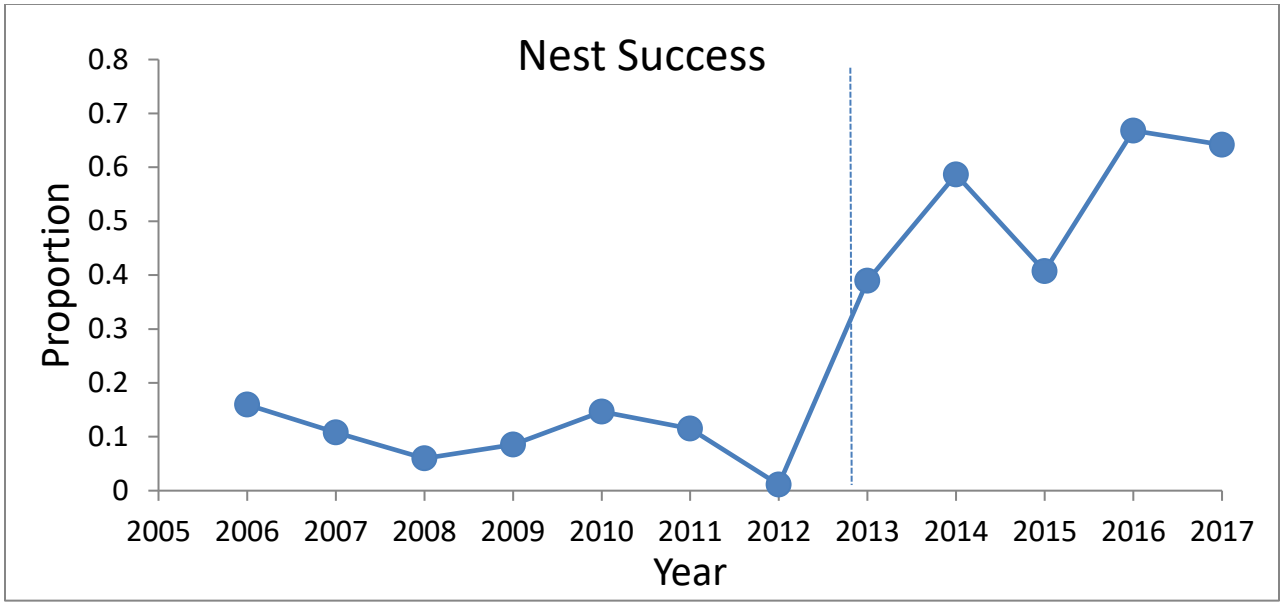



**Figure 3. Nest success of unexclosed nests by year. Note that nest success increased dramatically after predator management was initiated in 2013.**

## *Fledging Success*

Fledging success is defined as the number of chicks fledged per adult male. Using direct observations of fledglings on the beach, we estimated between 62 and 73 chicks fledged in 2017. During our repeated counts to occupied sites, we counted 28-51 males during the three adult surveys. Using the mean of these two estimates (40 males and 68 chicks fledged) and the extremes of each (e.g., high male count and low fledge estimate), we estimated that 1.7 (1.55-1.83) chicks fledged/male.

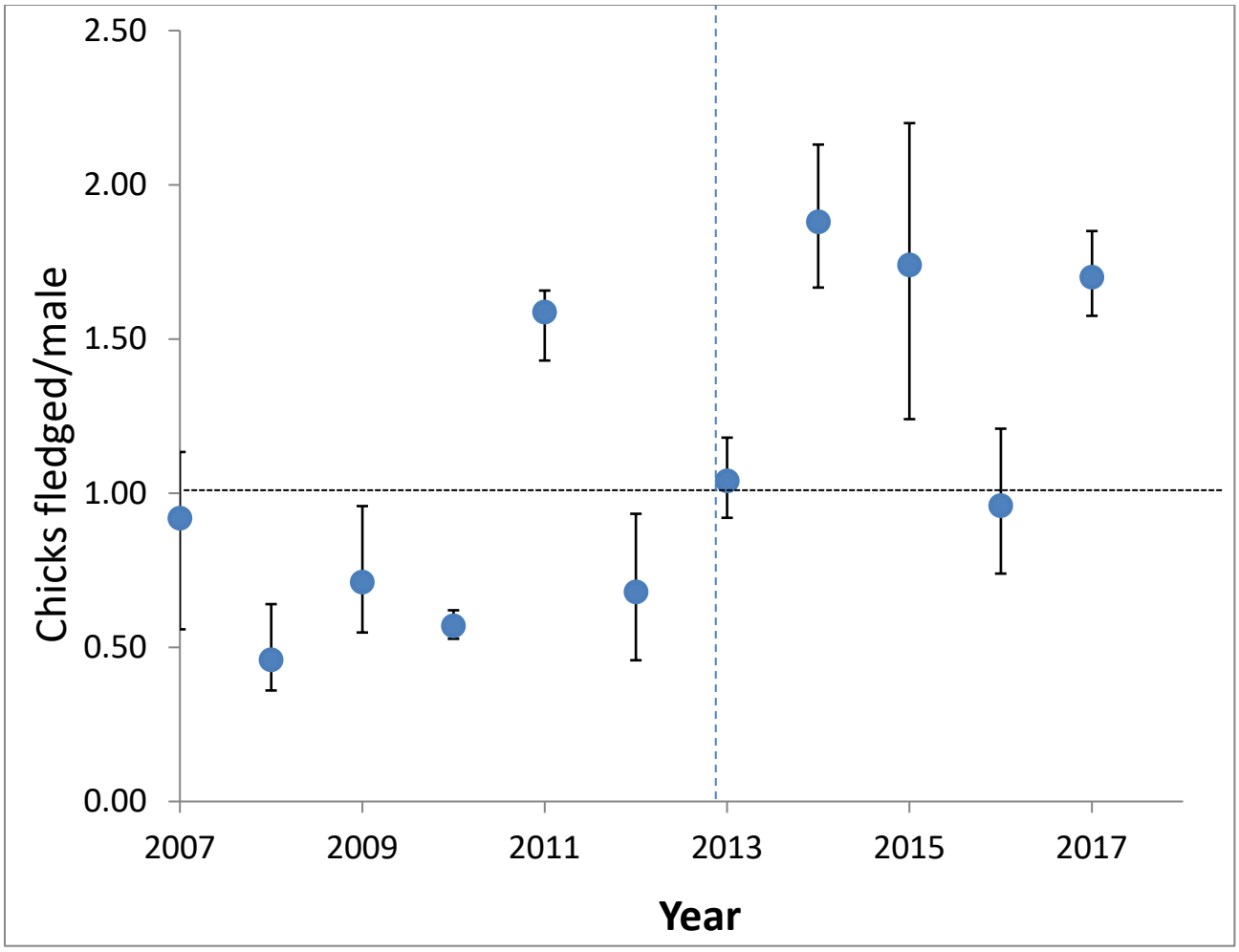



**Figure 4. Number of snowy plover chicks fledged per adult male 2007-2017 for all Washington nesting sites combined. Population modeling indicates that one chick fledged per adult male is needed on average to maintain a stable population (black line). Fledging success was clearly above 1.0 in three years, 2011, 2014, 2015 and 2017 while approximately 1.0 in 2013 and 2016. Note that predator management was initiated in 2013 (blue dashed line).**

## *Nest Locations*

The nest locations for 2017 are presented by nesting site in Appendix I. At Midway Beach, snowy plovers nested in Grayland Beach State Park and on the beach immediately south of Grayland Beach State Park to Warrenton-Cannery Road. At Graveyard Spit, nests were located on the landward side of the dune barrier (berm), the top of the berm, or on the outer beach. At Leadbetter Point, snowy plovers nested on the tip of the Peninsula, State Parks Seashore Conservation Area (SCA) on the outer beach, and in the Willapa NWR and Washington State Parks habitat restoration areas.

## *Predator Management*

Predator management occurred on both Midway/Grayland Beach and Leadbetter Point in 2017. Predator management and monitoring of predator activities were conducted by one Wildlife specialist with USDA APHIS Wildlife Services who worked primarily during the active (April-July) plover nesting season although in 2017, a few resident ravens were targeted for removal in August with DRC-1339. APHIS activities were focused on removing the predator species (crows and ravens) primarily responsible for most

of the nest predation events observed over the past 10 years. Communication between plover biologists and wildlife specialists helped focus activities on locations and individual predators that were apparently causing the most plover depredations. Management activities included observing predator activities in plover nesting sites and then conducting targeted dispersal or lethal removal as appropriate. No negative impacts to plovers were reported from APHIS's activities.

Ultimately, we plan on evaluating the success of the predator management program by comparing nest and fledging success and post-hatching survival rates before and after predator removal activities. This type of comparison takes several years of data before and after management activities were conducted. Preliminary plover nest success and fledging success results (above) are very promising.

**Table 10. Number of American crows and common ravens dispersed or killed by year (2013-2017). Note that most of the predator management activities focused on dispersing corvids.**

| | Leadbetter Point | | | | Midway | | | |
|---|---|---|---|---|---|---|---|---|
| | American Crow | | Common Raven | | American Crow | | Common Raven | |
| Sum of # | Dispersed | Killed | Dispersed | Killed | Dispersed | Killed | Dispersed | Killed |
| 2013 | 60 | 32 | 13 | 18 | | | | |
| 2014 | 63 | 30 | 16 | 11 | 248 | 25 | 11 | 13 |
| 2015 | 33 | 11 | 15 | 8 | 16 | 2 | 2 | 8 |
| 2016 | 35 | 9 | 11 | 4 | 33 | 2 | 8 | 4 |
| 2017 | 38 | 11 | 11 | 7 | 56 | 12 | 6 | 3 |

# PROGRESS ON RECOVERY OBJECTIVES

Federal Recovery Objectives:

*Objective 1: 250 breeding adults in Recovery Unit 1.*
The 2017 Washington nesting population was 78 (range = 70-86) and the 2017 Oregon nesting population was 468 (Lauten et al. 2017) for a total of 546 (range = 614-632) nesting adult snowy plovers in Recovery Unit 1. Recovery unit objectives for breeding adults have been exceeded for four consecutive years and 5 out of the last 6 years.

**Table 11. Estimated number of breeding adult snowy plovers in Recovery Unit 1 by year.**

| 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| 268 (246-290) | 234 (231-236) | 379 (378-381) | 526 (514-547) | 622 (614-632) | 546 (538-554) |

*Objective 2: A 5-year average productivity of at least 1.0 fledged chick per adult male*
The number of chicks fledged per adult male in Recovery Unit 1 was >1 during 2012-2015 (Table 12) but dropped in 2016. Oregon's fledging rate was 0.60 chicks per male in 2016 and 0.88 in 2017 (Lauten et al., 2016, Lauten et al., 2017). Recovery unit wide estimates are not provided for 2016-2017 when, Oregon changed their methodology for assessing fledged chicks.

**Table 12. Estimated number of chicks fledged per breeding adult male in Recovery Unit 1 by year.**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Chicks fledged/male | 1.12 (1.08-1.16) | 1.04 (1.02-1.07) | 1.71 (1.68-1.74) | 1.55 (1.49-1.57) | * | * |

* Combined fledging rate not estimated due to changes in methodolgy

Washington State Recovery Objectives:

*Downlisting objective 1: A 4-year average of at least 25 breeding pairs*
We estimated there were 78 (range = 70-86) adult nesting snowy plovers in Washington during the 2017 nesting season and approximately 28-51 of these birds were males. Assuming all of these males paired, we estimate there were 28-51 breeding pairs in Washington. The 4-year average number of breeding pairs in Washington is approximately 40.

**Table 13. Estimated number of breeding pairs in Washington (2011-2017).**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Breeding Pairs | 19 | 22-24 | 23-27 | 35-55 | 43-57 | 28-51 |

*Downlisting objective 2: Fledge at least one young per pair per year, at two or more nesting areas with secure habitat.*

The average number of young fledged per adult male in Washington in 2017 was 1.70 (range = 1.55-1.83). The number of chicks fledged per male was approximately 1.0 or above for four of the last five years. Currently, snowy plovers are nesting at Leadbetter Point (primarily on the Refuge), Graveyard Spit, and Midway Beach. The first site is part of the Willapa National Wildlife Refuge while the other two are on private, tribal and Washington State Park lands.

**Table 14. Estimated number of chicks fledged per adult male in Washington (2011-2017).**

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|
| Fledge rate | 0.68 (0.46-0.94) | 1.04 (0.92-1.18) | 1.88 (1.67-2.13) | 1.74 (1.24-2.2) | 0.96 (0.74-1.21) | 1.70 (1.55-1.83) |

*Delisting objective 1: The average population reaches 40 breeding pairs at three or more secure nesting areas.*
See Downlisting Objective 1. The 4-year average of breeding pairs is currently 40. Recommend defining the term “secure” and determining the number of sites considered “secure”.

# 2017 MANAGEMENT ACTIONS

A number of the management actions that occurred in 2017 involved minimizing some human activities near active snowy plover nesting sites during the nesting season. Human related disturbance negatively affects hatching success of snowy plovers (Warriner et al. 1986, Schulz and Stock 1993) and snowy plover chick survival by as much as 72% (Ruhlen et. al. 2003). Disturbances to wintering snowy plovers are 16 times higher at a public beach than at a protected beach. Humans, dogs, American crows and other birds are the main sources of disturbance (Lafferty 2001). In addition, snowy plover feeding rates declined in response to disturbance (Lafferty 2001). Human disturbance negatively affects hatching rates and chick survival for various plover species (Flemming et al. 1988, Buick and Paton 1989, Dowling and Weston 1999).

*Management*

- *Nest site protection* - Approximately 8.0 miles of public beach at Leadbetter Point, 1.3 miles of beach at Midway Beach, and 0.75 miles or 64 acres at Graveyard Spit were demarcated with signs and PVC posts to restrict human access onto the dry portions of the beach and protect nesting birds. Access restrictions on private land occurred at one parcel on Midway Beach where permitted by the land owner.
    - The Midway Beach Road access cuts through the center of the highest snowy plover use area at this site, but has been closed to vehicle use since 2009. In 2013, a foot trail access was established on the Midway Beach Road right-of-way using symbolic fencing (i.e. ropes) but was removed at the end of the 2015 season due to a lack of maintenance and repeated emergency closures throughout the season due to plover nests either in the middle of the foot trail or within 50 feet on either side of it. No established foot trail existed in 2017.
    - Symbolic fencing, totaling over 1,500 feet in length, was placed along three trails that access the beach on the Long Beach Peninsula (1 private access, 1 State Park access, 1 National Wildlife Refuge access) during a period of 26 weeks.
- *Clam Tides* – Razor clam digs occurred at both Long Beach and Twin Harbors
    - A total of 20 days were open to recreational razor clamming at Long Beach in 2017 which, is a substantial reduction from the 94 days in the prior year. Eleven of these days overlapped the plover breeding season.
    - A bonus limit was allowed for razor clams at Long Beach. Limits increased from 15 clams to 25, for late April/early May.
    - Clam digging occurred on 15 days during the plover breeding season in April at Midway Beach
    - Portable toilets were again placed on the beach at Leadbetter Point during six clamming days to minimize human traffic into the closed nesting habitat
- *Enforcement*: Washington Department of Fish and Wildlife coordinated law enforcement activities especially during clam tides.
    - Additional enforcement effort was directed to the nesting beach during high traffic events such as the 4$^{th}$ of July holiday and scheduled clam digs
    - Approximately 137 contacts and 36 verbal warnings were issued by WDFW enforcement as part of their emphasis on plover protection at Long Beach and Midway Beaches
    - Compliance has reportedly improved as a result of increased enforcement patrols and outreach
- *Outreach*: WDFW Shellfish program continues to conduct outreach via their news releases relating to clam digging dates through distribution of a brochure entitled “Razor Clamming and Nesting Birds” which is distributed to recreational diggers.
    - Non-enforcement staff conducted outreach during July 4$^{th}$ weekend at Midway beach
- *Predator Management:* Between March and August, predator management was conducted by wildlife specialists with USDA APHIS Wildlife Services on public land at Leadbetter Point and both public and private lands at Midway/Grayland Beach in 2017. They visited Leadbetter Point and Midway/Grayland beach to disperse or lethally remove nest predators (crows and ravens) in or adjacent to the plover nesting areas.
- *Vehicle Restrictions*:
    - Coastal beaches at Willapa NWR and Leadbetter Point State Park are closed to vehicle traffic year round. However, driving is allowed on the wet sand portions of the beach in these areas during razor clam harvest openings.
    - All of the Midway Beach area is open to vehicle traffic and there are vehicle access points at Cranberry Beach Road and Warrenton-Cannery Road.

    - Overnight camping and fires are prohibited on the Refuge at Leadbetter Point. Campfires on State Park managed beaches are not permitted in driftwood or within 100 feet of the dunes.
- *Nest exclosures*: No nests exclosures were installed during 2017 and have not been used since 2013.

*Restoration*

- Pre-breeding:
    - One hundred acres of invasive beachgrass was removed using bulldozers and discs at the Habitat Restoration Area at the within the Willapa Wildlife Refuge on Long Beach.
    - A 200 meter wide strip of pine forest was cut, adjacent to the Habitat Restoration area on the Willapa Wildlife Refuge
- Post-breeding:
    - Youth conservation crews assisted with habitat maintenance by hand pulling beachgrass from 2.0 acres of the restoration area.
    - An additional 0.25 acres of beachgrass was spot treated with herbicide

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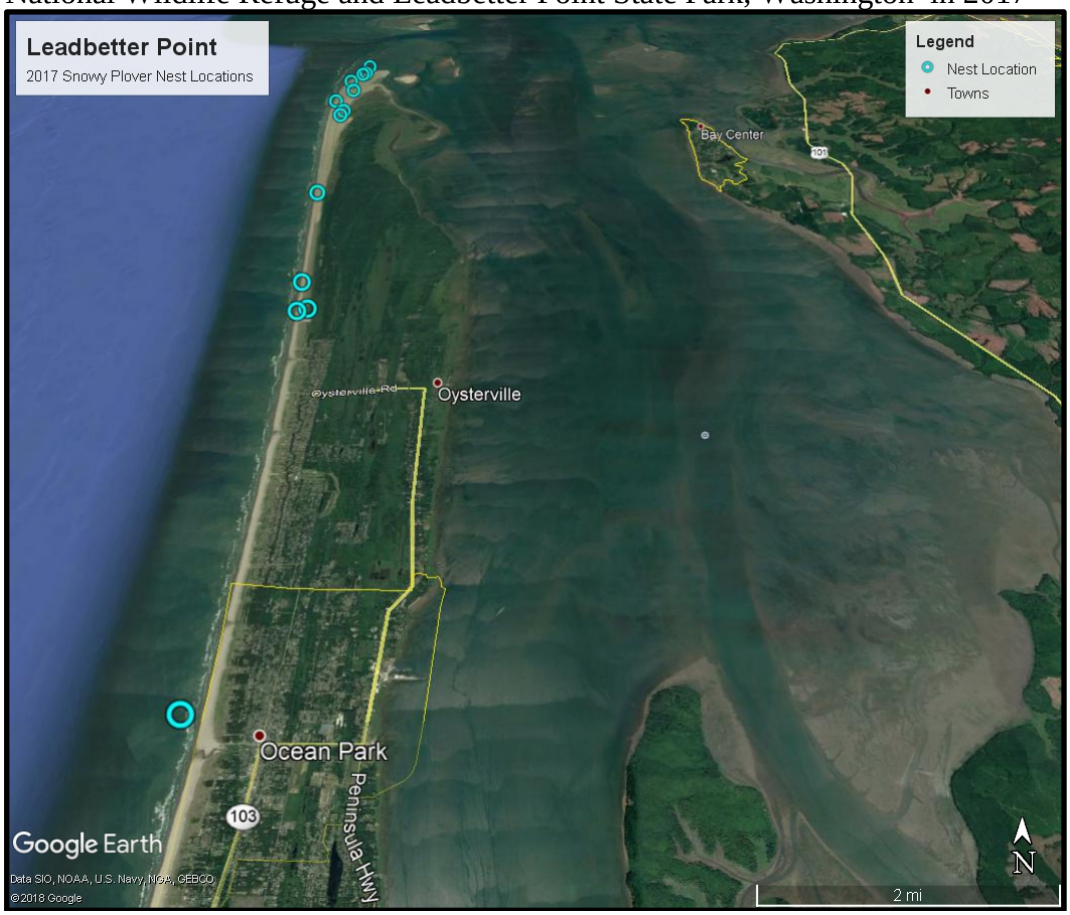
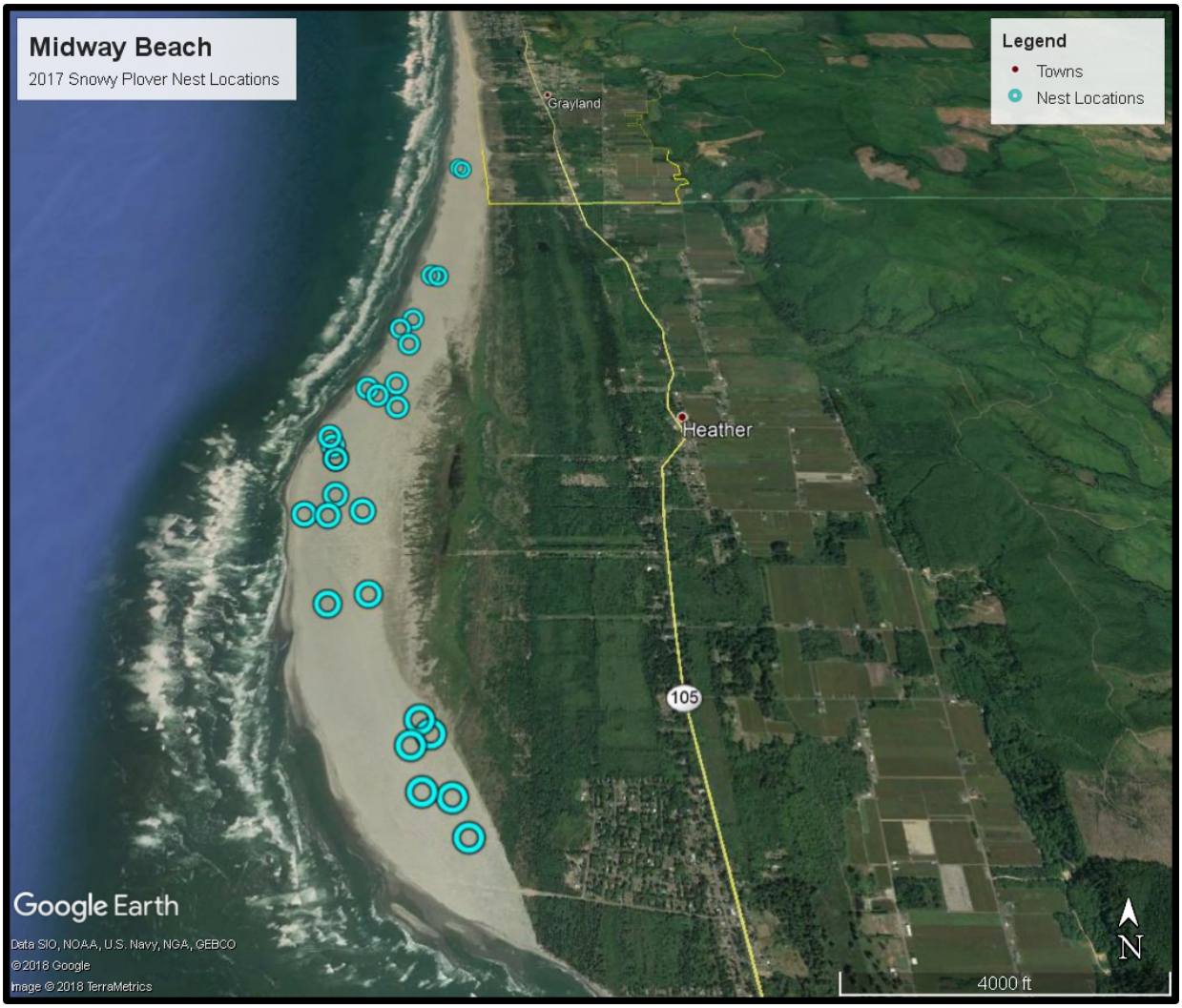
# APPENDIX I

MAP: Graveyard Spit Snowy Plover Nest Locations. Blue circles represent locations of snowy plover nests at Graveyard Spit near Tokeland,Washingtoin in 2017. .

MAP  Blue circles represent locations of snowy plover nests at Leadbetter Point, Willapa National Wildlife Refuge and Leadbetter Point State Park, Washington  in 2017



MAP: Midway Beach Snowy Plover Nest Locations. Blue circles represent locations of snowy plover nests in at Midway Beach Washington in 2017.



# APPENDIX II

List of Snowy Plover Chicks banded at Graveyard Spit and Midway Beach (sorted by location band date) with leg band color combinations. All Washington banded birds have a two toned, Red over Violet (RV) colored legband on their left leg (See cover photo).

| Location | Left Band | Right Band | Local Band Information |
|---|---|---|---|
| Graveyard Spit | **RV** | **AO** | Nest 16. HY 2017 (6/22/17), Graveyard Spit, WA. (2381-02625). ***FLEDGED***. Parents: X:X; Siblings: RV:BO, RV:GO. |
| Graveyard Spit | **RV** | **BO** | Nest 16. HY 2017 (6/22/17), Graveyard Spit, WA. (2381-02627). ***FLEDGED***. Parents: X:X; Siblings: RV:AO, RV:GO. |
| Graveyard Spit | **RV** | **GO** | Nest 16. HY 2017 (6/22/17), Graveyard Spit, WA. (2381-02626). ***FLEDGED***. Parents: X:X; Siblings: RV:AO, RV:BO. |
| Graveyard Spit | **RV** | **RW** | Nest 19. HY 2017 (7/13/17), Graveyard Spit, WA. (2381-02628). ***FLEDGED***. Parents: B/G/B:N ♀ and X:X ♂; Sibling: RV:WW. |
| Graveyard Spit | **RV** | **WW** | Nest 19. HY 2017 (7/13/17), Graveyard Spit, WA. (2381-02629). ***FLEDGED***. Parents: B/G/B:N ♀ and X:X ♂; Sibling: RV:RW. |
| Graveyard Spit | **RV** | **OO** | Nest 23. HY 2017 (7/20/17), Graveyard Spit, WA. (2381-02650). ***FLEDGED***. Parents: X:X; Sibling: RV:RO. |
| Graveyard Spit | **RV** | **RO** | Nest 23. HY 2017 (7/20/17), Graveyard Spit, WA. (2381-02651). ***FLEDGED***. Parents: X:X; Sibling: RV:OO. |
| Graveyard Spit | **RV** | **GA** | Nest 18. HY 2017 (7/24/17), Graveyard Spit, WA. (2381-02658). ***FLEDGED***. Parents: Y/W/Y:G ♀ and X:X ♂ ; Sibling: X:X. |
| Graveyard Spit | **RV** | **RG** | Nest 20. HY 2017 (7/24/17), Graveyard Spit, WA. (2381-02655). ***FLEDGED***. Parents: X:X; Siblings: RV:VG, RV:YG. |
| Graveyard Spit | **RV** | **VG** | Nest 20. HY 2017 (7/24/17), Graveyard Spit, WA. (2381-02656). ***May have fledged***. Parents: X:X; Siblings: RV:RG, RV:YG. |
| Graveyard Spit | **RV** | **YG** | Nest 20. HY 2017 (7/24/17), Graveyard Spit, WA. (2381-02657). ***FLEDGED***. Parents: X:X; Siblings: RV:RG, RV:VG. |
| Graveyard Spit | **RV** | **AY** | Nest 27. HY 2017 (7/28/17), Graveyard Spit, WA. (2381-02661). ***FLEDGED***. Parents: X:X; Siblings: RV:RY, RV:VY. |
| Graveyard Spit | **RV** | **RY** | Nest 27. HY 2017 (7/28/17), Graveyard Spit, WA. (2381-02662). ***FLEDGED***. Parents: X:X; Siblings: RV:AY, RV:VY. |
| Graveyard Spit | **RV** | **VY** | Nest 27. HY 2017 (7/28/17), Graveyard Spit, WA. (2381-02663). ***FLEDGED***. Parents: X:X; Siblings: RV:AY, RV:RY. |
| Graveyard Spit | **RV** | **BW** | Nest 26. HY 2017 (8/04/17), Graveyard Spit, WA. (2381-02664). ***FLEDGED***. Parents: X:X; Siblings: RV:OW, RV:VW. |
| Graveyard Spit | **RV** | **OW** | Nest 26. HY 2017 (8/04/17), Graveyard Spit, WA. (2381-02665). ***FLEDGED***. Parents: X:X; Siblings: RV:BW, RV:VW. |
| Graveyard Spit | **RV** | **VW** | Nest 26. HY 2017 (8/04/17), Graveyard Spit, WA. (2381-02666). ***Did NOT fledge***. Parents: X:X; Siblings: RV:BW, RV:OW. |
| Graveyard Spit | **RV** | **AA** | Nest 28. HY 2017 (8/09/17), Graveyard Spit, WA. (2381-02670). ***Did NOT fledge***. Parents: WY:GA ♀ and X:X ♂; Sibling: RV:RA. |
| Graveyard Spit | **RV** | **RA** | Nest 28. HY 2017 (8/09/17), Graveyard Spit, WA. (2381-02671). ***FLEDGED***. Parents: WY:GA ♀ and X:X ♂; Sibling: RV:AA. |
| Graveyard Spit | **RV** | **GG** | Nest 25. HY 2017, Graveyard Spit, WA. (2381-02674 - banded at OCA 9/08/17). REHABED CHICK; ***FLEDGED***. Parents: X:X; Siblings: 2 X:X's. |
| Midway Beach | **RV** | **YB** | Nest 20. HY 2017 (7/15/17), Midway Beach, WA. (2381-02630). ***FLEDGED***. Parents: O/B:R ♀ and X:B ♂; Sibling: RV:BB. |
| Midway Beach | **RV** | **BB** | Nest 20. HY 2017 (7/16/17), Midway Beach, WA. (2381-02631). ***FLEDGED***. Parents: O/B:R ♀ and X:B ♂; Sibling: RV:YB. |
| Midway Beach | **RV** | **AL** | Nest 24. HY 2017 (7/17/17), Midway Beach, WA. (2381-02632). ***FLEDGED***. Parents: X:X; Siblings: RV:OL, RV:YL. |
| Midway Beach | **RV** | **OL** | Nest 24. HY 2017 (7/17/17), Midway Beach, WA. (2381-02633). ***Did NOT fledge***. Parents: X:X; Siblings: RV:AL, RV:YL. |
| Midway Beach | **RV** | **YL** | Nest 24. HY 2017 (7/17/17), Midway Beach, WA. (2381-02634). ***FLEDGED***. Parents: X:X; Siblings: RV:AL, RV:OL. |
| Midway Beach | **RV** | **BR** | Nest 25. HY 2017 (7/20/17), Midway Beach, WA. (2381-02653). ***FLEDGED***. Parents: X:X; Sibling: RV:AR. |
| Midway Beach | **RV** | **AR** | Nest 25. HY 2017 (7/20/17), Midway Beach, WA. (2381-02652). ***FLEDGED***. Parents: X:X; Sibling: RV:BR. |
| Midway Beach | **RV** | **RV** | Nest 13. HY 2017 (7/27/17), Midway Beach, WA. (2381-02659). ***FLEDGED***. Parents: X:X ♀ and X:GW ♂; Sibling: RV:VV, X:X. |
| Midway Beach | **RV** | **VV** | Nest 13. HY 2017 (7/27/17), Midway Beach, WA. (2381-02660). ***Not known to have fledged***. Parents: X:X ♀ and X:GW ♂; Sibling: RV:VV, X:X. |
| Midway Beach | **RV** | **RL** | Nest 23. HY 2017 (8/09/17), Midway Beach, WA. (2381-02667). ***FLEDGED***. Parents: X:S ♀ and X:X ♂; Siblings: RV:VL, RV:WL. |
| Midway Beach | **RV** | **VL** | Nest 23. HY 2017 (8/09/17), Midway Beach, WA. (2381-02668). ***Did NOT fledge***. Parents: X:S ♀ and X:X ♂; Siblings: RV:RL, RV:WL. |
| Midway Beach | **RV** | **WL** | Nest 23. HY 2017 (8/09/17), Midway Beach, WA. (2381-02669). ***Did NOT fledge***. Parents: X:S ♀ and X:X ♂; Siblings: RV:RL, RV:VL. |
| Midway Beach | **RV** | **AV** | Nest 26. HY 2017 (8/15/17), Midway Beach, WA. (2381-02672). ***FLEDGED***. Parents: X:X; no siblings. |
| Midway Beach | **RV** | **RR** | Nest 19. HY 2017, Midway Beach, WA. (2381-02673 - banded at OCA 9/08/17). REHABED CHICK; ***FLEDGED***. Parents: RV:W/B/W ♀ and UK ♂ |