5-YEAR REVIEW
Western Snowy Plover
[Pacific Coast population Distinct Population Segment]
(*Charadrius nivosus nivosus*)
2019

GENERAL INFORMATION:

Species: Pacific Coast population DPS of the western snowy plover (*Charadrius nivosus nivosus*; formerly *C. alexandrinus nivosus*)
Date listed: March 5, 1993
FR citation(s): 58 FR 12864; March 5, 1993: Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Pacific Coast Population of the Western Snowy Plover.
Classification: Threatened

BACKGROUND:

Most recent status review: 5-Year Review – Short Form Summary, Pacific Coast Population of Western Snowy Plover (*Charadrius alexandrinus nivosus*) (June 8, 2006). See also 71 FR 20607; April 21, 2006: 12-Month Finding on a Petition to Delist the Pacific Coast Population of the Western Snowy Plover, Retention of Threatened Status, and Reaffirmation of the DPS as the Listable Entity.

Federal Register Notice announcing initiation of this review: 83 FR 2825; June 18, 2018. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 50 Species in California, Nevada, and the Klamath Basin of Oregon.

ASSESSMENT:

This 5-year review was conducted by the U.S. Fish and Wildlife Service's (Service) Arcata Fish and Wildlife Office (AFWO). Data for this review were solicited from interested parties through a Federal Register notice announcing this review on June 18, 2018. Information was received from the U.S. Forest Service (USFS), Los Padres National Forest in California (USFS 2018). We also contacted Service Field Office species leads in Region 1 (Pacific) and Region 8 (Pacific Southwest) and others who might have recent data or other information relevant to the status of the population. We used survey information from individuals who have been monitoring breeding and wintering locations across the range of the subspecies, and reviewed unpublished reports, published literature, and information found in our files.

Updated Information

Taxonomy

The taxonomic classification has changed from *Charadrius alexandrinus nivosus* to *Charadrius nivosus nivosus*, since the last published 5-year review (77 FR 2243). This taxonomic and nomenclatural change did not alter the description, distribution, or listing status of the distinct population segment (DPS). However, the List of Endangered and Threatened Wildlife currently does not use the most recently accepted scientific name, nor does it reflect the current entry in the Integrated Taxonomic Information System (*https://www.itis.gov/*). We will correct this error in a future rule published in the Federal Register. We use *Charadrius nivosus nivosus* in this document.

Note: In the remainder of this review, we will refer to the western snowy plover or the Pacific coast population of western snowy plover (Pacific Coast WSP) interchangeably. We do not provide any updated data or status information on Mexico's portion of the range.

Population Size and Distribution (Breeding)

Population Size

Population size estimates since the last 5-year review are based on breeding window surveys (Table 1). Window surveys are the one-time pass of a surveyor, or teams of surveyors, through potential snowy plover nesting habitat in May or early-June.

Population Distribution

The current Pacific coast breeding population extends from Midway Beach, Washington, to Bahia Magdalena, Baja California Sur, Mexico, which is similar to the known range since the last 5-year review. The vast majority of breeding western snowy plovers continue to nest in California (Page et al. 2008, 2016; California Department of Parks and Recreation [CDPR] 2016; Campbell 2017; Robinette 2016), although an increasing number are now nesting in coastal Oregon and Washington (Lauten et al. 2017; Pearson et al. 2017).

Trends: Notable Population Size Decreases in 2007, 2008, 2012, 2016, 2017, and 2018

The 2007 breeding window survey revealed large adult population decreases, compared to the 2006 population estimate, in four out of six recovery units. The magnitude of these losses (2007 downturn) has determined the shape of the population growth trajectories up to 2018 in all four affected units and for the western snowy plover population as a whole. Recovery Unit 2 (RU2) lost 19 adults or 42% of the preceding year's population, and has required 9 years for the subpopulation to recover to its population numbers. Other declines in 2007 were RU4 (-87 adults, -24%, 7 years to recover), RU5 (-241 adults, -26%, 8 years to recover), and RU6 (-115 adults, -39%, 3 years to recover). Despite small increases in populations in RU 1 and 3, the net loss was 340 adults (-18%). Where the decreases were discussed in survey reports, they were attributed to overwinter conditions (e.g., Page et al. 2008), and not to density-dependence (i.e., overcrowding) on wintering sites.

Table 1. Pacific Coast WSP breeding window survey results, in descending order 2019 to 2005, for each recovery unit (RU1 through RU6) and the U.S. Pacific coast (excludes the Baja California peninsula). All counts are breeding age adults and are uncorrected (raw). Recovery Units are RU1: Washington and Oregon (WA-OR); RU2: Northern California (NC); RU3: San Francsico Bay (SFB); RU4: Monterey Bay (MB) area; RU5: San Luis Obispo (SLO) area; RU6: San Diego (SD) area.

Year	RU1 (WA-OR)	RU2 (NC)	RU3 (SFB)	RU4 (MB)	RU5 (SLO)	RU-6 (SD)	Total (U.S. Pacific Coast)
2019	479	41	190	303	807	397	2,217
2018	402	52	235	361	874	451	2,375
2017	342	56	246	369	856	464	2,333
2016	477	46	202	366	820	373	2,284
2015	340	38	195	348	963	376	2,260
2014	269	27	178	374	822	346	2,016
2013	260	23	202	261	754	326	1,826
2012	234	21	147	324	771	358	1,855
2011	202	28	249	311	796	331	1,917
2010	196	19	275	298	686	311	1,785
2009	182	15	147	279	707	257	1,587
2008	147	18	133	257	717	269	1,541
2007	175	26	207	270	676	183	1,537
2006	158	45	102	357	917	298	1,877
2005	137	41	124	337	969	209	1,817

In 2008, 2012, 2016, 2017, and 2018, several localized population decreases affected one or more RUs, but were fully or partly offset by same-year gains in the unaffected units. In all cases, the losses are difficult to assess. In two instances (RU2, RU4) the losses in 2008 followed closely on the 2007 downturn, so teasing apart the year effects underlying these downturns is difficult. In three cases (2008, RU1; 2008, RU3; and 2012, RU2) the subpopulations recovered to pre-2007 downturn levels in 3 years or less. In one case (2012, RU3), the population was not fully recovered in the six survey periods since (2018). The two remaining instances in 2016 (RU5) and 2017 (RU1) are relatively too recent to assess their impact, although we noted that the 2016 downturn in RU5 erased a substantial portion of the gains accrued since 2007. This decline was likely attributed to a discontinuance of predator management due to contracting problems (K. Kughen, pers. comm., 2019) and loss of breeding habitat due to strong winter storms (Robinette 2016). Cautiously, we suggest that localized adjustments in population estimates may not have a long-term effect on population and subpopulation growth trajectories absent a major perturbation. There is, however, uncertainty in these analyses as data are based on imperfect census data and not true abundance, and because we have incomplete information on overwinter survival and return rates.

Analysis of Adult Population Trends (2007-2018) by Recovery Unit, RU1-RU6

Grays Harbor, Pacific and Clatsop (WA); Tillamook, Lincoln Lane, Douglas, Coos, and Curry (OR); RU1 — the circa-1997 baseline estimate was 134 adults. The recovery target is 250 breeding adults, total subpopulation size (Service 2007). RU1 was unaffected by the 2007 downturn. The breeding window survey estimate has increased from 137 adults (2005) to 402 (2018). The shape of the population trajectory (based on regression analysis using 2005-2017 data) is exponential (least squares best fit; AFWO, unpublished records). The population has exceeded the recovery target in each survey year since 2013 based on unadjusted window survey numbers (which are conservative). Observed fecundity on Oregon sites exceeded the target of 1.0 annual fledglings per male in 2011 through 2015, but not in 2016 or 2017 (Lauten et al. 2017). For the Washington sites, for the period 2006-2015, target fecundity was attained in 2006, 2011, and 2013-2015 (Stinson 2016). Overall, productivity in Oregon and Washington, as measured by one or more of the following: fledging success, brood success, number of fledglings/male, and overall number of fledglings produced, have all improved since active predator management and ongoing maintenance have been implemented (Lauten et al. 2014, 2017; Pearson 2014; Stinson 2016).

Del Norte, Humboldt, and Mendocino (CA); RU2 — the circa-1997 baseline estimate was 50 adults. The recovery target is 150 breeding adults, total population size (Service 2007). In the 2007 downturn this RU saw a 42% loss of adults (-19 adults). The number of breeding adult plovers (30; 16 males and 14 females) was the lowest recorded since monitoring began in 2001 (Colwell et al. 2007). The RU experienced repeated decreases in 2007, 2008, 2009, 2012, and 2017. From 2012 to 2018, however, the breeding window survey estimate increased from 21 adults to 52. The shape of the population trajectory since 2012 is linear, positive, and relatively steep (least-squares best fit; AFWO, unpublished records). However, this is unit has been described by some researchers as a "sink" (Pulliam 1988; Mullin et al. 2010; Eberhart-Phillips and Colwell 2014; Hudgens et al. 2014) in which the population can only be sustained through immigration. RU2 has not approached or exceeded the population recovery target in any

breeding window survey year. Nearly all plovers breeding in RU2 occur in Humboldt County, although a new location (Salmon Creek, Sonoma County) was discovered in 2018. Observed fecundity exceeded the target of 1.0 annual fledglings per male in 2016, 2017, 2018, and 2019 (Feucht et al. 2018; Feucht, pers. Comm., 2019).

San Francisco Bay (CA); RU3 —the circa-1997 baseline estimate was 264 adults. The recovery target is 500 breeding adults, total population size (Service 2007). This RU was unaffected by the 2007 downturn, but experienced repeated declines in 2006, 2008, 2011, 2012, 2014 and 2015. From 2005 to 2018, however, the breeding window survey increased from 124 adults to 235. The shape of the population trajectory (2005-2017) is linear (least squares best fit) and positive, with gradual slope and very high year-to-year fluctuation (r-squared = 0.29) (AFWO, unpublished records). The population has not attained or exceeded the recovery target in any survey year since 2005. Fecundity is not estimated in the annual intensive breeding season surveys. This RU is subject to high nest depredation rates and intraspecies aggression given its position within a highly-modified urban environment (former salt ponds and berms), competing habitat restoration needs of other listed species, and the large observed fluctuations in available habitat, especially during the first half of the nesting season, on some years (Robinson-Nilson et al. 2011; Pearl et al. 2018).

Sonoma, Marin, San Francisco, San Mateo, Santa Cruz and Monterey (CA); RU4 —the circa-1997 baseline estimate was 300 adults. The recovery target is 400 breeding adults, total population size (Service 2007). In the 2007 downturn event, this RU experienced a loss of 87 adults (24% less than the 2006 population). Since 2007, the breeding window survey estimate has increased from 257 adults (2008) to 361 (2018). The shape of the population trajectory since 2007 is linear, positive, and gradual, with minimal annual fluctuation (least-squares best fit; AFWO, unpublished records). The population has not attained or exceeded the recovery target in any survey year since 2005. In Monterey Bay, fecundity peaked at 2.0 fledglings per male in 2003 and has been unstable and declining since then, falling below 1.0 in each year since 2012 (Page et al. 2016). Since consecutive-year data have been reported (1995-2014), the fecundity estimates in the Point Reyes subpopulation have exceeded 1.0 annual fledglings per male in 12 of the last 20 years: 1996-1999; 2003-2007; and 2011-2013, including 3 of the last 5 years reported (Campbell 2017).

San Luis Obispo, Santa Barbara, and Ventura, including the northern Channel Islands (CA); RU5 — the circa-1997 baseline estimate was 886 adults. The recovery target is 1,200 breeding adults, total population size (Service 2007). In the 2007 downturn event, this RU experienced a loss of 241 adults (26% less than the 2006 population). Since 2007, the breeding window survey estimate population has increased from 676 adults (2007) to 874 (2018). The shape of the population trajectory since 2007 is linear, positive, and gradual, with minimal annual fluctuation (least squares best fit; AFWO, unpublished records). The population has not attained or exceeded the recovery target in any survey year since 2005. Fecundity data are not compiled for the entire RU due to the number of reporting jurisdictions (Federal, State, local, and private); some underfunded jurisdictions do not collect or report the supporting data on an annual basis. However, annual monitoring reports from several of the larger jurisdictions (e.g., Vandenberg Air Force Base [Robinette et al. 2016], Oceano Dunes State Vehicular Recreation Area [CDPR 2017], and Coal Oil Point Reserve [Sandoval and Nielsen 2016]) report fecundity results that exceed the recovery criterion in most years.

Los Angeles, Orange, and San Diego (CA); RU6 — the circa-1997 population baseline was 316 adults. The recovery target is 500 breeding adults, total population size (Service 2007). In the 2007 downturn event, this RU experienced a loss of 115 adults (39% less than the 2006 population). Since 2007, the breeding window survey estimate has increased from 183 adults (2007) to 451 (2018). The shape of the population trajectory since 2007 is linear, positive, and gradual, with minimal annual fluctuation (least-squares best fit) (AFWO, unpublished records). The population has not attained or exceeded the recovery target in any survey year since 2005. Fecundity data are not reported for the entire RU due to lack of supporting data in some jurisdictions to enable the compiled estimates. Annual monitoring reports from two of the larger jurisdictions (e.g., Marine Corps Base Camp Pendleton [Camp Pendleton] and Naval Base Coronado) report fecundity results that exceed the recovery criterion in most years.

Coast-wide (all six RUs Combined) — the circa-1997 population baseline was 1,950 adults. The recovery target is 3,000 breeding adults, total population size (Service 2007). In the 2007 downturn, the population experienced a net loss of 340 adults (18% less than the 2006 population). Since 2007, the breeding window survey estimate has increased from 1,537 adults (2007) to 2,375 (2018). The shape of the population trajectory since 2007 is linear, positive, and gradual, with minimal annual fluctuation (least-squares best fit; AFWO, unpublished records). Based on an examination of plotted records, this coast-wide growth pattern can be directly attributed to increases in recovery units RUs 2, 4, 5, and 6, along with rapid population expansion (growth) in RU1.

Recovery Criteria:

Our current estimate (2,217 breeding adults; Table 1) remains below the population size of 3,000 birds listed as a recovery objective in the recovery plan (Service 2007), although some local population sizes have surpassed recovery objectives for some areas (e.g., Monterey Bay, Oregon-Washington). Yearly average productivity (Criterion 2; number of fledging/per male) are not compiled annually for the entire U.S. Pacific coast; however, the best available information indicates that the yearly average productivity has not been met. Site-specific reports (unpublished reports) and window survey results are submitted annually. These are maintained on the AFWO website at https://www.fws.gov/arcata/es/birds/WSP/plover.html.

Conservation Efforts

Extensive collaboration with numerous Federal, State, and private agencies continue to support recovery related activities for western snowy plovers. Such activities include: 1) monitoring extant populations; 2) surveying suitable habitat for additional populations; 3) research of ecological requirements and biological characteristics; 4) restoration of coastal dune habitats to remove invasive plant species (e.g., *Ammophila arenaria*, *Carpobrotus chilensis*; *Cytisus scoparius*); 5) ongoing habitat restoration and management, 6) predator removal and surveillance under integrated predator damage management programs (Wildlife Services Division of the U.S. Department of Agriculture); 7) salvage operations for at-risk nests (wind-blown sand; tide burial) and collection of abandoned/non-viable eggs; 8) captive rearing programs at approved facilities including the Santa Barbara Zoo and Monterey Bay Aquarium; 9) color-banding research and resighting; 10) closures to public access and fencing to reduce recreational pressures at extant

populations; 11) public education and engagement (outreach); and 12) other recovery-related activities.

Partners supporting these important recovery-related activities include (in alphabetical order) Bureau of Land Management, California Department of Fish and Wildlife, CDPR, Department of Defense (DOD), Humboldt State University, Los Angeles Audubon Society, National Park Service, Oregon Department of Fish and Wildlife, Oregon State Parks, Point Blue Conservation Science, Portland State University and the Oregon Biodiversity Information Center, San Diego Zoo (Institute for Conservation Research), San Francisco Bay Bird Observatory, University of California Coal Oil Point Reserve, APHIS Wildlife Services, USFS, Washington Department of Fish and Wildlife, Washington State Parks, and the Service, among others. The coordinated effort of these partners to provide greater information specific to the subspecies has been important for making informed decisions regarding threat abatement and recovery options on a rangewide scale. Many of the activities listed above are ongoing and contribute to our knowledge of the western snowy plover population to help conserve this imperiled species.

CONCLUSION:

After review of the best available scientific and commercial information, we conclude that the Pacific coast population of western snowy plover status remains threatened. The evaluation of threats affecting the species under the factors in 4(a) (1) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.; Act) and analysis of the status of the species from our 2006 5-year review (Service 2006), 12-month petition finding (71 FR 20607; April 21, 2006), and threats discussion in the 2007 recovery plan (Service 2007) remain an accurate reflection of the status of the species.

Threats have not changed significantly since the last 5-year review. Evidence of habitat loss and degradation remains widespread; while the degree of this threat varies by geographic location, habitat loss and degradation attributed to human disturbance, urban development, introduced beachgrass, and expanding predator populations remain the management focus in all six recovery units. Efforts to improve habitat at current and historic breeding beaches, and efforts to reduce the impacts of human recreation and predation on nesting plovers, have improved plover numbers. Active vegetation and predator management and habitat restoration should be continued. Because of active management efforts, including increased monitoring, use of predator exclosures at some sites, predator management, and expanded beach closures, western snowy plover population numbers have increased at some locations. However, despite active vegetation and predator management, ongoing and projected changes in sea level and climate is expected affect coastal habitat suitability, nest survival, overwinter survivorship, and quality of nesting and roosting habitats.

RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

The following actions will help guide continuing recovery of the Pacific coast population of western snowy plover by providing information to improve management of nesting and wintering sites. Conservation of the western snowy plover is dependent on continued cooperation with our partners to minimize impacts from current threats and aid in future restoration.

1. Continue to coordinate with Point Blue Conservation, state wildlife managers, federal agencies, university/academic affiliations, and other researchers and data specialists to conduct analysis of existing snowy plover data, to determine trends; create reliable, accurate population models; quantify long-term trends; and direct future management priorities to determine population and breeding stability.

2. Continue to work with DOD (the Navy, the Marine Corps, and Air Force), state fish and wildlife offices, state parks, and other partners to continue current successful site management to minimize impacts of encroaching vegetation, predation, and human disturbance. Where feasible, expand management techniques to other sites to improve habitat conditions for nest and brood survival, particularly in areas where no active management is ongoing. Investigate innovative techniques of site management and monitoring to reduce costs and better protect the species.

3. Collaborate with Mexican nongovernmental organizations, scientists, and federal agencies on potential recovery and management actions at nesting and wintering sites in Mexico.

4. Develop banding protocol to create unified data collection rangewide. Continue banding and recapture studies to determine reproductive success, survival, and movement.

5. Develop standardized monitoring protocols and on-line data portal to facilitate synthesis, analysis, and sharing of data.

6. Consider reconvening an ad-hoc recovery team to determine feasibility and support for a reevaluation of the delisting criteria based upon the active source-sink processes of the Pacific coast metapopulation

7. Continue to support public-private partnerships, such as collaborative resighting databases or movement studies using GPS technologies, to identify natal origin, dispersal matrices, and other irruptive movements of snowy plovers across the Pacific coast.

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 9-10-19

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