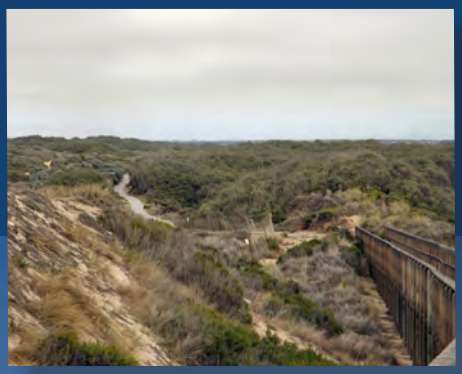

Draft
Habitat Conservation Plan for the Oceano Dunes District

Appendices

February 2020

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Draft Habitat Conservation Plan for the California Department of Parks and Recreation Oceano Dunes District

Appendices

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Appendices

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Appendix A. Listed Species and Other Special-Status Species Not Included in the HCP

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LISTED SPECIES AND OTHER SPECIAL-STATUS ANIMAL AND PLANT SPECIES NOT INCLUDED IN THE HABITAT CONSERVATION PLAN (HCP)

In addition to the covered species in the HCP, observations of other special-status animal and plant species have been documented in the HCP area. Additionally, numerous other special-status animal and plant species have been documented within five miles of the HCP area and/or are included on the U.S. Fish and Wildlife Service (USFWS) Resource Report for the HCP area.

The following tables provide an explanation (i.e., omission rationale) for why California Department of Parks and Recreation (CDPR) has not included each species as a covered species. These or other species could be added to the HCP and Incidental Take Permit (ITP) via a formal amendment to the HCP if either 1) the species becomes listed under the federal Endangered Species Act (ESA) during the duration of the permit and requires incidental take authorization, or 2) the species is already listed, and it is determined that incidental take authorization is warranted due to new information about the potential for take.

ANIMAL SPECIES

Table 1: Special-status animals not included in the HCP

Species	Listing Status[1]	Potential to Occur in the HCP Area	Omission Rationale
Invertebrates			
Vernal pool fairy shrimp (*Branchinecta lynchi*)	FT	None	• No suitable habitat for this species is present within the HCP area. • This species has not been documented in the HCP area or within 5 miles of the HCP area.
Monarch butterfly (*Danaus plexippus*)	Currently under USFWS review for listing under federal ESA	Observed	• Suitable habitat for overwintering monarch butterflies is limited to the eucalyptus (*Eucalyptus* sp.)-Monterey cypress (*Cupressus macrocarpa*) grove in the HCP area. Covered activities in the Monarch Grove or in other areas containing potential roost sites will not directly impact monarch butterflies. Some activities are conducted within the Monarch Grove, but these activities are conducted outside the monarch wintering period and are intended to benefit the species by improving overwintering habitat.
Kern primrose sphinx moth (*Euproserpinus euterpe*)	FT	None	• This species has not been documented in the HCP area or within 5 miles of the HCP area. • In San Luis Obispo (SLO) County, this species is only known to occur within the Carrizo Plain.

Table 1: Special-status animals not included in the HCP			
Species	**Listing Status[1]**	**Potential to Occur in the HCP Area**	**Omission Rationale**
Fish			
Steelhead (South-Central California Coast DPS) (*Oncorhynchus mykiss irideus*)	FT	Observed	• Letter from National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) to CDPR dated December 23, 2008, found that unauthorized steelhead take from covered activities was unlikely. Specific to Arroyo Grande Creek, NOAA Fisheries concluded vehicle crossings do not occur under conditions that could cause direct contact with steelhead or that diminish the value of the creek as steelhead habitat; therefore, an ITP was not recommended.
Arroyo chub (*Gila orcuttii*)	CSSC	None	• Fish surveys have been conducted from 2004-2017, and this species has not been documented in the HCP area[1].
Reptiles/Amphibians			
California tiger salamander (*Ambystoma californiense*)	FT, ST	None	• This species has not been documented in the HCP area or within 5 miles of the HCP area.
Coast range newt (*Taricha torosa*)	CSSC	Observed	• Suitable habitat for this species is limited to aquatic habitat and areas near aquatic habitat in the HCP area. • This species has only been rarely observed in the HCP area; therefore, the chance for take is remote. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G4. Both of these rankings indicate that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.

[1] Arroyo chub have been extirpated from much of their native range, and the only occurrences within five miles of the HCP area were introduced into the Santa Maria River.

Table 1: Special-status animals not included in the HCP			
Species	**Listing Status[1]**	**Potential to Occur in the HCP Area**	**Omission Rationale**
Western spadefoot (*Spea hammondii*)	CSSC	Observed	• This species has only been found at Oso Flaco Lake and within the vegetation islands in the HCP area; therefore, suitable habitat in the HCP area is limited. • This species has only been rarely observed in the HCP area and the chance for take is remote. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G3. These rankings indicate that this species is vulnerable, but not imperiled; therefore, this species is not likely to be federally listed during the permit term.
Western pond turtle (*Emys marmorata*)	CSSC	Observed	• Suitable habitat for this species is limited to aquatic habitat (e.g., Oso Flaco Lake, Oceano Lagoon, and Arroyo Grande Creek) in the HCP area. • This species is given a Global Ranking of G3. This ranking indicates that this species is vulnerable, but not imperiled; therefore, this species is not likely to be federally listed during the permit term.
Blunt-nosed leopard lizard (*Gambelia sila*)	FE, SE, SFP	None	• This species has not been documented in the HCP area or within 5 miles of the HCP area. • In SLO County, this species is only known to occur within the Carrizo Plain.
California horned lizard (*Phrynosoma blainvilli*)	CSSC	Observed	• This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G3G4. Both of these rankings indicate that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
California/Silvery legless lizard (*Anniella pulchra*)	CSSC	Observed	• This species is listed by the International Union for Conservation of Nature (IUCN) as a Least Concern (LC) species. It is also given a Global Ranking of G3G4. Both of these rankings indicate that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.

Table 1: Special-status animals not included in the HCP			
Species	**Listing Status[1]**	**Potential to Occur in the HCP Area**	**Omission Rationale**
Two-striped gartersnake (*Thamnophis hammondii*)	CSSC	Observed	• Suitable habitat for this species is limited to aquatic habitat in the HCP area. • This species has only been rarely observed in the HCP area and the chance for take is remote. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G4. Both of these rankings indicate that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
Birds			
Ducks, Geese, and Swans			
Redhead (*Aythya americana*)	CSSC (nesting)	Observed	• The HCP area is outside the known breeding range for this species and this species is only known as a migrant and wintering bird in estuarine and lake habitats in the HCP area.
Black brant (*Branta bernicla*)	CSSC (wintering and staging)	Observed	• The HCP area is outside the known breeding range for this species. • This species relies on intertidal eelgrass beds within marine waters during the non-breeding season; therefore, it is unlikely to be affected by covered activities. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G5. These rankings indicate that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
Loons			
Common loon (*Gavia immer*)	CSSC (nesting)	Observed	• The HCP area is outside the known breeding range for this species and this species is only known as a migrant and wintering bird in estuarine, subtidal, and lake habitats in the HCP area.
Pelicans			

Table 1: Special-status animals not included in the HCP			
Species	**Listing Status[1]**	**Potential to Occur in the HCP Area**	**Omission Rationale**
American white pelican (*Pelecanus erythrorhyncos*)	CSSC (nesting colony)	Observed	• The HCP area is outside the known breeding range for this species and this species is only known as a summer non-breeder, migrant, or wintering bird in estuarine, shallow marine, and lake habitats in the HCP area.
California brown pelican (*Pelecanus occidentalis californicus*)	SFP (nesting colony and communal roosts)	Observed	• The HCP area is outside the known breeding range for this species and this species is only known as a migrant and wintering bird in estuarine, subtidal, and marine habitats in the HCP area. • This species is not likely to be listed under the federal ESA because the population has successfully recovered and was removed from the list in 2009. • This species is not known to communally roost in areas where covered activities could affect the species.
Herons, Egrets, Bitterns			
Least bittern (*Ixobrychus exilis*)	CSSC (nesting)	Observed	• This species is an uncommon breeder in the HCP area. • This species is limited to breeding in suitable aquatic habitat (e.g., Oso Flaco Lake) in the HCP area. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G5. These rankings indicate that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
Storks			
Wood stork (*Mycteria americana*)	CSSC	Observed	• The HCP area is outside the known breeding range for this species. • This species has only been observed one time in the HCP area in 2011 near Oso Flaco Lake.
New World Vultures			

Table 1: Special-status animals not included in the HCP			
Species	**Listing Status[1]**	**Potential to Occur in the HCP Area**	**Omission Rationale**
California condor (*Gymnogyps californianus*)	FE, SE, SFP	Low	• The HCP area is outside the known breeding range for this species. • This species has not been documented in CNDDB within 5 miles of the HCP area. • This species was recorded on eBird as being observed in 2014 outside the HCP area nearby Pismo Beach; however, this species is likely only a rare migrant through the area.
Hawks, Kites, Harriers, Eagles			
Golden eagle (*Aquila chrysaetos*)	SFP	Observed	• This species is not known to nest in the HCP area and is only known as a rare migrant in the area.
Swainson's hawk (*Buteo swainsoni*)	ST	Low	• The HCP area is outside the current known range for this species. • This species has not been observed in the HCP area, and the only CNDDB occurrence within 5 miles of the HCP area is believed to be extirpated. • This species was recorded on eBird as being observed only one time in the HCP area in 2010 at Oceano Campground and is likely only a very rare migrant through the HCP area. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G5. These rankings indicate that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
Northern harrier (*Circus cyaneus*)	CSSC (nesting)	Observed	• This species has been observed to be a rare breeder in the HCP area. • Suitable nesting habitat for this species is limited in the HCP area. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G5. These rankings indicate that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.

Table 1: Special-status animals not included in the HCP			
Species	**Listing Status**[1]	**Potential to Occur in the HCP Area**	**Omission Rationale**
White-tailed kite (*Elanus leucurus*)	SFP (nesting)	Observed	• A nest for this species has never been documented in the HCP area; therefore, it is likely only a rare breeder in the area. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G5. These rankings indicate that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
Falcons			
American peregrine falcon (*Falco peregrinus anatum)*	SFP (nesting)	Observed	• This species is not likely to be listed under the federal ESA because the population has recovered, and it was removed from the list in 1999. • This species is known to nest approximately 20 miles away on the bluffs of Shell Beach, but is not known to nest in the HCP area.
Rails, Coots, Gallinules			
California black rail (*Laterallus jamaicensis coturniculus*)	ST, SFP	Observed[2]	• This species is limited to suitable aquatic habitat (e.g., Oso Flaco Lake) in the HCP area. • This species has not occurred in the HCP area since 1991.
Ridgway's rail (*Rallus obsoletus obsoletus*)	FE, SE, SFP	None	• The HCP area is outside the known range for this species.

[2] Last observed in 1991 at Oso Flaco Lake and this occurrence was never visually confirmed.

Table 1: Special-status animals not included in the HCP			
Species	**Listing Status[1]**	**Potential to Occur in the HCP Area**	**Omission Rationale**
Sandpipers and Relatives			
Black tern (*Chlidonias niger*)	CSSC (nesting colony)	Observed	• The HCP area is outside the known breeding range for this species and this species is likely a rare non-breeding summer resident or migrant in aquatic habitats (e.g., Oso Flaco Lake and Oceano Lagoon) in the HCP area.
Black skimmer (*Rynchops niger*)	CSSC (nesting colony)	Observed	• The HCP area is outside the known breeding range for this species and this species is likely only a rare spring or fall migrant in the HCP area.
Auklets, Puffins, and Relatives			
Marbled murrelet (*Brachyramphus marmoratus*)	FT, SE	Observed	• The HCP area is outside the known breeding range for this species. • This species forages offshore; therefore, it is unlikely to be impacted by covered activities.
Cuckoos and Relatives			
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	FT, SE	Observed[3]	• The HCP area is outside the current known breeding[4] and wintering range for this species. Any observations are likely rare migrants; therefore, this species is not likely to be affected by covered activities. • This species has only rarely been observed in the HCP area at Oso Flaco Lake and Oceano Campground.
Owls			

[3] Last observed in 1999 in the Oso Flaco Lake area.

[4] CNDDB documents a yellow-billed cuckoo nest in 1932 at Pismo Beach; however, this occurrence is extirpated. The eBird checklist for the HCP area documents a yellow-billed cuckoo at Oso Flaco Lake in 1999 that was later banded at a MAPS station and another yellow-billed cuckoo was documented at Oceano Campground in 2010. No other yellow-billed cuckoos have been documented in the HCP area and the current known breeding range does not include the HCP area.

Table 1: Special-status animals not included in the HCP			
Species	**Listing Status[1]**	**Potential to Occur in the HCP Area**	**Omission Rationale**
Burrowing owl (*Athene cunicularia*)	CSSC	Observed	• This species is not known to breed in the HCP area. • This species is known to be an infrequent winter visitor within the HCP area. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G4. Both of these rankings indicate that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
Swifts			
Vaux's swift (*Chaetura vauxi*)	CSSC (nesting)	Observed	• The HCP area is just south of the known breeding range for this species, and no suitable breeding habitat is present in the HCP area. • This species likely only occurs as a rare migrant in the HCP area.
Black swift (*Cypseloides niger*)	CSSC (nesting)	Observed	• The HCP area is outside the known breeding range for this species and this species is likely a rare migrant in the HCP area.
Tyrant Flycatchers			
Olive-sided flycatcher (*Contopus cooperi*)	CSSC (nesting)	Observed	• This species is an uncommon breeder in SLO County. • Only marginal breeding habitat for this species is present in the HCP area. • This species has only been observed in the HCP area at Oso Flaco Lake, Meadow Creek, and Oceano Campground.
Willow flycatcher (*Empidonax traillii*)	SE[5]	Observed[5]	• The HCP area is outside the known breeding and wintering sites for this species. Any observations are likely migrants; therefore, this species is not likely to be affected by covered activities.
Southwestern willow flycatcher (*Empidonax traillii extimus*)	FE, SE	None	• The HCP area is outside the known range for this species.

[5] The subspecies observed was not recorded; however, based on the known range of the willow flycatcher subspecies, it was most likely little willow flycatcher (*Empidonax traillii brewsteri*), which is state-listed only.

Table 1: Special-status animals not included in the HCP			
Species	**Listing Status[1]**	**Potential to Occur in the HCP Area**	**Omission Rationale**
Shrikes			
Loggerhead shrike (*Lanius ludovicianus*)	CSSC (nesting)	Observed	• This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G4. Both of these rankings indicate that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
Vireos			
Least Bell's vireo (*Vireo bellii pusillus*)	FE, SE	None	• The HCP area is outside the known range for this species.
Swallows			
Bank swallow (*Riparia riparia*)	ST	Observed	• The HCP area is outside the known breeding and wintering range for this species. Any observations are likely migrants; therefore, this species is not likely to be affected by covered activities.
Wood Warblers			
Yellow-breasted chat (*Icteria virens*)	CSSC (nesting)	Observed	• This species' breeding range has been documented as being restricted to Arroyo Grande Creek above Lopez Lake; however, this species could be a rare breeder in the HCP area based on a few rare records of this species singing in the HCP area during the breeding season. • Suitable nesting habitat within the HCP area is limited to riparian habitat and this species has only been observed at Oso Flaco Lake and Oceano Lagoon within the HCP area. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G5. These rankings indicate that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
Lucy's warbler (*Oreothlypis luciae*)	CSSC (nesting)	Observed	• The HCP area is outside the known breeding range for this species and this species is likely a rare migrant through the HCP area.

Table 1: Special-status animals not included in the HCP			
Species	**Listing Status[1]**	**Potential to Occur in the HCP Area**	**Omission Rationale**
Yellow warbler (*Setophaga petechia*)	CSSC (nesting)	Observed	• This species is limited to breeding in riparian habitat in the HCP area. • This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G5. These rankings indicate that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
Sparrows, Buntings, Warblers, & Relatives			
Summer tanager (*Piranga rubra*)	CSSC (nesting)	Observed	• The HCP area is outside the known breeding range for this species and this species is likely a rare migrant in the HCP area[6].
Blackbirds			
Tricolored blackbird (*Agelaius tricolor*)	ST	Observed	• This species is not known to nest in the HCP area. • This species has only infrequently been observed flying over and foraging at Oso Flaco Lake and Arroyo Grande Creek in the HCP area.
Yellow-headed blackbird (*Xanthocephalus xanthocephalus*)	CSSC (nesting)	Observed	• The HCP area is outside the known breeding range for this species and this species is likely a migrant in the HCP area.
Mammals			
Pallid bat (*Antrozous pallidus*)	CSSC	Observed	• This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G5. These rankings indicate that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
Townsend's big-eared bat (*Corynorhinus townsendii*)	CSSC	Observed	• This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G3G4. Both of these rankings indicate that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.

[6] A male summer tanager was documented as singing in the HCP area in June 2012; however, no female or nest was ever found.

Table 1: Special-status animals not included in the HCP

Species	Listing Status[1]	Potential to Occur in the HCP Area	Omission Rationale
Western red bat (*Lasiurus blossevillii*)	CSSC	Observed	• This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G5. These rankings indicate that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
Giant kangaroo rat (*Dipodomys ingens*)	FE, SE	None	• The HCP area is outside this species' known range.
Southern sea otter (*Enhydra lutris nereis*)	FT, SFP	Low	• This species occurs offshore of the HCP area; therefore, covered activities are unlikely to occur in areas that would affect this species.
American badger (*Taxidea taxus*)	CSSC	Observed	• This species is listed by the IUCN as an LC species. It is also given a Global Ranking of G5. These rankings indicate that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.

[1]Listing Status Designations:

FE	Federally endangered	SE	State endangered	CSSC	California species of special concern
FT	Federally threatened	ST	State threatened	SFP	State fully protected
FC	Federal candidate	SC	State candidate		

PLANT SPECIES

Table 2: Special-status plants not included in the HCP

Species	Listing Status[1]	Potential to Occur in HCP Area	Omission Rationale
Red sand verbena (*Abronia maritima*)	CRPR 4	Observed	• This species is given a Global Ranking of G4. This ranking indicates that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
Hoover's bent grass (*Agrostis hooveri)*	CRPR 1B	Low	• This species is not known to occur in the HCP area, and limited suitable habitat is present in the HCP area.
Morro manzanita (*Arctostaphylos morroensis*)	FT	None	• Known only from Morro Bay; therefore, the HCP area is outside this species' known range.
Santa Margarita manzanita (*Arctostaphylos pilosula*)	CRPR 1B	Low	• This species is not known to occur in the HCP area, and limited suitable habitat is present in the HCP area.
Sand mesa manzanita (*Arctostaphylos rudis*)	CRPR 1B	Observed	• Only a single individual has been documented in the Phillips 66 Leasehold area; therefore, this species has limited distribution in the HCP area and is unlikely to be affected by covered activities.
Nuttall's milkvetch (*Astragalus nuttallii* var. *nuttallii*)	CRPR 4	Observed	• This species is given a Global Ranking of G4. This ranking indicates that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
Davidson's saltscale (*Atriplex serenana* var. *davidsonii*)	CRPR 1B	Low	• This species is not known to occur in the HCP area, and limited suitable habitat is present in the HCP area. • Only one occurrence of this species has been documented within 5 miles of the HCP area, and that record is from 1965.
Monterey Coast paintbrush (*Castilleja latifolia*)	CRPR 4	Observed	• This species is given a Global Ranking of G4. This ranking indicates that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
California jewelflower (*Caulanthus californicus*)	FE, SE, CRPR 1B	None	• Known only from a few areas in the hilly terrain west of the San Joaquin Valley; therefore, the HCP area is outside this species' known range.
Coastal goosefoot (*Chenopodium littoreum*)	CRPR 1B	Observed	• This species was last documented in the Oso Flaco Lake region in 1950. • This species has only recently been observed at Phillips 66 Leasehold; therefore, it has a limited distribution in the HCP area and is unlikely to be affected by covered activities.

Table 2: Special-status plants not included in the HCP			
Species	Listing Status[1]	Potential to Occur in HCP Area	Omission Rationale
Brewer's spineflower (*Chorizanthe breweri*)	CRPR 1B	Low	• This limited suitable habitat for this species is present in the HCP area and it has only been observed in the Phillips 66 Leasehold and by Surprise Lake in the very southern portion of the HCP area. • Only one occurrence of this species has been documented within 5 miles of the HCP area, and that record is from 1977.
Douglas' spineflower (*Chorizanthe douglasii*)	CRPR 4	Observed	• This species has only been observed in the HCP area at the Pavilion Hill vegetation island, Phillips 66 Leasehold, and by Surprise Lake in the very southern portion of the HCP area; therefore, this species has limited distribution in the HCP area and is unlikely to be affected by covered activities. • This species is given a Global Ranking of G4. This ranking indicates that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
San Luis Obispo mariposa lily (*Calochortus obispoensis*)	CRPR 1B	Low	• This species is not known to occur in the HCP area, and limited suitable habitat is present in the HCP area.
San Luis Obispo owl's clover (*Castilleja densiflora* var. *obispoensis*)	CRPR 1B	Low	• This species is not known to occur in the HCP area, and limited suitable habitat is present in the HCP area.
Straight-awned spineflower (*Chorizanthe rectispina*)	CRPR 1B	Low	• This species is not known to occur in the HCP area, and limited suitable habitat is present in the HCP area.
California saw-grass (*Cladium californicum*)	CRPR 2	Observed[7]	• This species has not been observed near the HCP area since 1990. • Limited suitable habitat for this species is present in the HCP area (i.e., Oso Flaco Lake), and it has not been documented in this habitat to date.
Pismo clarkia (*Clarkia speciosa* ssp. *immaculata*)	FE, CRPR 1B	None	• This species is not known to occur in the HCP area, and limited suitable habitat for this species is present in the HCP area.
Salt marsh bird's-beak (*Chloropyron maritimum* ssp. *maritimum*)	FE, SE, CRPR 1B	None	• The HCP area is outside the known range for this species.

[7] California saw-grass has not been found in the HCP area in recent years; however, it was documented in CNDDB as occurring somewhere near Oso Flaco Lake in 1990.

Table 2: Special-status plants not included in the HCP			
Species	Listing Status[1]	Potential to Occur in HCP Area	Omission Rationale
Monterey cypress (*Hesperocyparis macrocarpa*)	CRPR 1B[8]	Observed	• This species is not native in the HCP area.
Paniculate tarplant (*Deinandra paniculata*)	CRPR 4	Observed	• This species has only been documented in the Phillips 66 Leasehold area; therefore, this species has limited distribution in the HCP area and is unlikely to be affected by covered activities. • This species is given a Global Ranking of G4. This ranking indicates that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
Dune larkspur (*Delphinium parryi* spp. *blochmaniae*)	CRPR 1B	Observed	• Targeted surveys have been conducted for this species, and it has only been found in the Phillips 66 Leasehold, Coreopsis Hill, and South Oso Flaco; therefore, it has a limited distribution in the HCP area. • This species is given a Global Ranking of G4T2. This ranking indicates that this species is secure considering populations outside California; therefore, this species is not likely to be federally listed during the permit term.
Umbrella larkspur (*Delphinium umbraculorum*)	CRPR 1B	Low	• This species is not known to occur in the HCP area, and limited suitable habitat for this species is present in the HCP area.
Blochman's leafy daisy (*Erigeron blochmaniae*)	CRPR 1B	Observed	• This species was included in the 1985 USFWS "Review of Plant Taxa for Listing as Endangered or Threatened Species" and was placed in category 3C during this review. Category 3C includes taxa that have proven to be more abundant or widespread than was previously believed and/or those that are not subject to any identifiable threat. This species was not included in the subsequent USFWS review of plant taxa (e.g., 1990 and 1993). As a result, this species is not likely to be federally listed during the permit term.
Indian knob mountain balm (*Eriodictyon altissimum*)	FE, SE, CRPR 1B	None	• Known only from the Irish Hills (between Morro Bay and Indian Knob) in San Luis Obispo County; therefore, the HCP area is outside this species' known range.
Suffrutescent wallflower (*Erysimum suffrutescens*)	CRPR 4	Observed	• This species is given a Global Ranking of G3. This ranking indicates that this species is vulnerable, but not imperiled; therefore, this species is not likely to be federally listed during the permit term.

[8] Only considered a special-status plant where they naturally occur.

Table 2: Special-status plants not included in the HCP			
Species	Listing Status[1]	Potential to Occur in HCP Area	Omission Rationale
Mesa horkelia (*Horkelia cuneata* var. *puberula*)	CRPR 1B	Observed[9]	• This species was last documented north of Oso Flaco Lake in 1973. • Recently this species has only been observed in the HCP area by Surprise Lake in the very southern portion of the HCP area; therefore, this species has limited distribution in the HCP area and is unlikely to be affected by covered activities. • This species is given a Global Ranking of G4. This ranking indicates that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
Kellogg's horkelia (*Horkelia cuneata* spp. *sericea*)	CRPR 1B	Observed	• This species has only been documented in the Pismo Dunes Natural Preserve and Phillips 66 Leasehold area and in the very southern portion of the HCP area; therefore, this species has limited distribution in the HCP area and is unlikely to be affected by covered activities. • This species is given a Global Ranking of G4. This ranking indicates that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
Southwestern spiny rush (*Juncus acutus* ssp. l*eopoldii*)	CRPR 4	Observed	• This species has only been documented in the Pismo Dunes Natural Preserve and vegetation islands; therefore, it has a limited distribution in the HCP area and is unlikely to be affected by covered activities. • This species is given a Global Ranking of G5. This ranking indicates that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
Fuzzy prickly phlox (*Linanthus californicus* ssp. *tomentosus*)	CRPR 4	Observed	• This species has only been documented in the Pismo Dunes Natural Preserve, South Oso Flaco, the Phillips 66 Leasehold, and in the very southern portion of the HCP area; therefore, it is unlikely to be affected by covered activities. • This species is given a Global Ranking of G5. This ranking indicates that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
San Luis Obispo County lupine (*Lupinus ludovicianus*)	CRPR 1B	Low	• This species is not known to occur in the HCP area, and limited suitable habitat for this species is present in the HCP area.

[9] Last observed in 1973 north of Oso Flaco Lake.

Table 2: Special-status plants not included in the HCP			
Species	Listing Status[1]	Potential to Occur in HCP Area	Omission Rationale
Dunedelion (*Malacothrix incana*)	CRPR 4	Observed	• This species is given a Global Ranking of G4. This ranking indicates that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
Southern curly-leaved monardella (*Monardella sinuata* ssp. *sinuata*)	CRPR 1B	Low	• This species is not known to occur in the HCP area, and limited suitable habitat for this species is present in the HCP area.
Crisp monardella (*Monardella undulata* ssp. *crispa*)	CRPR 1B	Observed	• This species is widespread in the HCP area and is given a Global Ranking of G3T2. The T2 ranking indicates that the subspecies is imperiled or threatened. In addition, it was given a rank of 2 in the USFWS 1993 review of plant taxa for listing as endangered or threatened species, which means the USFWS determined that proposing to list the species as endangered or threatened may be appropriate, but more information and/or surveys are needed to obtain sufficient information to list the species. Therefore, the USFWS may determine that listing is warranted during the permit term. It is not included as a covered species, however, because it is currently unlisted and will continue to be monitored over the permit term. Should it be listed, CDPR will evaluate effects of the covered activities and consult with USFWS on the need to add the species to the HCP via an amendment.
San Luis Obispo monardella (*Monardella undulata* ssp. *undulata*)	CRPR 1B	Observed	• This species is fairly widespread in the HCP area and is given a Global Ranking of G2. The G2 ranking indicates that the species is imperiled and at high risk of extinction due to a very restricted range, very few populations, steep declines, or other factors. Furthermore, it was given a rank of 2 in the USFWS 1993 review of plant taxa for listing as endangered or threatened species, which means the USFWS determined that proposing to list the species as endangered or threatened may be appropriate, but more information and/or surveys are needed to obtain sufficient information to list the species. Therefore, the USFWS may determine that listing is warranted during the permit term. It is not included as a covered species, however, because it is currently unlisted and will continue to be monitored over the permit term. Should it be listed, CDPR will evaluate effects of the covered activities and consult with USFWS on the need to add the species to the HCP via an amendment.

Table 2: Special-status plants not included in the HCP			
Species	Listing Status[1]	Potential to Occur in HCP Area	Omission Rationale
California spineflower (*Mucronea californica*)	CRPR 4	Observed	• This species has only been documented in the Pismo Dunes Natural Preserve, South Oso Flaco, and the Phillips 66 Leasehold; therefore, it is unlikely to be affected by covered activities. • This species is given a Global Ranking of G3. This ranking indicates that this species is vulnerable, but not imperiled; therefore, this species is not likely to be federally listed during the permit term.
Spreading navarretia (*Navarretia fossalis*)	FT, CRPR 1B	None	• The HCP area is outside the known range for this species.
Coast woolly-heads (*Nemacaulis denudata* var. *denudata*)	CRPR 1B	Observed[10]	• This species has not been documented in the HCP area since 2000, including during vegetation surveys conducted by CDPR.
Short-lobed broomrape (*Orobanche parishii* ssp. *brachyloba*)	CRPR 4	Observed	• This species has only been documented in South Oso Flaco; therefore, it has a limited distribution in the HCP area and is unlikely to be affected by covered activities. • This species is given a Global Ranking of G4T4. This ranking indicates that this species is uncommon, but not rare; therefore, this species is not likely to be federally listed during the permit term.
Monterey pine (*Pinus radiata*)	CRPR 1B[11]	Observed	• Not native in the HCP area.
Torrey pine (*Pinus torreyana* ssp. *torreyana*)	CRPR 1B[5]	Observed	• Not native in the HCP area.
Hickman's popcorn flower (*Plagiobothrys chorisianus* var. *hickmanii*)	CRPR 4	Observed	• This has only been documented within some vegetation islands, the Phillips 66 Leasehold, and near Maidenform; therefore, it is unlikely to be affected by covered activities. • This species is given a Global Ranking of G3T3. This ranking indicates that this species is vulnerable, but not imperiled; therefore, this species is not likely to be federally listed during the permit term.

[10] Documented in CNDDB as occurring north of Oso Flaco Lake near the boundary with OHV activity in 2000.

[11] Only considered a special-status plant where they naturally occur.

Table 2: Special-status plants not included in the HCP

Species	Listing Status[1]	Potential to Occur in HCP Area	Omission Rationale
Sand almond (*Prunus fasciculata* var. *punctata*)	CRPR 4	Observed	• This has only been documented within the Phillips 66 Leasehold; therefore, it has a limited distribution in the HCP area and is unlikely to be affected by covered activities. • This species is given a Global Ranking of G5T4. This ranking indicates that this species is widespread; therefore, this species is not likely to be federally listed during the permit term.
Black-flowered figwort (*Scrophularia atrata*)	CRPR 1B	Low	• This species is not known to occur in the HCP area, and this species mostly occurs on older sand dunes than are present in the HCP area.
Blochman's ragwort (*Senecio blochmaniae*)	CRPR 4	Observed	• This species is given a Global Ranking of G3. This ranking indicates that this species is vulnerable, but not imperiled; therefore, this species is not likely to be federally listed during the permit term.
San Bernardino aster (*Symphyotrichum defoliatum*)	CRPR 1B	Low	• This species is not known to occur in the HCP area, and limited suitable habitat for this species is present in the HCP area.

[1]Listing Status Designations:

FE: Federal endangered
SE: State endangered
CRPR 1B: Considered to be rare, threatened, or endangered in California and elsewhere
CRPR 2: Considered to be rare, threatened, or endangered in California, but more common elsewhere
CRPR 4: Watch List

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Appendix B. Superintendent's Orders and Other District Guidelines

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STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICL RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULER RECREATION AREA AND PISMO STATE BEACH

ORDER NO. OHV -554-001-15

January 16, 2015

Motorized and Non-Motorized Vehicles

The lands and facilities under the Administration of the California Department of Parks and Recreation, Oceano Dunes State Vehicular Recreation Area so designated on the attached map, are closed to parking, standing or stopping motorized and non-motorized vehicles between the hours of 11:00 PM and 6:00 AM.

1. The area north beach marker post #2 does not constitute a designated camping area. Camping is prohibited under the California Code of Regulations, Title 14, and Section 4451.

2. The area south beach marker post #2 is the designated camping area between for Oceano Dunes State Vehicular Recreation Area. Vehicle are allowed to be in the designated camping area between the hours of 11:00 PM and 6:00 AM if the vehicle displays a valid camping receipt and the receipt is affixed to the vehicle's windshield. All other vehicle are in violation of this posted order.

Exceptions to this closure order may be granted in writing by the District Superintendent or his/her designee at Oceano Dunes State Vehicular Area, 340 James Way, Suite 270, Pismo Beach, CA 93449.

Nothing herein shall affect any existing concession contract, private contract or property rights.

Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300, 4302, 4326, 4326(a), and 4353.

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554 – 002 – 2015

January 26, 2015

Unattended Vehicle

1. Vehicles left standing unattended anywhere on lands owned or operated by California State Parks within the Oceana Dunes State Vehicular Recreation Area (ODSVRA) as a result of being disabled, vandalized, having been involved in an accident, or where there is immanent threat that the vehicle will be inundated by creek water flow or tidal ocean water, will be considered hazards and attractive nuisances. Said vehicles are subject to tow and storage at owner's expense.

2. Exceptions to this order may be granted by an on-duty State Park Peace Officer Supervisor by contacting the California Department of Parks and Recreation, Oceana Dunes Ranger Station at (805) 473-7220, or in writing by the District Superintendent, or his/her designee at 340 James Way, Suite 270, Pismo Beach, CA 93449.

3. Nothing herein shall affect any existing concession contract, private contract, or property rights.

4. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code, Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300, 4301(i), 4302, 4355(a),4326 (a) and California Vehicle Code, Sections 21113 and 22651(n).

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554–003–2015
January 26, 2015

This order supersedes order no. 554-3-12

Kite Surfing

1. To ensure the protection of nesting western snowy plovers and California least terns, and to provide for public safety, no person shall operate, fly, release, or cause to be operated, flown, or released any kite, or other device capable of flight, controlled from the ground or water; whether by attached control device, free flying, or by remote control within lands owned, administered and within the 1000 foot coastal jurisdiction of the California Department of Parks and Recreation (CDPR), Oceano Dunes District (ODD).

2. Exceptions: Kites may be operated and/or flown on the beach below the toe of dunes at Pismo State Beach (PSB), and within the 1000 foot coastal jurisdiction of CDPR, ODD, north of the "closed to motor vehicle" signs, north of the Grand Avenue sand access ramp to Oceano Dunes State Vehicular Recreation Area (ODSVRA), extending northward to Pismo Creek. The launching and landing of kite boards and kite surfing equipment is permitted in this area.

   Kites may be operated and/or flown on the beach, below the toe of the dunes, within the 1000 foot coastal jurisdiction of CDPR, ODD, from the public restroom north of the Pier Avenue sand access ramp to ODSVRA in Oceano, northward to the public restroom south of the Grand Avenue sand access ramp to ODSVRA. The landing and launching of kite board sand kite surfing equipment is permitted in this area.

   In the interest of visitor safety in the Oceano Dunes District, Kite Surfing will be limited as follows:

3. Launching and landing restrictions:

   A. Dry land launching and landing and open water Kite Surfing is permitted between Grand Ave. and Pier Ave.
   B. Wet launching and landing and Kite Surfing over open water is permitted south of Pier Ave. Wet launching and landing is described as launching and landing where the entire kite equipment is in/above the rolling water area of the beach.
   C. Open water Kite Surfing is not allowed south of the beach marker post #6 between March 1st and September 30th of each year. No launching or landing is permitted for any reason south of beach post marker #6 between March 1st and September 30th of each year.

4. No person shall launch or land a kite if there is anybody between themselves and their kite or where their kite might land. Nor in an area 90 degrees in either direction of downwind, between themselves and their kite or where their kite might land.

5. When flying a kite on the beach, the operator must maneuver the kite to the highest elevation in a neutral position whenever any person enters his zone of impact; that is, the area where their kite might land, maintaining an eighty foot safe distance from any person.

6. No Kite Surfing is allowed within close proximity of swimmers.

7. All Kite surfers shall use a safety leash.

8. No overhead jumps in water less than six feet deep.

9. All Harbors and Navigation codes applicable to vessels under power will apply to Kite surfers.

10. Permission for Kite surfing can be revoked at any time by any lifeguard and/or Peace Officer on duty if a Kite · surfer is determined to be dangerous to others.

11. Land boarding, Kite Buggies or any other devices which are propelled by a kite or sail over land are prohibited.

12. Exceptions to this order may be granted by an on-duty State Park Peace Officer Supervisor by contacting the California Department of Parks and Recreation, Oceano Dunes Ranger Station at (805) 473-7220, or in writing by the District Superintendent, or his/her designee at 340 James Way, Suite 270, Pismo Beach, CA 93449.

13. Nothing herein shall affect any existing private contract or property rights.

14. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

15. This order replaces Superintendent's Order number OHV-554-3-12. Order number OHV 554-3-12 is hereby revoked.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code, Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300, 4302, 4651, and 4326(a), and 4301(i) and 4319.

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacrament

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554 – 004 – 2015

January 26, 2015

Refuse Disposal

1. To ensure the health and safety of persons on property administered by the Department of Parks and Recreation, Oceano Dunes District:

   A. No person shall import any litter, domestic, agricultural or commercial garbage or refuse, for the express purpose of disposing such material in the State Park trash can or dumpsters.

   B. No person shall climb on or into trash containers, dumpsters, nor remove, separate or dislodge the contents inside in total or in part.

   C. No person shall place petroleum waste products, batteries, or toxic substances in trash containers/dumpsters.

   D. No person shall place ignited or smoldering materials or coals inside any trash container/dumpster.

   E. No person shall dispose of wastewater containing formaldehyde into the wastewater dump stations, trash containers /dumpsters.

2. Exceptions to this order may be granted by the District Superintendent, Oceano Dunes District, 340 James Way, Suite 270, Pismo Beach, CA 93449.

3. Nothing herein shall affect any existing private contract or property rights.

4. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

5. This order replaces Superintendent's Order number OHV-554-4-10. Order number OHV 554-4-10 is hereby revoked.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code, Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300, 4326(a), 4301(i), 4310, 4324, and 4326. Health and Safety Code 25203
Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554–005–2015

January 26, 2015

Motor Vehicle Operation

1. The following lands operated by the Oceano Dunes District have motor vehicle operation restrictions: Pismo State Beach, north from Grand Avenue, where posted, to the Pismo Beach Pier; That portion of Pismo State Beach operated as part of Oceano Dunes SVRA south from the vehicle prohibition posting at Grand Avenue to beach marker post #2; That portion of Pismo State Beach and Oceano Dunes SVRA south from beach marker post #2 to the southern boundary of the riding area; That portion of Oceano Dunes SVRA, known as the Oso Flaco Lake Natural Area, south from the southern boundary of the riding area to the southern boundary of the SVRA; Any area permanently or temporarily fenced or posted closed to vehicle operation within the allowed riding areas. The restrictions for each area are as follows:

2. Pismo State Beach, north from Grand Avenue, where posted, to the Pismo Beach Pier: Motor vehicle operation is prohibited.

3. **That portion of Pismo State Beach operated as part of Oceano Dunes SVRA south from the vehicle prohibition posted at Grand Avenue to beach marker post #2**: Only street legal vehicles may be operated in this area. It is prohibited to cross Arroyo Grande Creek in any other manner than by crossing the creek as close to the ocean waterline as possible and parallel to the ocean waterline. Driving upstream or downstream in the creek channel or in any other manner in the creek channel is prohibited. If the creek crossing is posted "closed", crossing the creek is prohibited.

4. **That portion of Pismo State Beach and Oceano Dunes SVRA south from beach marker post #2 to the southern boundary of the riding area:** Street legal and non-street legal vehicles, with appropriate off-highway motor vehicle registration, may be operated in this area.

5. **That portion of Oceano Dunes SVRA, known as the Oso Flaco Lake Natural Area, south from the southern** boundary of the riding area to the southern boundary of the SVRA: Motor vehicle operation is prohibited.

6. **Any area permanently or temporarily fenced or posted closed to vehicle operation within the allowed riding areas**: Motor vehicle operation is prohibited.

7. Motor vehicles of any type or configuration owned by State Parks and operated by a State Park employee or authorized representative are exempt from all area closures in order to facilitate the operation of State Park owned and operated lands within the District. This

exemption also applies to authorized contractors operating authorized vehicles and equipment, Search and Rescue volunteers operating authorized vehicles and equipment and State Park volunteers operating authorized vehicles and equipment.

8. Exceptions to this order may only be given in writing by the District Superintendent of the Oceano Dunes District, 340 James Way, Suite 270, Pismo Beach, CA 93449, (805) 773-7170.

9. Nothing herein shall affect any existing private contract or property rights.

10. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Section 5003 and Section 5003.5, and section 5008, California Code of Regulations, Title 14, Section4300, 4301(i), 4326(a) and Section 4455.

Copies of this order have been filed with the Off-Highway Motor. Vehicle recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554 – 007 – 2015

January 26, 2015

Fees Motor Vehicle

1. Payment of fees is required for motor vehicles entering portions, or areas of lands owned or administered by the Department of Parks and Recreation within the Oceano Dunes State Vehicular Recreation Area.

2. No vehicle shall enter, attempt to enter, or be present in the park without the driver or registered owner making a reasonable effort to pay for any use fee that may apply. The driver or registered owner of any vehicle entering or remaining in the parks shall have a valid pass displayed at all times while the vehicle is in the park.

3. Valid passes are those issued by the Department of Parks and Recreation, Oceana Dunes State Vehicular Recreation Area, or their authorized agents. An issued camping pass may not be transferred to another vehicle.

4. Park access may be restricted, denied, or revoked at anytime to ensure the health and safety of persons, property, and wildlife on lands administered by the Department of Parks and Recreation.

5. Nothing herein shall affect any existing private contract or property rights.

6. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

7. The intent of this order is to stop the use of invalid passes and the misuse of valid passes to facilitate unlawful access to the park.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300,4302, and 4326(a).

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554–008–2015

January 26, 2015

Health and Safety Campfire

1. To ensure the health and safety of persons and property on lands administered by the Department of Parks and Recreation, Off-Highway Motor Vehicle Recreation Division, Oceano Dunes State Vehicular Recreation Area, the following restrictions are in effect:

   A. Only wood and untreated wood products, free of metal, petroleum products, or other toxic substances shall be used for campfires, beach fires, or recreational fires.

   B. Campfires, beach fires, or recreational fires shall not be larger than three (3) feet in diameter and two (2) feet in height.

   C. No person shall import, transport, or possess any wood, plastic, or fiber pallet.

   D. No person shall ignite, bum, or maintain any wood, plastic, or fiber pallet fire.

   E. No person shall light, build, use or maintain a fire during the hours of 11PM to 6AM except in the open use portion of the SVRA south of beach marker post #2.

2. Exceptions to this order may be granted in writing by the District Superintendent, Oceano Dunes State Vehicular Recreation Area, and 340 James Way, Suite 270, Pismo Beach, CA 93449.

3. Nothing herein shall affect any existing private contract or property rights.

4. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300, 4310, 4311, 4324, 4302, and 4326(a).

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554 – 009 – 2015

January 26, 2015

Notice of Posting

I hereby declare that on January 26, 2015 ORDER NO. 554-009-15, hereto attached, was posted at the offices of those units where it is to be in effect, as well as at other locations, which were determined necessary by the District Superintendent, Oceano Dunes District.

I declare under penalty of perjury that the foregoing is true and correct.

Brent Marshall, Superintendent
Oceano Dunes District

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554–009–2015

January 26, 2015

Seasonal Closure

1. Portions or areas of lands owned or administered by the Department of Parks and Recreation within Oceana Dunes State Vehicular Recreation Area and Pismo State Beach are subject to seasonal closure to all public use, entry or occupancy in order to protect the nesting habitat of the western snowy plover, a federally listed threatened species and the California least tern, federally listed endangered species.

2. Said areas are subject to such closure between March 1 and September 30, inclusive, annually.

3. Designated closed areas will be fenced and "seasonal closure" or other signs posted indicating the prohibition of public use, entry or occupancy for the protection of these species.

    a. Exceptions to fencing may occur in areas where tidal action prevents the extension of the fence line. In the tidal action zone where fencing cannot be maintained, "seasonal closure" signs will be placed at intervals of not less than 50 feet apart as close as is reasonable to the water's edge.

4. No person shall enter or occupy a designated seasonal closure area or allow dogs, horses or other animals under their control to enter a seasonal closure area.

5. No person shall camp or park or stop a motor vehicle within 100 feet of a seasonal closure area when signs prohibiting such activities are posted.

6. No person shall attach, affix or hang any material on any fencing or signpost demarking a seasonal closure area.

7. Exceptions to this order may only be granted in writing by the Superintendent, Oceana Dunes District, 340 James Way, Suite 270, Pismo Beach, CA 93449, (805) 773-7170.

8. Nothing herein shall affect any existing private contract or property rights.

9. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300, 4302, 4333, 4326, and 4326(a).

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554 – 010 – 2015

January 26, 2015

Glass Beverage

1. All lands and facilities administered by the California Department of Parks and Recreation, Oceano Dunes District, Oceano State Vehicular Recreation Area are restricted as follows, pursuant to CCR Title 14, Section 4333:

   "No person shall possess or use a glass container, bottle, jar, tumbler, or vessel of whatever nature, empty or not, where prohibited by order of the Department, except that persons may pick up glass containers left or discarded by others and remove or deposit same in an approved trash receptacle. Signs shall be posted at beaches at beaches and locations where glass containers are prohibited."

2. Exceptions to this order may only be granted in writing by the District Superintendent, or his designee, Oceano Dunes District, Oceano State Vehicular Recreation Area, 340 James Way Suite 270, Pismo Beach, CA 93449.

3. Nothing herein shall affect any existing concession contract, private contract or property rights.

4. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003 and 5008. California Code of Regulations, Title 14, Sections 4300, 4302, 4333, 4326, and 4326(a).

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554 – 011 – 2015

January 26, 2015

Electric Generator

This order modifies restrictions on use of an engine driven electric generator set by CCR 4320 (c). The generator use hours are extended to coincide more closely with the times campers usually rise and bed down and to accommodate use of electric medical assistive devices. Generator use hours are herby restricted within Pismo State Beach and Oceana Dunes SVRA as follows:

1. May 15 through September 15:
   No person shall operate an engine driven electric generator which emits sound which is, or is likely to be, disturbing to others between the hours of 10PM and 8AM without permission of the Oceana Dunes District Superintendent.

2. September 16 through May 14:
   No person shall operate an engine driven electric generator which emits sound which is, or is likely to be, disturbing to others between the hours of 8PM and 8AM without permission of the Oceana Dunes District Superintendent.

3. Exceptions to this order may only be given in writing by the District Superintendent of the Oceana Dunes District, 340 James Way, Suite 270, Pismo Beach, CA 93449, (805) 773-7170.

4. Nothing herein shall affect any existing private contract or property rights.

5. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

6. This order replaces Superintendent's Order number OHV-554-2-07. Order number OHV 554-2-07 is hereby revoked.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003, 5003.5, and 5008, California Code of Regulations, Title 14, Sections 4300, 4320(c), and 4326(a).

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554–012–2015

January 26, 2015

Oso Flaco Lake

1. The following lands and parking facilities administered by the California Department of Parks and Recreation, Oceano Dunes District, Oceano Dunes State Vehicular Recreation Area are subject to nighttime closure:

   A. Oso Flaco Lake parking lot is closed to parking of motorized and nonmotorized vehicles between the hours of sunset and 6AM

   B. No person shall park, stand or stop a vehicle in violation of posted prohibitions or restrictions.

2. Exceptions to this order may only be granted in writing by the District Superintendent or his/her designee, Oceano Dunes District, 340 James Way, Suite 270, Pismo Beach, CA 93449.

3. Nothing herein shall affect any existing concession contract, private contract or property rights.

4. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

~~Brent~~ Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300, 4300, 4326, 4326(a) and 4358.

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554 – 013 – 2015

January 26, 2015

Permit

1. Organized assemblies, organized events not addressed by Special Event Permit process, public demonstrations and protests will be granted and may be held within the lands operated by the Oceano Dunes District in accordance with the provisions of this order.

2. These activities shall be conducted in the following designated area — 100 yards south of the Pier Avenue sand access ramp, in the soft sand area below the vehicle closed area signage, west of Strand Way and west of any wind fencing if in place. The area will be marked off by park staff of an appropriate size to accommodate the permitted activity. See attached map for location of designated area.

3. The permit is valid for one day only, only one group and one activity per day on a first-come-first-served basis, between the hours of 10 AM to 2 PM.

4. Amplified sound to project voice or music is not permitted.

5. Signs and banners are permitted, provided they are within the area designated for the activity.

6. Literature, handouts and other printed materials may be distributed from the designated area to the general public, providing persons or vehicles outside the authorized area are not approached, delayed or obstructed in the course of their activities.

7. To apply for a permit, contact the District Superintendent of the Oceano Dunes District, 340 James Way, Suite 270, Pismo Beach, CA 93449, and (805) 773-7170.

8. Nothing herein shall affect any existing private contract or property rights.

9. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003, 5003.5, and 5008, California Code of Regulations, Title 14, Sections, 4300, 4302, 4301 (i), 4321, and 4326(a).

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554 – 016 – 2015

January 26, 2015

Curfew

The following lands and facilities of Oceano Dunes District are hereby under curfew to juveniles for public use entry or occupancy:

1. All area of Oceano Dunes State Vehicular Recreation Areas and Pismo State Beach.
   A. The curfew hours are 11:00PM to 6:00AM everyday.

2. This curfew shall apply to all juveniles except as follows:
   A. One who is accompanied by a parent or guardian,
   B. One who is part of a group permitted to occupy a unit or portion thereof and who is supervised by at least one responsible adult for each fifteen juveniles.
   C. One who is lawfully camping, having furnished to the department written consent of and the full name, residence number, and telephone number of the juvenile's parent or guardian, with the inclusive dates for which permission is granted to camp at the unit involved.

3. A juvenile is defined as any person under the age of 18 years.

4. Exceptions to this order may be granted in writing by his/her designee the District Superintendent, Oceano Dunes State Vehicular Recreation, 340 James Way, Suite 270, Pismo Beach, CA 93449.

5. Nothing here in shall affect any existing private contract or property rights.

6. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300, 4301(i), 4317, 4302, and 4326 (a).

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554 – 017 – 2015

January 26, 2015

Dogs

1. Dogs are prohibited from being in any portion of the Pismo Dunes Natural Preserve. The Pismo Dunes Natural Preserve is defined as that area bounded on the north by Arroyo Grande creek, on the east by a state park boundary fence located approximately ½ mile inland from the beach that extends south to a point approximately 1 ½ miles from Arroyo Grande Creek, on the south by a boundary fence that extends west approximately ½ mile and on the west by a boundary fence that extends north approximately 1 ½ miles to Arroyo Grande Creek.

2. Dogs are prohibited from being on any portion of the Oso Flaco Lake Natural Area. The Oso Flaco Lake Natural area is defined as that area bounded on the north by the south boundary of the Oceano Dunes SVRA, on the east by boundary fencing and signage, on the south by the north boundary of the Guadalupe-Nipomo Dunes National Wildlife Refuge and on the west by the Pacific Oceano.

3. All other beach area(s) within the lands owned or administered by the Oceano Dunes District are open to dogs under the following specified conditions:

   A. Dogs must be restrained by a leash of no more than six feet in length.
   B. Dogs must be at all times under the immediate control of a person or confined in a vehicle or habitable shelter.
   C. No person shall keep a noisy, vicious, or dangerous dog or dog disturbing to other persons, animals, or wildlife, within lands owned or administered by Oceano Dunes District after he/she has been asked by as Peace Officer to leave.

4. Exceptions to this order may only be granted in writing by the district Superintendent, Oceano Dunes District, 340 James Way, Suite 270, Pismo Beach, CA 93449.

5. Nothing herein shall affect any existing private contract or property rights.

6. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300,4301 (i),4302, 4326, 4326 (a), and 4312.

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
OFF-HIGHWAY MOTOR VEHICLE RECREATION DIVISION
OCEANO DUNES DISTRICT
OCEANO DUNES STATE VEHICULAR RECREATION AREA AND PISMO STATE BEACH

Order No. 554 – 018 – 2015

January 26, 2015

Campground

1. To provide for efficient campground operations and consistent service for the public as found in the majority of Campground Units within the State Park System, hours of operation are hereby posted.

2. Check-In time to the Pismo State Beach Campgrounds within the Oceano Dunes District is 2 PM on the first date of reservation.

3. Check – Out time from the Pismo State Beach Campgrounds within the Oceano Dunes District is 12 PM (Noon) on the final date of reservation.

4. Quiet hours are enforced from 10 PM to 6 AM.

5. Exceptions to this order may only be granted in writing by the district Superintendent, Oceano Dunes District, 340 James Way, Suite 270, Pismo Beach, CA 93449.

6. Nothing herein shall affect any existing private contract or property rights.

7. Nothing herein shall be construed in derogation of any other existing law, rule or regulation.

Brent Marshall, Superintendent
Oceano Dunes District

Authority:
State of California Public Resources Code Sections 5003 and 5008, California Code of Regulations, Title 14, Sections 4300, 4301 (i), 4326 (a) and (b) and 4454.

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

State of California
Department of Parks and Recreation
Off Highway Motor Vehicle Recreation Division
Oceano Dunes District
Oceano Dunes State Vehicular Recreation Area and Pismo State Beach
District Superintendent's Order No. 554-21-2015

Title:

Closure and Restrictions for Public Access and Entry to Designated Sensitive Resource Areas

Effective Date: February 1, 2015

1. In the interest of protecting California's most valued natural and cultural resources that have been entrusted to the Department of Parks and Recreation as found within the premises of the Oceano Dunes District (boundary map attached), areas that are identified by posted signage within the District shall be closed to visitor entry and access entirely.
2. No person, except state and local law enforcement officers, fire suppression agencies, permitted tribal members, and employees of the department in the performance of their duties, or persons adhering to any exception or restriction as listed in this order shall have access to the described areas listed above.
3. Nothing herein shall be construed in derogation of other provisions of law or existing private contract or property rights.
4. Exceptions to this order may only be granted in writing by the District Superintendent, Oceano Dunes District, 340 James Way, Suite 270, Pismo Beach, CA 93449. All parties entering the designated area shall carry a signed original document on their person or be accompanied by the District Superintendent.

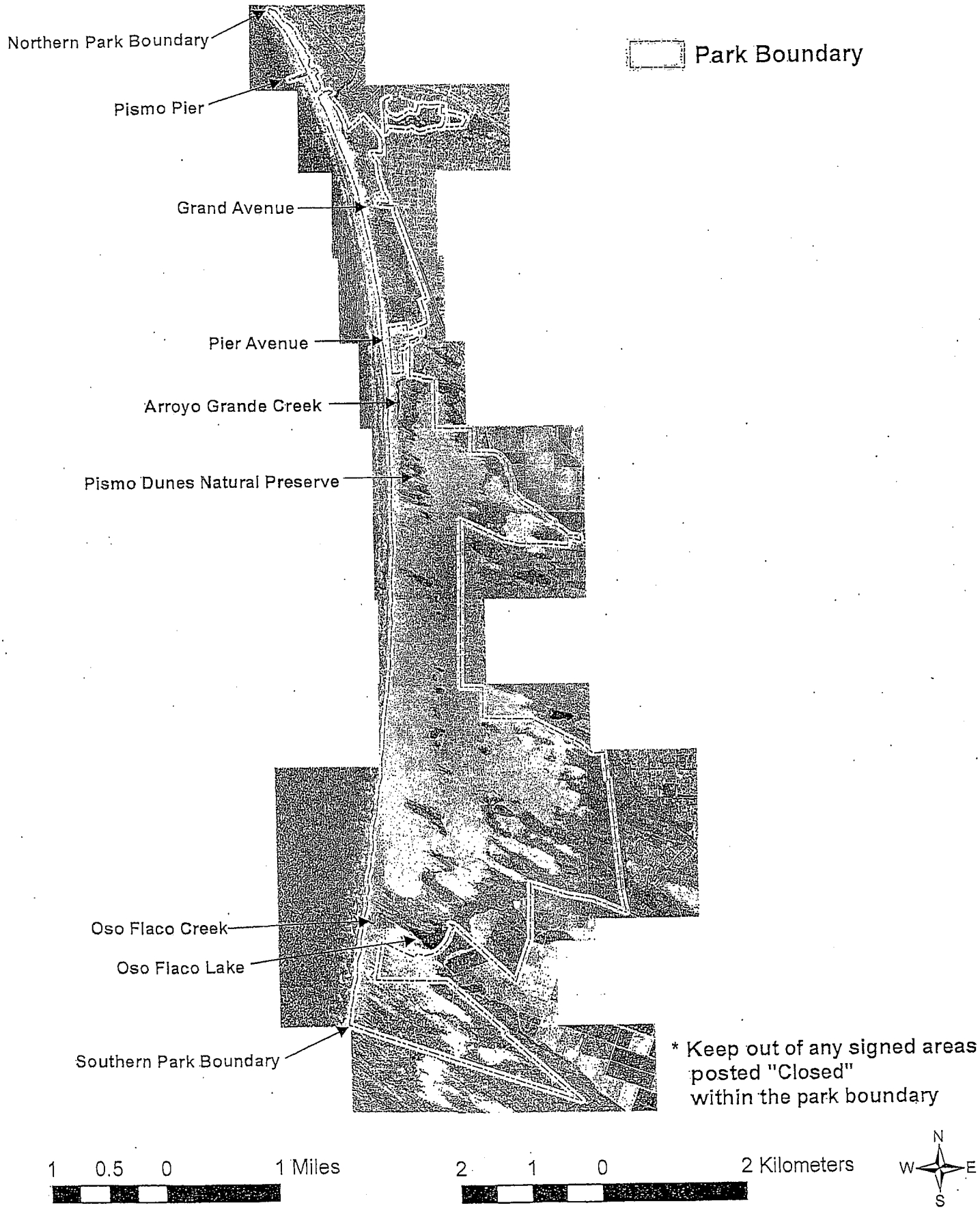
B C Marshall 1/30/15

Brent C. Marshall Date
District Superintendent

Authority: State of California Public Resources Code, section 5003 and 5008 and California Code of Regulations, Title 14, Section 4305, 4306, 4308, and 4326(a).

Copies of this order have been filed with the Off-Highway Motor Vehicle Recreation Division Headquarters in Sacramento.

DSO 554-21-2015: Closure and restrictions* for public access and entry to designated sensitive resource areas



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Appendix C. Permits

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DEPARTMENT OF THE INTERIOR
U.S. FISH & WILDLIFE SERVICE
Endangered Species Permit Office
2800 Cottage Way, Suite W-2606
Sacramento, CA 95825-1846
permitsR8ES@fws.gov

FEDERAL FISH AND WILDLIFE PERMIT

1. PERMITTEE

OCEANO DUNES STATE VEHICULAR RECREATION AREA
340 JAMES WAY, SUITE 270
PISMO BEACH, CA 93449
U.S.A.

2. AUTHORITY-STATUTES
16 USC 1539(a)
16 USC 1533(d)
16 USC 703-712

REGULATIONS
50 CFR 17.22
50 CFR 17.32
50 CFR 21.23 & 21.27
50 CFR 13

3. NUMBER: TE815214-9 AMENDMENT

4. RENEWABLE: ☒ YES ☐ NO

5. MAY COPY: ☒ YES ☐ NO

6. EFFECTIVE: 04/22/2016

7. EXPIRES: 03/16/2021

8. NAME AND TITLE OF PRINCIPAL OFFICER *(If it is a business)*
BRENT MARSHALL
DISTRICT SUPERINTENDENT

9. TYPE OF PERMIT
NATIVE ENDANGERED & THREATENED SP. RECOVERY - E & T

10. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED
ON LANDS SPECIFIED WITHIN THE ATTACHED SPECIAL TERMS AND CONDITIONS

11. CONDITIONS AND AUTHORIZATIONS

A. GENERAL CONDITIONS SET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 ABOVE, ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL, TRIBAL, OR OTHER FEDERAL LAW.

C. VALID FOR USE BY PERMITTEE NAMED ABOVE.

D. Further conditions of authorization are contained in the attached Special Terms and Conditions.

☒ ADDITIONAL CONDITIONS AND AUTHORIZATIONS ALSO APPLY

12. REPORTING REQUIREMENTS
ANNUAL REPORTS DUE: 01/31
See permit conditions for further reporting requirements.

ISSUED BY: FOR

TITLE: ENDANGERED SPECIES DIVISION CHIEF

DATE: 04/22/2016

SPECIAL TERMS AND CONDITIONS
Oceano Dunes State vehicular recreation area

1. This permit was previously issued on June 1, 2012. The terms and conditions set forth in that permit are hereby superseded by this amendment.

2. Acceptance of this permit serves as evidence that the permittee understands and agrees to abide by the "General Permit Procedures and Permit Regulations for Native Endangered and Threatened Wildlife Species Permits," 50 CFR Part 13, 50 CFR 17.21 and 17.22 (endangered wildlife) and/or 50 CFR 17.31 and 17.32 (threatened wildlife), as applicable found at: http://www.fws.gov/carlsbad/r8permits/permitprocedures-regulations.htm

3. The permittee must have all other applicable State and Federal permits prior to the commencement of activities authorized by this permit. In addition, this permit does not authorize access to Federal, Tribal, State, local government, or private lands as it is the responsibility of the permittee to obtain land owner permission prior to commencing permitted activities on such lands.

4. The permittee is authorized to take (harass by survey, locate and monitor nests, use remote sensing cameras near nests, float eggs, remove non-viable eggs, remove viable eggs from abandoned nests, replace non-viable eggs with viable eggs from abandoned nests, transfer viable eggs from abandoned nests to a permitted facility for hatching and captive rearing, capture and band chicks, conduct rescue activities, release, erect fence and nest exclosures, and control predators) the western snowy plover (Pacific Coast population DPS) (*Charadrius nivosus nivosus*) and take (harass by survey, locate and monitor nests, use remote sensing cameras near nests, remove non-viable eggs, remove viable eggs from abandoned nests, replace non-viable eggs with viable eggs from abandoned nests, transfer viable eggs from abandoned nests to an a permitted facility for hatching and captive rearing, capture and band chicks, conduct rescue activities, release, erect fence and nest exclosures including a chick fence, and control predators) the California least tern (*Sterna antillarum browni*) (*Sterna a. browni*) in conjunction with monitoring for the purpose of enhancing their survival, as described in the permittee's April 8, 2015, permit renewal request, in accordance with the conditions stated below.

5. Permitted activities are restricted to the following geographic area in California:

   San Luis Obispo and Santa Barbara Counties.

   Proposals to conduct activities pursuant to this permit at specific locations within the above referenced areas must be submitted in writing to the Recovery Permit Coordinator at the Ventura Fish and Wildlife Office (VFWO), 2493 Portola Road, Suite B, Ventura, California 93003 (telephone: 805-644-1766) of the U.S. Fish and Wildlife Service (Service) at least 10 days prior to conducting such activities.

   Notifications shall include, as appropriate: (a) an explanation of the purpose of the study and a clear description of methods, including the names of field personnel and the number and dates of surveys; (b) the number of individuals proposed to be captured

and/or collected; (c) a map (at a minimum, a 1:24,000 scale U.S. Geological Survey (USGS) topographical map) depicting the location of the survey site(s); (d) the assessor's parcel number (APN) for the site (if possible); and (e) geographic information system (GIS) data depicting the survey site or global positioning system (GPS) coordinates (if possible). Information may be submitted electronically if pre-arranged with the Recovery Permit Coordinator.

After 15 days of the Service's receipt of the notification, the permittee may commence activities authorized by this permit unless authorization is denied by the Service. If the permittee is denied authorization to conduct the proposed activities or activities at the requested location(s), including previously authorized sites, a request for reconsideration may be submitted to the Endangered Species Division Chief at the Service's Regional Office for the Pacific Southwest Region (Region 8), 2800 Cottage Way, Room W-2606, Sacramento, California 95825-1846, as provided in 50 CFR 13.29. The procedures specified in 50 CFR 13.29(b) must be followed.

6. Authorized individuals:

Only individuals on the attached List of Authorized Individuals (List) are authorized to conduct activities pursuant to this permit. The List, printed on Service letterhead, may identify special conditions or circumstances under which individuals are authorized to conduct permitted activities and must be retained with these Special Terms and Conditions. Each named individual will be responsible for compliance with the terms and conditions of this permit.

To request changes to the List, the permittee must submit written requests to the Recovery Permit Coordinator at the VFWO at least 30 days prior to the requested effective date. The request must be signed and dated by the permittee and include:

a. The permit number.

b. The name of each individual to be appended to the List.

c. The resume/qualifications statement of each person to be appended to the List, detailing their experience with each species and type of activity for which authorization is requested.

d. The names, phone numbers and email addresses of a minimum of two references including letters of reference. Letters of reference should address the individual's qualifications for the specific activities to be conducted.

e. The names of the individuals to be deleted from the List.

Note: This procedure is for personnel changes only. For requests to renew/amend this permit, a complete application must be submitted to the Endangered Species Division Chief at the Region 8 office.

7. Taking of the western snowy plover (plover):

The permittee is authorized to conduct population surveys, locate and monitor nests, use remote sensing cameras near nests, band plover chicks near the nest and release, handle and float eggs to determine incubation stage, remove non-viable eggs, remove viable eggs from abandoned nests, replace non-viable eggs with viable eggs from abandoned nests, transfer viable eggs from abandoned nests to a permitted facility for hatching and captive rearing, conduct rescue activities, erect fence exclosures, and conduct predator control activities within the geographic boundaries specified above, and the time limitation specified in the permit, provided that:

a. Disturbance to nesting plovers shall be avoided during certain climatic conditions, such as high wind and extreme cold or heat. Attempts shall be made to minimize the amount of time spent in plover nesting areas.

b. Activities are conducted in such a way that the safety of individual plovers and their nests, eggs, and young are not compromised.

c. Remote sensing cameras may be used near nests as described in the permittee's amendment application dated January 4, 2011.

d. Chicks are captured by hand, near the nest (e.g., within 30 feet), and shall be released at the capture site within 10 minutes, as long as the release would not compromise the safety of the chick. Rescue activities are exempt.

e. Not more than 20 minutes shall be spent on any single day attempting to capture an individual chick. Chicks shall not be pursued for more than 2 minutes in a single capture attempt. Rescue activities are exempt.

f. Chicks shall not be disturbed if the ambient temperature, measured 3 inches above the sand, exceeds 85 degrees Fahrenheit. Rescue activities are exempt.

g. Individual(s) banding and color-marking chicks must first obtain a valid Federal Migratory Bird Banding Permit with auxiliary color-marking authorization from the VFWO. All banding and color-marking are done under valid a Federal Migratory Bird Banding Permit with auxiliary color-marking authorization. The use of specific colors for color-banding shall be coordinated with Gary Page of the Point Reyes Bird Observatory (telephone: 415-868-1221) and the USGS, Biological Resources Division, Bird Banding Laboratory, Patuxent Wildlife Research Center, Gabrielson Lab, 12100 Beech Forest Road, Laurel, Maryland 20708-0422 (telephone: 301-497-5942). In addition, the procedures for authorizing plover banding activities as specified in a letter written by the Service dated January 11, 2008, must be followed.

h. No more than four bands (including an aluminum Service band) are attached per chick, with no more than two bands per leg.

i. Abandoned plover eggs may be collected from the wild provided that:

i. The permittee shall confirm that the eggs are abandoned. To confirm if eggs are abandoned, the permittee shall unbury unattended egg(s) if they are buried in sand, create a nest scrape, smooth the sand around the egg(s), and check the egg(s) a minimum of once every 12 hours over a period of at least 24 hours to look for signs of nest attendance. If no adult snowy plover tracks are sighted around the egg(s) in that time period, and there are no other signs of nest attendance by adults, then the permittee may collect the egg(s). Other methodologies may be allowed upon receiving approval by the Service.

ii. The permittee may also lightly mark the top of egg(s) with a soft-tipped marker to determine if the egg(s) are being turned, which is a sign of active incubation.

j. When possible, all efforts will be made to replace non-viable eggs from active nests with viable eggs from abandoned nests. All remaining abandoned viable snowy plover eggs may be collected for captive rearing. No collection of viable eggs from active nests is authorized.

k. For predator control activities, the use of vehicles shall be restricted to the shoreline in the area closed to the public.

l. A final report shall be submitted to the VFWO as specified in condition 18(b) below for each project specific survey conducted for the plover.

8. Taking of the California least tern (tern):

The permittee is authorized to conduct population surveys, locate and monitor nests, use remote sensing cameras near nests, and capture, band, and release chicks, remove non-viable eggs, remove eggs from abandoned nests, replace non-viable eggs with viable eggs from abandoned nests, transfer viable eggs from abandoned nests to a permitted facility for hatching and captive rearing, conduct rescue activities, erect fence exclosures including a chick fence, and conduct predator control activities within the geographic boundaries specified above, and the time limitation specified in the permit, provided that:

a. Disturbance to nesting terns shall be avoided during certain climatic conditions, such as high wind and extreme cold or heat. Attempts shall be made to minimize the amount of time spent in tern nesting areas.

b. Activities are conducted in such a way that the safety of individual terns and their nests, eggs, and young are not compromised.

c. Capture, banding, marking, and handling of adult terns is not authorized under this permit.

d. When entering the nesting colony for any purpose, activities shall be conducted as unobtrusively as possible and with the least amount of disturbance to the colony.

e. Remote sensing cameras may be used near nests as described in the permittee's amendment proposal dated January 4, 2011.

f. Chicks are captured by hand, near the nest (e.g., within 30 feet), and shall be released at the capture site within 10 minutes, as long as the release would not compromise the safety of the chick. Rescue activities are exempt.

g. Not more than 20 minutes shall be spent on any single day attempting to capture an individual chick. Chicks shall not be pursued for more than 2 minutes in a single capture attempt. Rescue activities are exempt.

h. Chicks shall not be disturbed if the ambient temperature, measured 3 inches above the sand, exceeds 85 degrees Fahrenheit. Rescue activities are exempt.

i. Chicks are to be banded before release. Individual(s) banding and color-marking chicks must first obtain a valid Federal Migratory Bird Banding Permit with auxiliary color-marking authorization from the VFWO. All banding and color-marking shall be done under a valid Federal Migratory Bird Banding Permit with auxiliary color-marking authorization. The use of specific colors for color-banding shall be coordinated with Gary Page of the Point Reyes Bird Observatory (telephone: 415-868-0367) and the USGS, Biological Resources Division Bird Banding Laboratory, Patuxent Wildlife Research Center, Gabrielson Lab, 12100 Beach Forest Road, Laurel, Maryland 20708-0422 (telephone: 301-497-5942).

j. No more than two bands (including an aluminum Service band and a color band) are attached per chick, with no more than one band per leg.

k. Abandoned tern eggs may be collected from the wild provided that:

   i. The permittee shall confirm that the eggs are abandoned. To confirm if eggs are abandoned, the permittee shall unbury unattended egg(s) if they are buried in sand, create a nest scrape, smooth the sand around the egg(s), and check the egg(s) a minimum of once every 12 hours over a period of at least 24 hours to look for signs of nest attendance. If no adult tern tracks are sighted around the egg(s) in that time period, and there are no other signs of nest attendance by adults, then the permittee may collect the egg(s). Other methodologies may be allowed upon receiving approval by the Service.

   ii. The permittee may also lightly mark the top of egg(s) with a soft-tipped marker to determine if the egg(s) are being turned, which is a sign of active incubation.

l. When possible, all efforts will be made to replace non-viable eggs from active nests with viable eggs from abandoned nests. All remaining abandoned viable tern eggs may be collected for captive rearing. No collection of viable eggs from active nests is authorized.

m. The permittee is authorized to erect a chick fence with approval from the VFWO on a case by case basis.

n. For predator control activities, the use of vehicles shall be restricted to the shoreline in the area closed to the public.

o. A final report shall be submitted to the VFWO as specified in condition 18(b) below for each project specific survey conducted for the tern.

9. The permittee is authorized to erect exclosures around all tern and plover nests within the geographic boundaries specified above, and the time limitation specified within the permit, provided that:

a. The permittee follows exclosure protocols established for Oceano Dunes State Vehicular Recreation Area by the VFWO. Exclosures that are 10 x 10 feet with top netting may be used for plovers, as described in the permittee's June 22, 2004, application, and as previously approved by the VFWO.

b. Tern and plover adults, chicks, and eggs are not handled.

10. Minor deviation from the stipulated terms and conditions may be authorized on a case-by-case basis when approved by the applicable FWO unless an amendment to this permit would be required.

11. This permit does not cover any activities authorized pursuant to a biological opinion or habitat conservation plan (HCP). All such activities must be authorized by the office that wrote the biological opinion, issued the section 10(a)(1)(B) incidental take permit based on an HCP, or is the lead field office implementing the HCP. Note also that this permit is not to be construed as meaning that the permittee or other authorized individuals are qualified to conduct activities pursuant to a biological opinion or HCP except insofar as the activities are similar to those authorized in this permit. Their qualifications for activities to be done pursuant to the biological opinion are subject to review and written approval for the specific activities by the office that wrote the biological opinion, issued the section 10(a)(1)(B) incidental take permit based on an HCP, or is the lead field office implementing the HCP.

12. This permit does not authorize take of federally listed species that are not specifically authorized pursuant to this permit. However, the Service acknowledges that incidental take of a co-occurring federally listed species could potentially occur while conducting certain permitted activities. When applicable, the following conditions now apply to all federally listed animals that the permittee is not authorized to take pursuant to this permit, but which may be incidentally sighted, encountered, captured, injured, or killed:

a. Each individual authorized pursuant to this permit shall be knowledgeable about potentially co-occurring listed species that may occur throughout the habitats in which permitted activities are conducted and must be observant and cautious to the extent that "take" of a co-occurring listed species is minimized to the maximum extent practicable.

b. Any federally listed animal that the permittee is not authorized to take pursuant to this permit, but is incidentally captured during the course of conducting authorized activities, shall be released immediately at the point of capture.

c. During the course of your permitted activities, if an incidental injury or mortality occurs to a federally listed species not authorized in this permit, the permittee shall follow instructions specified in condition 13 below.

d. Any incidental capture, injury or mortality of a federally listed species not authorized in this permit shall be recorded and reported in the annual report submitted pursuant to this permit.

e. We request that all incidental encounters and/or sightings of other federally listed species not authorized under this permit be recorded and reported in the annual report submitted pursuant to this permit and also reported to the California Natural Diversity Database (CNDDB) as specified in condition number 16 below.

13. The number of individual plovers or terns (adults, juveniles, chicks, or eggs) allowed to be incidentally injured or killed during permitted activities pursuant this permit is 2 plovers and 0 (zero) terns in any calendar year.

a. Any incidental injury or killing must be reported within 3 working days to the Regional Recovery Permit Coordinator (telephone: 760-431-9440) and the Recovery Permit Coordinator at the VFWO.

b. In the event that the number of individuals allowed to be incidentally injured or killed is exceeded during the performance of permitted activities, the permittee must:

i. Immediately cease the activity until reauthorized by the Region 8 office, which may, after analysis of the circumstances of injury or mortality, revoke or amend this permit.

ii. Immediately notify the Regional Recovery Permit Coordinator and the Recovery Permit Coordinator at the appropriate FWO. Within 3 working days, the permittee shall follow-up such verbal notification in writing to each office.

iii. With the written notification, the permittee is to provide a report of the circumstances that led to the injury or mortality. A description of the changes in protocols that will be implemented to reduce the likelihood of

such injury or mortality from happening again should be included, if appropriate. A copy of this report shall also be sent to the California Department of Fish and Wildlife (CDFW), Attention: Permitting Biologist, Wildlife Branch, 1812 Ninth Street, Sacramento, California 95811 (telephone: 916-445-3764).

c. Dead specimens and/or appropriate parts of dead specimens that are incidentally taken pursuant to this section shall be preserved in accordance with standard museum practices. Within 120 days, the preserved specimen(s) shall be properly labeled and deposited with one of the designated repositories specified below. Specimens must be accessioned with complete collecting data. The permittee shall supply the repository with a copy of this permit to validate that the specimens supplied to the museum were taken pursuant to a permit. Collection data (e.g., dates and location) and deposition of carcasses by the permittee must be reported in the subsequent annual report.

14. The permittee is authorized to salvage all plover and tern carcasses and provide them to one of the designated repositories within 120 days by following condition number 13.c above. Any specimens salvaged will be documented and specified in the annual report submitted to the appropriate field office.

15. Designated repositories:

The California Academy of Sciences, Golden Gate Park, San Francisco, California; the Museum of Vertebrate Zoology, University of California, Berkeley, California; the Santa Barbara Museum of Natural History, Santa Barbara, California; the Western Foundation of Vertebrate Zoology, Camarillo, California; the California Animal Health and Food Safety Laboratory System, California; and the Marine Wildlife Veterinary Care and Research Center, Santa Cruz, California. Other depositories may be authorized by the VFWO.

16. California Natural Diversity Database forms shall be completed, as appropriate, for each listed species addressed herein and submitted to the Biogeographic Data Branch, CDFW, 1416 9th Street, Suite 1266, Sacramento, California 95814 (also accessible online at: http://www.dfg.ca.gov/biogeodata/cnddb), with copies submitted to the appropriate FWO. Copies of the form can be obtained from the CDFW at the above address (telephone: 916-322-2493)

17. All reports or other documents that include information gathered under the authority of this permit (e.g., reports prepared by consulting firms for their clients, theses, or scientific journal articles) shall reference this permit number. Copies of such documents shall include a transmittal letter and be provided to the Recovery Permit Coordinator at the appropriate FWO upon their completion. Draft documents, raw/field data, and other information resulting from work conducted under the authority of this permit shall be submitted to the Service upon request.

18. Annual reports:

Two types of annual reports shall be submitted to the Recovery Permit Coordinator at the appropriate FWO by January 31, following each year this permit is in effect as specified below.

a. Annual summary report:

In order to track, document, and assess all project-specific activities conducted pursuant to this permit, we are requiring an annual summary report be submitted that summarizes all of the activities conducted pursuant to this permit during the previous calendar year. Activities that are continuous (i.e., overlapping in two or more calendar years), must be reported each year the activity is in effect. The annual summary report shall be in the following format to include and not be limited to the following:

i. Permittee name and number with date of expiration;

ii. A section listing all authorized activities conducted for each permitted species during the previous calendar year. This information can be in tabular format and should provide a summary of each activity for each species authorized in this permit. This section shall include but not be limited to:

A. The name and title of each permitted activity conducted during the previous calendar year (preferably the same title as the reports previously or concurrently being submitted to the Service as specified in condition 18(b) below);

B. The specific location of the project site, including the County;

C. The common and scientific names of the listed species for which the permitted activity was conducted;

D. Whether or not the species was observed;

E. The date and name of the Service office where each individual report(s) have been or will be submitted;

F. Whether or not GIS data was submitted; and

G. The version of each activity report (draft or final) and the report date. If a draft report was submitted, indicate the reason (ongoing activities; processing/analysis of data, final report in review, final report in progress, etc.) and the anticipated final report finish date.

iii. Number of individuals incidentally injured and/or killed, including dates, locations, circumstances of take, and depository receiving the preserved specimen(s). If no injuries or mortalities occurred, please state this in writing in your annual summary report.

iv. Other pertinent observations made regarding the status or ecology of the species.

v. Planned future activities, if authorized under this permit.

vi. If no activities were conducted with any or all species authorized under the permit during the previous year within any field office jurisdiction, you must state this in writing in your annual summary report to that field office.

b. Comprehensive project reports:

i. For each project-specific activity, the permittee shall submit a comprehensive annual report to the appropriate FWO in the following format:

(i) an introduction section addressing reasons and objectives for taking the species; (ii) a methodology section which includes an overview of the study design and methods used to collect and analyze data; (iii) a results section that provides and summarizes the data collected, including information on any other federally listed species detected while conducting activities authorized under this permit; and (iv) a conclusion section that specifically provides recommendations for recovery of the species and any plans for future studies. Activities that are continuous (i.e., overlapping in two or more calendar years), must be reported each year the activity is in effect to the appropriate FWO. Information may be submitted electronically if pre-arranged with the Recovery Permit Coordinator. The annual report shall include, but not be limited to:

A. Summary presentations and brief discussions of survey and monitoring results;
B. Locations sampled or study area(s) delineated on a 7.5 minute U.S. Geological Survey topographic map at 1:24,000 scale. The name of the USGS map identified;
C. The names of all personnel conducting the activity and associated permit numbers.
D. The results of all sampling efforts, including the numbers and life stage of each listed species observed, dates of observation, and estimates of population sizes; and
E. Other pertinent observations made during sampling efforts regarding the status or ecology of the species.

19. Failure to comply with reporting requirements may result in non-renewal or suspension/revocation of this permit.

4-26-16
Date

FOR Endangered Species Division Chief

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Southwest Region
2800 Cottage Way, Suite W-2606
Sacramento, California 95825-1846

LIST OF AUTHORIZED INDIVIDUALS
TE-815214-9

1. Individuals authorized to independently conduct population surveys; locate and monitor nests; capture, recapture, and release individuals; band western snowy plover and California least tern chicks; handle and float eggs to determine incubation stage for the western snowy plover; remove non-viable eggs; remove viable eggs from abandoned nests; replace non-viable eggs with viable eggs from abandoned nests; transfer viable eggs from abandoned nests to a permitted facility for hatching and captive rearing; conduct rescue activities (including transfer of rescued individuals to an approved facility); and erect and monitor fence and nest exclosures including a chick fence:

   Douglas George.

2. Individuals authorized to independently conduct population surveys, locate and monitor nests, and erect and monitor fence and nest exclosures including a chick fence:

   Amber Branske, Tamar Carmona, Amber Clark, Ronnie Glick, Joanna Iwanicha, Cheryl Lish, Stephanie Little, Natalie Rathjen-Gonzales, and Ryan Slack.

3. Individuals authorized to independently handle and float eggs to determine incubation stage for the western snowy plover:

   Amber Clark, and Joanna Iwanicha.

4. Individuals authorized to independently use remote sensing cameras near nests:

   Amber Branske, Amber Clark, Tamara Carmona, Douglas George, Ronnie Glick, Joanna Iwanicha, Cheryl Lish, Stephanie Little, Natalie Rathjen-Gonzales, and Ryan Slack.

5. Individuals authorized to independently conduct population surveys, locate and monitor nests, and erect and monitor the fence exclosure:

   Caitrin Doles, Nicola Petch-Baker, Sarah Robinson, Sarah Stratton, Jose Valazquez, and Joshua Willems.

LIST OF AUTHORIZED INDIVIDUALS
TE-815214-9

6. Individuals authorized to independently conduct population surveys from the shoreline that is closed to the public, monitor nests from the shoreline that is closed to the public, and inspect and maintain the fence from the shoreline that is closed to the public:

   Mattie Bishop, Nancy LaGrille, and Ryan Wardle.

7. Under the direction of Douglas George, individuals authorized to remove eggs from abandoned nests, transfer viable eggs from abandoned nests to an approved facility for hatching and captive rearing, and conduct rescue activities (including transfer of rescued individuals to an approved facility):

   Mattie Bishop, Amber Branske, Tamar Carmona, Amber Clark, Caitrin Doles, Ronnie Glick, Joanna Iwanicha, Cheryl Lish, Stephanie Little, Nicola Petch-Baker, Natalie Rathjen-Gonzales, Sarah Robinson, Ryan Slack, Sarah Stratton, Jose Valazquez, Ryan Wardle, and Joshua Willems.

8. Individuals authorized to independently erect and monitor fence and nest exclosures only:

   Donald Bergman, Kathleen Holt, and Abraham Ramirez.

9. Individuals authorized to conduct predator control activities under the direction of an individual listed in 1 or 2 above, including use of a vehicle along the shoreline in the area closed to the public:

   Kevin Estrada, Barry Lowry, and Paul Young.

NOTE:

Supervised individuals may conduct activities pursuant to this permit only under the direct, on-site supervision of an independently authorized individual listed above. On-site supervision is defined as a supervised individual conducting activities within 3 meters (9.8 feet) of an independently authorized individual.

Individuals assisting an authorized person in the deployment of exclosures must receive training by one of the above-authorized individuals in the design, construction, and set-up of exclosures, prior to deployment in the field. The authorized individual must provide on-site supervision to assistants at all times during exclosure set-up.

4-26-16
Date

For Endangered Species Division Chief

This List is only valid if it is dated on or after the permit issuance date.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
08EVEN00-2008-B-0093

July 25, 2017

LIST OF AUTHORIZED INDIVIDUALS
TE-815214-9.2

1. Individuals authorized to independently conduct population surveys; locate and monitor nests; capture, recapture, and release individuals; band western snowy plover and California least tern chicks; handle and float eggs to determine incubation stage for the western snowy plover; remove non-viable eggs; remove viable eggs from abandoned nests; replace non-viable eggs with viable eggs from abandoned nests; transfer viable eggs from abandoned nests to a permitted facility for hatching and captive rearing; conduct rescue activities (including transfer of rescued individuals to an approved facility); and erect and monitor fence and nest exclosures including a chick fence:

   Douglas George.

2. Individuals authorized to independently conduct population surveys, locate and monitor nests, and erect and monitor fence and nest exclosures including a chick fence:

   Mattie Bishop, Tamar Carmona, Amber Clark, Amber Frazier, Ronnie Glick, Joanna Iwanicha, Cheryl Lish, Stephanie Little, Sarah Robinson, Ryan Slack, Jose Velazquez, and Joshua Willems.

3. Individuals authorized to independently handle and float eggs to determine incubation stage for the western snowy plover:

   Amber Clark, Joanna Iwanicha, and Ryan Slack.

4. Individuals authorized to independently use remote sensing cameras near nests:

   Mattie Bishop, Amber Clark, Tamara Carmona, Amber Frazier, Douglas George, Ronnie Glick, Joanna Iwanicha, Cheryl Lish, Stephanie Little, Sarah Robinson, Ryan Slack, Jose Velazquez, and Joshua Willems.

5. Individuals authorized to independently conduct population surveys, locate and monitor nests, and erect and monitor the fence exclosure:

   Nicola Petch-Baker, Anne Bauer, Haven Dlott, Caitrin Doles, Daniel Elting, and Karen Hondrick.

LIST OF AUTHORIZED INDIVIDUALS
TE-815214-9.2

6. Individuals authorized to independently conduct population surveys from the shoreline that is closed to the public, monitor nests from the shoreline that is closed to the public, and inspect and maintain the fence from the shoreline that is closed to the public:

   Lydia Bishop, Jessica Budke, Nancy LaGrille, Amanda Sprague, and Ryan Wardle.

7. Under the direction of Douglas George, individuals authorized to remove eggs from abandoned nests, transfer viable eggs from abandoned nests to an approved facility for hatching and captive rearing, and conduct rescue activities (including transfer of rescued individuals to an approved facility):

   Anne Bauer, Lydia Bishop, Mattie Bishop, Jessica Budke, Tamar Carmona, Amber Clark, Haven Dlott, Caitrin Doles, Daniel Elting, Amber Frazier, Ronnie Glick, Karen Hondrick, Joanna Iwanicha, Cheryl Lish, Stephanie Little, Nicola Petch-Baker, Sarah Robinson, Ryan Slack, Amanda Sprague, Jose Velazquez, Ryan Wardle, and Joshua Willems.

8. Individuals authorized to conduct predator control activities under the direction of an individual listed in 1 or 2 above, including use of a vehicle along the shoreline in the area closed to the public:

   Robert Chapman, Kevin Estrada, Barry Lowry, Alexander Shaefer, and Paul Young.

NOTE:

Supervised individuals may conduct activities pursuant to this permit only under the direct, on-site supervision of an independently authorized individual listed above. On-site supervision is defined as a supervised individual conducting activities within 3 meters (9.8 feet) of an independently authorized individual.

Individuals assisting an authorized person in the deployment of exclosures must receive training by one of the above-authorized individuals in the design, construction, and set-up of exclosures, prior to deployment in the field. The authorized individual must provide on-site supervision to assistants at all times during exclosure set-up.

25 July 2017
Date

Christopher Kofron
Senior Biologist
Listing and Recovery

This List is only valid if it is dated on or after the permit issuance date.

State of California – The Resources Agency ARNOLD SCHWARZENEGGER, Governor
DEPARTMENT OF FISH AND GAME
Wildlife Branch
Nongame Wildlife Program
1812 9th Street
Sacramento, CA 95811

Expiration Date: March 5, 2012

Attachment (Letter Permit) to Scientific Collecting Permit for

Ronnie Glick (SC-009557)
California State Parks, Oceano Dunes District

Conditions for Research on California Least Tern
March 10, 2010

This letter permit, along with your Scientific Collecting Permit (SCP), satisfies the requirement of a Memorandum of Understanding (MOU) and specifically authorizes you to conduct the following activities for the California least tern (*Sternula antillarum browni)* (terns), in conjunction with population studies and management activities for the purpose of enhancing their survival:

a) search ('survey') for terns, by entering the colonies;
b) locate and "monitor" (observe and closely approach for purposes of seeing and counting contents and following progress of) nests, including removal of addled or infertile eggs;
c) construct protective fences around nest areas;
d) salvage least tern carcasses, including from colonies;
e) band or auxiliary mark terns under a bird banding lab permit.

This work will be conducted throughout the Oceano Dunes State Vehicular Recreation Area in coastal San Luis Obispo and Santa Barbara Counties. Your Department of Fish and Game (Department) contact for this work is Esther Burkett, eburkett@dfg.ca.gov, 916-445-3764, address in the letterhead above.

Conditions

1. You agree to conduct studies of the terns according to the following: a) the terms of federal recovery permit TE-815214-5.1 (federal permit) issued by the U. S. Fish and Wildlife Service (Service), and any amendments thereto, and b) you conduct surveys using protocols approved by the Service. Although the provisions of the federal permit and this letter permit may vary from one to the other, the more restrictive conditions prevail. This letter permit does not authorize you to survey for listed or special-concern species other than those of the terns.

2. Prior to conducting activities described above at a site which you previously have not studied during the current field season, you shall contact, or attempt in good faith to contact, regarding the proposed study site, other persons and entities holding a State permit allowing take of the terns. You shall not conduct work on a site under known active study by another permit-holder for the terns, unless the Department contact allows it.

3. All surveying methods utilized must follow standard practices and ensure no undue disturbance, impact, or harassment of the terns. All reasonable efforts shall be made in the field to avoid needless destruction or abandonment of any active nest or take of eggs and chicks, and to avoid needless colony abandonment. Should any one serious injury or mortality occur, all work must cease immediately and the Department contact must be notified as soon as possible. Before any additional work can be authorized, consultation shall occur between you and the Department contact. The Department contact will need time to consult internally and possibly externally before authorizing any additional work.

Reporting

4. You are required to submit an annual report to the Department contact describing the results and significant findings of your research with terns. The annual reports must be submitted on or before January 31st of the year following each year of research. The reports must follow standard scientific format (Introduction, Study Area (with map), Methods, Results, Discussion, and Literature Cited), or you may submit a copy of the annual report required by the Service. Please make note of any confirmed or suspected predators or disturbances at your study sites. You must also provide copies of abstracts you may prepare for any papers you present, or copies of any papers you prepare for popular articles or scientific journals. The annual scientific report of activities described above is *in addition* to the Report of Specimens Collected or Salvaged (RSCS), which is the standard reporting requirement of the SCP when renewing your permit. The RSCS form is found at this link: http://www.dfg.ca.gov/licensing/pdffiles/SC_REPT.xls. You shall also submit California Native Species Field Survey Forms for the California Natural Diversity Database (CNDDB), at least annually, which are available at the following link: http://www.dfg.ca.gov/biogeodata/cnddb.

   For terns, you shall coordinate with and submit report data to Dan Marschalek, DFG Least Tern Coordinator, South Coast Region, in the manner requested by him. Contact:

   DMarschal@dfg.ca.gov
   Office: (858) 467-4201
   Fax: (858) 467-4299
   4949 Viewridge Avenue
   San Diego, CA 92123

All other standard provisions of scientific collecting permits apply, and the attached provisions must also be followed: Standard Memorandum of Understanding (MOU)/Letter Permit Conditions (Attachment 1).

A List of Authorized Individuals (LAI) has been designated under the terms of this letter permit. You may request to change Field Investigators or Field Assistants to be named on the LAI, to perform field studies as described above, by submitting to the Department contact the following: 1) name of individual; 2) activity or activities the individual will conduct; 4) whether or not these activities will be conducted independently or under direct supervision (within three meters); and 5) resumes, *Curriculum vitae*, or statements of qualifications that describe the individual's experience with the terns and experience with the methods to be employed in the study. Letters of recommendation may also be provided as supplemental information. A current LAI must be in possession of all field personnel while conducting work authorized by this letter permit.

You may continue to do work with the terns permitted above for activities and locations that were authorized by your 2003 MOU. Any new work proposed will require additional State authorization through an amendment to your letter permit and SCP. If the proposal is approved, the Department must post a new 30-day public notice before new activities with the terns can begin. Such additional field work may be further delayed, depending on any comments the Department may receive during the notice period.

This letter permit must be in your possession along with a current SCP while conducting the work described above, and is valid through **March 5, 2012**. You may use the SCP amendment form for any modifications to your research in the future (http://www.dfg.ca.gov/licensing/pdffiles/fg1379e.pdf). Should you have any questions, please contact Esther Burkett by email or by telephone.

Randi Logsdon Digitally signed by Randi Logsdon DN: CN = Randi Logsdon, C = US, O = Department of Fish and Game, OU = Wildlife Branch Date: 2010.03.10 17:13:15 -08'00'

FOR: Esther Burkett
Staff Environmental Scientist

Date: March 10, 2010

California Natural Resources Agency
DEPARTMENT OF FISH AND GAME
http://www.dfg.ca.gov
Wildlife Branch
Nongame Wildlife Program
1812 9th Street
Sacramento, CA 95811

ARNOLD SCHWARZENEGGER, Governor
DONALD KOCH, Director

LIST OF AUTHORIZED INDIVIDUALS

Ronnie Glick (SC-009557)
California State Parks, Oceano Dunes District

Research on California Least Tern
March 10, 2010

1. Individuals authorized to conduct activities pursuant to this letter permit:

   Principal Investigator:

   Ronnie Glick

   Independent Researchers (Field Investigators):

   Stephanie Little, Amber Clark, Joanna Iwanicha, Nancy La Grille, Margaret Przybylski, Daniel Costello, Jamie Miller

   Field Assistants:

   None listed

2. The Independent Researchers listed above may conduct activities pursuant to this letter permit for California least tern without the direct supervision of the Principal Investigator, as authorized by federal recovery permit TE0815214-5.1 or later.

3. Field Assistants must work under the direct supervision of the Principal Investigator or an Independent Researcher, *i.e.*, within 3 meters, and may assist on capture efforts, until such time as the Principal Investigator can certify in writing to the Department, and the Department responds favorably, that the individual may work independently.

March 10, 2010
Date

Randi Logsdon
Digitally signed by Randi Logsdon
DN: CN = Randi Logsdon, C = US, O = Department of Fish and Game, OU = Wildlife Branch
Date: 2010.03.10 16:06:16 -07'00'

FOR: Esther Burkett
Staff Environmental Scientist
California Department of Fish and Game

This list is valid only if dated on or after the effective date of the letter permit. This list and the letter permit must be in the possession of all individuals while conducting field activities.

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Appendix D. Representative Photographs

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Photo 1: Several of the vegetation islands (BBQ Flats, Worm Valley, and Pavilion Hill) in the HCP area.

Photo 2: View toward the Pacific Ocean from Oceano Dunes State Vehicular Recreation Area (SVRA) backdunes.

Photo 3: Arroyo Grande Creek with street-legal vehicles driving on the beach in the background.

Photo 4: Representative photograph of a western snowy plover nest in the HCP area.

Photo 5: California least tern nesting within an exclosure in the HCP area.

Photo 6: Representative photograph of an exclosure fence (Southern Exclosure) to protect nesting western snowy plover and California least tern within the HCP area.

Photo 7: Representative photograph of a small circular exclosure to protect western snowy plover in the HCP area.

Photo 8: Representative photograph of an exclosure fence and seasonal closure sign to protect nesting western snowy plover and California least tern within the HCP area.

Photo 9: Western snowy plover and California least tern protection sign in the HCP area.

Photo 10: Typical dogs on leash sign in the HCP area.

Photo 11: Representative photographs of signs posted in the HCP area to protect shorebird flocks.

Photo 12: Typical speed limit sign within the HCP area.

Photo 13: Representative photograph of symbolic fencing in south Oso Flaco.

Photo 14: Representative photograph of a fenced vegetation island (i.e., Eucalyptus Tree vegetation island) and surrounding area.

Photo 15: Fencing at Post 6 to protect nesting western snowy plover and California least tern in the HCP area.

Photo 16: Oso Flaco Boardwalk over Oso Flaco Lake.

Appendix E. 2019 Nesting Season Management Plan

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2019 NESTING SEASON MANAGEMENT PLAN TO AVOID TAKE OF THE CALIFORNIA LEAST TERN AND WESTERN SNOWY PLOVER AT OCEANO DUNES STATE VEHICULAR RECREATION AREA SAN LUIS OBISPO COUNTY, CALIFORNIA

February 2019

BACKGROUND AND PURPOSE

On March 21, 2001 the California Department of Parks and Recreation (DPR), Oceano Dunes District State Vehicular Recreation Area's (ODSVRA, SVRA) incidental take authorization pursuant to Section 7 of the Endangered Species Act expired. The incidental take authorization with the U.S. Army Corps of Engineers (ACOE) was not renewed. The ACOE determined that the activity being conducted at the ODSVRA was no longer under ACOE jurisdiction. Therefore ODSVRA lost the federal nexus needed to renew the Section 7 permit.

The biological opinion of the Section 7 permit had authorized incidental take of two-federally listed species: the California least tern (*Sternula antillarum browni*) (CLTE) and the western snowy plover (*Charadrius nivosus nivosus*) (SNPL). Both birds have documented nesting and foraging habitat at ODSVRA. The Biological and Conference Opinion for the Section 7 (dated January 25, 1996) provides a list of rules governing the recreational activities at the ODSVRA; program elements of a SNPL and CLTE monitoring program; reasonable and prudent measures necessary and appropriate to minimize incidental take; and additional terms and conditions to implement the reasonable and prudent measures.

ODSVRA has been diligently implementing the terms of the biological opinion since its issuance. As anticipated by the biological opinion, some incidental take of SNPL and CLTE has taken place; however measures undertaken at ODSVRA have resulted in the overall protection of the bird populations within park boundaries, which has contributed to the recovery of both SNPL and CLTE at the ODSVRA.

The absence of ACOE jurisdiction has left ODSVRA without incidental take authorization. ODSVRA / DPR has met with the U.S. Fish and Wildlife Service (USFWS) to address the situation and to determine the best course of action to resolve conflicts between listed species and ongoing vehicular recreation activities. At present DPR believes that it can continue to operate the SVRA and provide protection (attempting no take) of the listed species through the implementation of various protections, monitoring, and management measures as described below.

The measures following are intended to be carried out throughout the 2019 SNPL and CLTE nesting season. A subset of these will also be used after the nesting season to assure that SNPL are afforded protection during the non-nesting season. Measures to be

implemented during the non-nesting season (October 1 through February 28) will consist of:

- Weekly monitoring for location of SNPL within the ODSVRA, as staff levels and weather conditions allow
- Continued enforcement of dog leash laws
- Continued enforcement of the posted 15 MPH vehicle speed limits on the beach
- Continued public education programs with enhanced use of brochures, signage, and social media
- Continued staff education programs
- Beach closures may occur in the event that conditions such as tides, storms, or creek flow causes the beach to be unsafe to the public

ODSVRA/DPR has contracted with MIG Environmental to develop a Habitat Conservation Plan (HCP). In the absence of the HCP and to continue operations under the "no-take" scenario, ODSVRA has been working closely with the USFWS and the California Department of Fish and Wildlife (DFW) to develop yearly management plans for the CLTE and SNPL. ODSVRA meets with USFWS and DFW prior to the start of each nesting season to map out distinctive measures for this management plan.

PROTECTION MEASURES AND MANAGEMENT PROTOCOLS

Specific protection measures and prescribed management protocols for implementation by DPR as contained within US Fish and Wildlife Service biological opinion (1-8-95-F/C-17) prepared under Section 7 consultation with the US Army Corps of Engineers for the issuance of Regional General Permit No. 42 (Corps of Engineers File No. 95-50035-TAW), dated January 25, 1996; FWS permit No. PRT 815214; FWS "*Exclosure Protocols For Snowy Plover Nests"*, dated January, 1994 and July, 1999; and California Department of Fish and Wildlife letter concerning DPR management protocols for the avoidance of take of CLTE within ODSVRA, dated May 8, 2001, and additional measures added in 2002, 2003, 2006, and 2016 are incorporated by reference and are components of this plan. The following detail describes modifications, changes, or additions to the management protocols contained in the above referenced documents. Additional measures listed are derived from ODSVRA monitoring of the prior nesting season. These measures are listed as recommendations in the annual CDPR report written in consultation with Point Blue Conservation Science (Point Blue). ODSVRA / CDPR oversees the SNPL and CLTE program using data collected by staff and consultants. Through these consultations and data collection, ODSVRA reviews all recommendations and implements what is reasonable and sound given all issues. ODSVRA continues to implement management actions that will ensure the highest extent of protection to both the SNPL and CLTE. ODSVRA is responsible for the management of these two species within its boundaries. All measures will be operational and in place by March 1, 2019, unless otherwise noted or discussed with appropriate wildlife agencies.

ADAPTIVE MANAGEMENT

The management measures and protocols contained in this proposal represent the best management practices at this time. However, adaptive management practices may be employed in the protection efforts for SNPL and CLTE during the course of the 2019 nesting season. Adaptive management will be used to provide management flexibility to best afford protection for these species. Program adaptations causing initiation of changes of these proposed management actions could result from the following:

- Observations and data collected by ODSVRA resource management staff, which monitors SNPL and CLTE, might indicate protocols, which are proposed herein as ineffective.
- USFWS or DFW may indicate more recent findings on species management.
- Recognition and response to currently unforeseen threats to the species, or other factors.

ROLE OF OTHER DEPARTMENTS AND AGENCIES

United States Fish and Wildlife Service: USFWS staff is available to provide quick and timely responses to informational requests by DPR on aspects of the plan that need immediate action.

During the course of the 2019 nesting season, the USFWS may recommend protocol alterations or modifications for the management and protection of SNPL and CLTE. USFWS agrees to consult with DPR to coordinate and gain concurrence on any new management protocol changes that may affect SNPL and CLTE.

California Department of Fish and Wildlife: DFW/CDFW may recommend protocol alterations or modifications for the management and protection of CLTE during the course of the 2019 CLTE nesting season. USFWS and DPR have agreed to consult with DFW on any modifications suggested or required by DFW.

SEASONALLY PROTECTED AREAS FOR SNPL AND CLTE

The following seasonal exclosures and symbolically fenced areas will be maintained throughout the 2019 SNPL and CLTE nesting season:

- *Arroyo Grande Creek / Post 1.5 Area*: Posted, signed, and symbolically rope fence in the upper Arroyo Grande creek and lagoon. No successful plover nests in 2010 and 2017. No nest attempts in 2002-2004; 2006–2009; 2011-2014; or 2018. Three (3) successful plover nests in 2001; (1) successful CLTE nest in 2005; (1) successful SNPL nest in 2015, and (1) successful SNPL nest in 2016. ODSVRA staff will monitor area frequently. If a SNPL nest is found in this area, a 200-foot-diameter single nest exclosure will be erected or a 100 meter (330 foot) exclosure for CLTE.

- *Southern Exclosure:* Approximately 300 acres. 2-inch by 4-inch no-climb wire fencing, second layer of wire fencing to extend height to 6 feet, buried 6-8 inches, and posted to form a single contiguous fenced area within the southern portion of the riding area. The adjoining shoreline is also part of the Southern Exclosure and is closed to public entry using symbolic fence.

- *Oso Flaco Natural Area:* 1) The area north of the boardwalk and south of the camping/riding area (approximately 68 acres, 0.5-mile stretch of shoreline) is closed to the public and connected to the Southern Exclosure. Foredunes are closed by 2-inch by 4-inch no-climb wire fence and a second layer of wire fencing to extend height to 6 feet, buried 6-8 inches, and the adjacent shoreline is closed using symbolic fence and signs. 2) The upper beach for the area south of the boardwalk to the southern boundary (1.2 miles) is closed with symbolic rope, posts, and signs. The symbolic fencing will be in place at the terminus end of the Oso Flaco boardwalk trail at the beach to direct visitors away from potential nesting areas.

EXCLOSURES for SNPL and CLTE NESTS

Additional exclosures will be erected and maintained based upon CLTE and SNPL nesting activities as described below.

- For SNPL nests found in the riding area, a circular single nest exclosure will be constructed with a minimum 200 foot diameter. For CLTE nests the exclosure will be a minimum 100 meters (330 feet) in diameter. Fencing material will consist of 2-inch by 4-inch galvanized wire mesh fence fabric, 5 feet high, and steel "t" posts every 15 feet and intermediate line posts as needed. The bottom edge of the wire fencing will be buried 6-8 inches to discourage predator access inside the exclosure.

- When individual SNPL / CLTE nests are established outside of the existing seasonal exclosures, within the riding area, and are located within 500 feet of the established Southern Exclosure, fencing will be erected to enlarge the Southern Exclosure so as to encompass the nest site, if topography allows. Fencing so erected will be placed a minimum distance of 100 feet away from the nest site for SNPL and 100 meters (330 feet) away from the nest site for CLTE.

- When two or more nests sites in the riding area are located within 500 feet of each other, and are 500 feet or more away from the seasonal exclosure they will be encompassed into a new large seasonal exclosure, if topography allows. Seasonal exclosures so erected will include fencing that extends to the surf line if chick travel corridors establish that need, so as to provide a secure travel corridor for foraging activity for SNPL chicks. Fencing for such new seasonal exclosures will maintain a minimum distance of 100 feet from nest sites for SNPL and 100 meters (330 feet) from nest sites of CLTE.

- If a single SNPL / CLTE nest is established further than 500 feet from a seasonal exclosure with no other nest(s) located within 500 feet, ODSVRA will erect a single nest exclosure fence as described above.

- Nest exclosure fencing will be extended westerly to the surf line if evaluation by ODSVRA staff and/or USFWS/DFW determine SNPL chick travel corridor needs require such an action, thereby affording additional protection to SNPL.

- If a SNPL/ CLTE nest is established within 150 feet of a restroom facility, the following protocols will be implemented:

    1) Permanent Restroom Buildings will be closed to public use and exclosure fencing will surround and isolate the restroom to prevent public use.
    2) Chemical toilets will be relocated to a minimum distance of 330 feet from any nest site.

- If a SNPL or CLTE nest is initiated inside the seasonal exclosure and close to the exclosure fence that borders the riding area, staff will install additional fencing to maintain a perimeter of a minimum of 100 feet from the riding and camping area to the nest for SNPL and 100 meters (330 feet) from the riding and camping area for nests of CLTE. These "bumpouts" will be monitored regularly. If an incubating bird is disturbed by recreational activity, the bumpout will be increased in size as needed. All nests are monitored for disturbance and any nest that is disturbed by regular recreational activity may receive a bumpout. This additional fencing will remain in place during the period when nests are active or chicks are found in this area. Once chicks move out of the area or reach fledge age, the bumpouts will be removed.

- 10-foot by 10-foot nest exclosures, as called for in the ODSVRA predator management plan and used since 2003, may be used if deemed necessary by staff for SNPL nest protection. Circular exclosures with 7 foot diameter have been used by ODSVRA since 2012 for SNPL nests as needed. Both smaller exclosures are constructed using 2-inch by 4-inch wire no-climb fence and 1/2-inch by 1/2-inch mesh netting will be placed on top. Fence will be buried to a depth of 6-8 inches.

- Mini-exclosures measuring approximately 3 foot by 3 foot by 3 foot have been used at ODSVRA since 2010 for SNPL nest protection. These are constructed with 2-inch by 4-inch wire non-climb fence (with a top of the same material) and are secured with stakes. When appropriate, they are buried 4-8 inches deep.

- SNPL nesting activity occurs within the non-off highway vehicle use area of the ODSVRA in the Oso Flaco Lake Area. This area will be monitored regularly during the nesting season. Single nest exclosures or symbolic fencing may be erected around nests when, in the opinion of the Senior Environmental Scientist and/or monitors, the exclosure or symbolic fencing is necessary to ensure the protection of nest sites from human disturbance or predation. If a nest is established within but close to the symbolic fencing boundary, it may be moved further west to give the nest a greater

buffer area while still providing a walkway for the public. A 7-foot circular exclosure may be used in Oso Flaco to protect the nest from predators, if topography and other conditions allow. Single nest exclosures in Oso Flaco will be erected at the 2-egg stage of the clutch to help reduce abandonment threat.

MANAGEMENT ACTIONS SPECIFIC TO CALIFORNIA LEAST TERN

- DPR will implement provisions and measures agreed to for CLTE management and protection that are contained within a Memorandum of Understanding (MOU) from CDFW to DPR that is in effect for the 2019 nesting season. ODSVRA in consultation with DFW Wildlife Biologists are confident the measures mentioned within this take avoidance document, if faithfully implemented at ODSVRA, will avoid take of this State listed, fully protected species. ODSVRA proposes that these same measures will be adequate to assure USFWS that there will be no take of CLTE in the operation of ODSVRA during the 2019 nesting season.

- For CLTE nests, exclosure fencing will be maintained a minimum of 100 meters (330 feet) from active nesting areas. Fencing will be added as deemed necessary by the Senior Environmental Scientist or lead field monitors. Fencing will be added once nests are initiated and removed once nests have hatched and chicks have either moved into other areas or have reached fledge age.

- In the event that CLTE chicks are observed traveling outside of a single nest exclosure, the exclosure will be increased in size up to 600 feet in diameter. Small mesh fencing or silt fencing may be used to reduce CLTE travel outside the exclosure. Exclosure size may be altered based on operational need, public safety considerations, and the need to maintain adequate travel corridors within the SVRA. DPR will consult with DFW for agreement and approval if the appropriate setback distances cannot be achieved as a result of operational needs.

- CLTE chicks will be monitored closely and fencing may be adjusted if chicks are found within 150 feet of the fence line that borders public recreational activity areas. If chicks movement is a result of monitoring activity (such as walking inside the exclosure to band), the chicks will be monitored until they are a safe distance from the fence and the chicks are no longer subject to disturbance.

- The footbridge hand railing at Oso Flaco Lake is used by CLTE for perching after chicks have fledged and when adult birds are teaching fledglings to fish in the lake. The visiting public will be provided with information about the CLTE presence and activity at Oso Flaco Lake, and will be provided with guidelines to avoid disturbance of the activities of CLTE. If, in the opinion of the Senior Environmental Scientist or monitors, visitor activities are significantly disrupting CLTE behavior, the footbridge may be closed to public use, or types of public use on the boardwalk may be temporarily prohibited until the CLTE have left the lake area.

- Banding of CLTE chicks will continue at ODSVRA for 2019. A permitted Master Bander from Point Blue Conservation Science has been contracted to perform this duty.

- Driftwood will be placed throughout the Southern Exclosure to serve as natural shelter for CLTE chicks. Tern shelters may also be used.

- The top of the Southern Exclosure fencing will be lined with a strip of thicker plastic fencing (orange silt construction fencing cut into approximately 1 foot sections) in March of 2019 covering most of the western and northern fenced areas. The thicker fencing may assist to increase the visibility of the exclosure fence for flying CLTE. If staff resources are available, some of the eastern fenceline and bumpout fencing will also be lined with this strip. This strip of fencing was installed on the western and northern exclosure fence each year beginning in 2016 with favorable results.

- CDPR monitors the location of the CLTE night roost each night and as viewing conditions allow. Over the past 20 years, the night roost has been within the northern Southern Exclosure, near or within the CLTE nesting area. CDPR has a protocol in place to protect the night roost if it is found in an area where birds would be vulnerable from public recreational activity. If the night roost is located in an area that is open to public recreational activity, monitoring staff would call for all available help from park staff and close off the area, and an appropriate buffer area, with fencing. The exclosure fencing will be maintained a minimum of 100 meters (330 feet) from the night roost location. Fencing will be added as deemed necessary by the Senior Environmental Scientist or lead field monitors and fencing will be removed once the night roost is no longer present.

PUBLIC INFORMATION AND INTERPRETATION

- All first time visitors will be provided with a flyer or pamphlet describing the natural history of the species, their status under endangered species acts, recovery efforts in place within the SVRA and a list or description of activities either prohibited or desired by the public that serve to protect both CLTE and SNPL. This information will be regularly updated as needed.

- Interpretive programs will be updated to reflect new information and emerging trends, including through social media.

- All first time visitors entering the ODSVRA by vehicle will be provided with a copy of the ODSVRA park brochure that contains information on the federally and state listed status of the SNPL and CLTE, and management actions in place to aid in the recovery effort of these species.

- All visitors entering the ODSVRA by vehicle to camp will be offered plastic garbage bags and will be informed they are to haul their trash out of the ODSVRA at the end

of their visit. Visitor participation in reducing or eliminating trash within the SVRA will discourage predators from frequenting the visitor use area and thus reduce the likelihood of predation on SNPL and CLTE.

- Trash dumpsters will be provided for the deposit of trash bags near the OHV staging area, near Post 2. The location of the trash dumpsters will be changed as necessary to avoid disturbance to any nearby active CLTE or SNPL nests.

- Interpretive panels describing the CLTE and SNPL population status and threats to their survival will be posted at ODSVRA Safety Center located at the entrance to Sand Highway, at Oso Flaco Lake and at the Pier Avenue and Grand Avenue entrances ramps to the SVRA.

- Interpretive signs describing park law, policies, and guidelines for the protection of SNPL and shorebirds are posted at multiple bathroom locations throughout the ODSVRA camping areas.

- Seven days a week, 24-hours a day the ODSVRA AM radio station will again be used for the 2019 nesting season. The radio station will broadcast visitor safety, park rules and regulations and information on the SNPL and CLTE including actions that visitors can take to help assure the survival of the species. The radio station will be updated with new measures taken in the 2019 season.

- Visitors entering ODSVRA by vehicle with a dog will be provided with an informational handout about the ill effects of unleashed dogs on wildlife. Pedestrian visitors with dogs who have not entered the recreation area by vehicle will be provided the same pamphlet by ODSVRA staff.

SNPL AND CLTE BIOLOGICAL MONITORING

- During anticipated high visitor use periods as determined by historic visitor attendance records, e.g., Memorial Day Weekend, July 4th Weekend, Labor Day Weekend, monitoring staff will provide extended hours of monitoring within the off highway vehicle use area of the ODSVRA.

- Monitoring will take place daily for a minimum of 8 hours per day to enable a better identification of potential human use related threats to SNPL and CLTE and to summon law enforcement assistance if needed to prevent or eliminate any human use related threats to the species. If entering nesting exclosures, monitors will be those individuals approved by USFWS for this function.

- Point Blue has been contracted by DPR to furnish a master bander for the 2019 SNPL and CLTE nesting season. The Point Blue bander will be responsible for the banding of all SNPL and CLTE chicks, and if determined necessary, to band SNPL adults. The Point Blue bander will be in consultation with and under the direction of the

Senior Environmental Scientist assigned to ODSVRA. The Point Blue bander will assist in the preparation of a written end of nesting season report for OSVSRA. The banding of newly hatched SNPL / CLTE chicks will follow protocols approved by USFWS and DFW. The Point Blue bander will report all banding data and records per guidelines established by USFWS and Point Blue. SNPL eggs will be "floated" to help estimate hatch rates by Point Blue or by those individuals approved by USFWS for this activity. The Point Blue bander will be available to start work no later than March 1 of each year and will be available for the full breeding season.

- During holiday periods, one (1) monitor will be assigned the specific duty during daylight and evening hours of ensuring that no unauthorized entry is made into the north end of the Southern Exclosure.

- Any SNPL / CLTE breeding activity in the riding area (such tracks, scrapes, or pairs observed) will be monitored closely. The areas will be marked and rechecked during the day and one (1) person will be assigned each morning to recheck any potential breeding areas. All SNPL / CLTE tracks in the riding area will be walked to check for potential nests. Any nest found would be immediately protected with a single nest exclosure.

- Monitors will closely track SNPL / CLTE chicks/broods hatched from any area within the riding area (single nest exclosures) and, if determined necessary, carefully direct the brood to the Southern Exclosure. Prior to a known nest hatching, monitors will oversee the erection of signs and/or symbolic fencing to provide a safe passage until the brood reaches a non-vehicle use area of the SVRA. Monitors will follow the broods if and when leaving the single nest exclosures, identify threats to brood movement or safety, and obtain assistance as necessary from SVRA patrol staff. Should the broods engage in foraging activity in the wrack line near these exclosures, vehicle traffic flow will be diverted or regulated to allow safe movement of the brood until the brood moves back into the exclosure.

- SNPL chicks observed on the shoreline at the northern end of the Southern Exclosure will be monitored closely. The area north of the Southern Exclosure will be scanned thoroughly each morning for chicks that may have moved outside of the exclosure. If chicks are found, the brood will be directed back into the exclosure, as described above.

- ODSVRA will continue to participate in the Region 5 working group for SNPL recovery.

- A predator management plan will be implemented again in the 2019 nesting season as in previous seasons to address predation issues at ODSVRA. Predator management personnel will be available to start work no later than March 1 and will be available for the full duration of the breeding season.

MAINTENANCE ACTIVITIES

- All protocols for maintenance activities and maintenance vehicle movement and routing contained in the biological opinion remain in effect. Since 2014, ODSVRA has ceased conducting surveys for plover nests specifically prior to maintenance activities on the sand ramps. Over the previous ten years, ODSVRA has been conducting surveys prior to sand ramp maintenance and no nests or birds have been recorded. There is too much visitor use activity at the sand ramps for these areas to be considered viable nesting or roosting areas. These areas will be regularly inspected a minimum of once per day associated with the regular monitoring activities within the riding area. During these daily surveys (also called the lower transect), the park is surveyed from Pismo Creek to the large seasonal exclosure to identify snowy plover individuals and nests. The sand ramps will be covered in this daily survey.

- At least one vehicle or trailer and all tools and equipment necessary will be available daily throughout the 2019 nesting season to immediately construct a single nest exclosure(s) or bumpout for SNPL or CLTE when requested by monitoring staff.

- Maintenance staff and Resource monitoring staff will carry trash bags in each vehicle and provide trash bags to visitors for the removal of trash and litter from visitor use areas.

- The exclosure fence will be maintained throughout the season with the assistance of heavy equipment.

ENFORCEMENT ACTIVITIES

State Park peace officers will provide focused enforcement of trespass into the nesting exclosures, the dog leash laws, the posted 15 MPH beach speed limit, firework violations, kite flying violations, public use of drones/unmanned aerial vehicles (UAV), and litter violations throughout the 2019 nesting season. During periods of anticipated high visitor use, additional ranger staff will be dedicated solely to this focused law enforcement function so as to eliminate threats to SNPL or CLTE associated with those visitor activities.

- State Park peace officers will respond to requests by monitors for assistance with SNPL and CLTE protection and security. The enforcement of laws affecting the safety of SNPL and CLTE will be the highest non-emergency priority for law enforcement focus and action within the ODSVRA.

- During anticipated high visitor attendance periods, State Park peace officer staff will provide additional enforcement focus on ensuring that the integrity of exclosures is maintained and that no trespass occurs with SNPL or CLTE exclosures.

- Sundays through Thursdays, except for holiday periods, a minimum of two (2) State Park Ranger/peace officers will be on duty and available from 0700 through 2000 hrs each day to respond to:

  1) Requests for assistance by monitors for the protection of SNPL and CLTE
  2) Exclosure trespass violations
  3) Enforce dog leash laws
  4) Enforce the posted 15 MPH beach speed limit
  5) Firework violations
  6) Kite flying violations
  7) Litter violations

- During non-holiday weekends (Friday and Saturday), a minimum of two (2) State Park peace officers will be on duty and available from 0600 through 2400 hrs each day to enforce the above mentioned violations.

- During major holiday periods State Park peace officers will be on duty 24 hrs/day. From 0700 to 2400 a minimum of three (3) ranger/peace officers will be on duty at any one time. From 2000 to 0200 a minimum of three (3) ranger/peace officers will be on duty at any one time. From 0200 to 0700 two (2) ranger/peace officers will be on duty. During mid day periods, when visitor attendance is highest, as many as four (4) ranger/peace officers will be on duty. During all shifts ranger/peace officers will be available to enforce the above listed violations.

- During daylight hours on major holiday periods, one (1) State Park peace officer will be assigned the primary duty of patrolling the beach, including outside the nest exclosure areas and ensuring that no entry is made into exclosures established for CLTE and SNPL nest site protection.

- On July 4th, State Park Visitor Service Staff, or State Park Volunteers will be assigned to the large southern exclosure to help quell the use of fireworks over the area, which could endanger nest success. Additional resources may be brought in to enforce fireworks restrictions including CalFire Law Enforcement staff.

DISTRICT SUPERINTENDENT ORDERS

- The District Superintendent of ODSVRA will issue orders:

  1) Establishing a buffer zone around single nest exclosures prohibiting the camping, stopping or parking of vehicles within 100 ft of the exclosure perimeter fencing
  2) Prohibition of kite flying south of the Pier Ave. ramp during the SNPL and CLTE nesting season
  3) Prohibition of fireworks
  4) No entrance into any signed or closed area within the Oso Flaco Natural Area

5) No dogs or horses allowed in the Oso Flaco Natural Area, and
6) Public Drone/UAV restrictions are in development as well

- Temporary closure of the Oso Flaco Lake footbridge may be made if, in the opinion of the Senior Environmental Scientist and or the biological monitors, human activity at the footbridge is adversely affecting least tern adult or fledgling feeding activities at the lake.

RARE PLANT MONITORING ACTIVITIES IN 2019

DPR has been preparing a HCP to cover a host of state and federally listed species within Oceano Dunes SVRA and Pismo State Beach. Information on the distribution of certain listed plant species is out of date and needs to be updated to provide the most accurate information to wildlife agencies. In particular, populations of surf thistle (*Cirsium rhothophilum*) and beach spectaclepod (*Dithyrea maritima*) are known from North and South Oso Flaco. It is not possible to fully map the distribution of these plant species outside the nesting season for snowy plover and least tern. The beach spectaclepod, in particular, is an annual plant that may not sufficiently germinate by March 1 and is typically desiccated and difficult to identify after September 30. The only way to collect accurate information on the distribution and health of beach spectaclepod is to conduct surveys during its likely flowering period in April – May.

DPR proposes to conduct surveys in North and South Oso Flaco during the most likely flowering period for beach spectaclepod and surf thistle during the 2019 nesting season.

DPR proposes the following protocols to allow these surveys to continue while eliminating or minimizing the potential for take to nesting snowy plover and least tern:

1) A team of two biologists will conduct these surveys. One member of the team will be a skilled botanist with experience in identifying the target plant species. The second member of the team will be a skilled snowy plover monitor listed on the List of Authorized Individuals for Recovery Permit TE-815214-9, Category 2, Individuals authorized to independently conduct population surveys, locate and monitor nests, and erect and monitor fence and nest exclosures including a chick fence.

2) Prior to conducting botanical surveys, the team will review records of all known nesting sites in the survey area. No surveys will be conducted within 150 feet of known nesting sites until the nest fates are determined (hatch or fail) and the brood and attending adult are known to have left the area. No surveys or walking within sight of nests will occur for nests that are close to hatch or newly hatched.

3) Surveys may be conducted in areas without known nests; however, the team will follow existing nest search protocols to identify new nests, breeding behavior, and the presence of adults tending broods.

4) If new nests, breeding behavior or adults tending broods are noted in an area, the team will make appropriate field notes and leave the area until the nest fates are determined or breeding/brooding activity is no longer occurring in the area.

5) Botanical surveys will take the minimum time necessary to avoid disturbance to breeding birds in the area. Surveys will be limited to mapping plant populations, preliminary counts of individuals, notes on population health, notes on threats to population health, and other associated information. Botanical surveys should take no longer than 15 minutes at each site with a known population.

6) Walking surveys of the entire foredune complex in the North and South Oso Flaco areas will take the minimum time necessary to identify new, previously unmapped populations of target species.

7) All botanical surveys will be conducted under similar constraints as nest search surveys including during appropriate weather conditions, wind conditions, times when predator activity is not occurring, and other precautions as listed in the Federal recovery permit and the ODSVRA plover and tern monitoring protocol.

If these conditions are followed, DPR can collect critical information on rare plants that will support the completion of the HCP while minimizing or eliminating the threat to nesting plovers and terns that could result from surveys in the North and South Oso Flaco areas.

DPR 2018 SNPL AND CLTE NESTING REPORT

DPR prepared a report in consultation with Point Blue entitled “Nesting of the California Least Tern and Western Snowy Plover at Oceano Dunes SVRA, San Luis Obispo County, California, 2018 Season”. In the report were several recommendations regarding Monitoring, enhancement of available nesting habitat, enhancement of hatching success, fledging success, and winter survival.

ODSVRA is prepared to implement the recommended measures of the annual report and the subsequent recommendations of the Scientific Subcommittee, with the exception to implementation of year-round closures in any portion of the camping and riding area of the SVRA.

Attachments:

Recommendation Section of DPR 2018 Nesting of the California Least Tern and Western Snowy Plover at ODSVRA.

Scientific Subcommittee recommendations 2018

RECOMMENDATIONS

Continue monitoring
Monitoring is critical for effective protection of nesting terns and plovers. As problems and threats arise for adult birds, nests, and chicks, timely information from monitoring can help guide appropriate management actions and evaluate their effectiveness. Monitoring efforts at ODSVRA should have adequate funding, resources, and flexibility to address anticipated problems (e.g., nesting failure, causes of chick loss, predator pressure) as well as unanticipated problems.

Continue banding least tern and snowy plover chicks
Continue banding least tern and snowy plover chicks to better understand chick behavior and factors promoting or threatening survival of chicks (e.g., feeding rates for tern chicks, foraging activity and movements of plover chicks, age and location of disappearance of different cohorts of chicks). Banding also provides a means to document fledging success. Without this information, the seasonal productivity of terns and plovers at ODSVRA would be unknown and management effectiveness could not be assessed. Additionally, bands provide an opportunity to gain insight into predator impacts on chicks and fledglings. Over time, banding of tern and plover chicks will provide information on natal site fidelity of terns and plovers fledged at ODSVRA, as well as migration to other sites.

Continue banding least tern chicks to individual
Beginning in 2006, least tern chicks were banded to allow individual chicks to be identified. This was done, in part, by placing one or two different colors of tape on the federal band, creating a unique combination for each chick. Banding to individual provides the opportunity to gain additional information that otherwise may not be obtainable, including:

1) providing the most accurate means to count the number of juveniles produced;
2) identifying if different areas within the colony are having different fledging success during a season;
3) identifying if broods hatching more than one chick are fledging more than one chick;
4) tracking individual chick and juvenile movement within the ODSVRA colony;
5) providing information on the length of stay of individual juveniles at the colony site after fledging;
6) tracking recruitment of juveniles into ODSVRA's breeding population; and
7) tracking movement of individuals to other colonies in California.

Banding to individual provides valuable information to assist in developing and assessing site management actions directed toward the recovery of the least tern.

Continue option to band adult snowy plovers
The occurrence of abandoned plover nests can raise concern about possible mortality of adult plovers. If elevated adult mortality rates occur or are suspected, it could prove beneficial to band certain adults. This would allow monitors to verify if mortality was taking place and possibly identify the causes.

Provide adequate-sized bumpouts and single nest exclosures to protect least tern nests and chicks in or close to the open riding area
Least tern nests inside the Southern Exclosure and located close to the north or east fence receive temporary additional fencing to create a buffer from recreational activities in the open riding area. These bumpouts connect to the fence adjacent to the nests and extend into the open riding area. Earlier practice has been to provide a 100-foot buffer between a nest and the open riding area, using bumpout fencing for nests inside the Southern Exclosure and a 100-foot-radius circular single nest exclosure for nests in the open riding area. In 2016-18, as recommended by CDFW, the minimum distance between least tern nests and the open riding area was increased, and where needed bumpouts were used to provide a buffer of 300 feet in 2016 and 328 feet (100 meters) in 2017-18. Sixty percent (21/35) of nests were within 328 feet of the exclosure fence in 2018 and bumpouts were installed to increase the buffer from the open riding area. This is slightly higher

than in 2017 and 2016 when 54% (28/52) and 50% (24/48) of known location nests, respectively, were within 328 feet of the exclosure fence. In 2016-18, all nests receiving bumpouts were in close proximity and near the eastern side of 6 and 7 exclosures, and therefore the bumpout fencing was moved and connected several times over the course of the nesting season as additional nests were initiated. In 2018, a bumpout was also installed to maintain a 328 foot buffer between the night roost and the open riding area. By the end of the season, the night roost bumpout and several nest bumpouts had coalesced into one large bumpout with multiple layers of fencing (Appendix C). Of the nests with bumpouts 81% (17/21) were documented to hatch. This compares to 79% (11/14) for all other nests not within 328 feet of the exclosure fence and open riding area (Appendix A).

For 2019, it is recommended to continue to provide a bumpout for tern nests within 328 feet (100 meters) of the open riding area fencing, as approved by CDFW. Nests in the open riding area should receive a single nest exclosure with a minimum radius of 328 feet. Nests will be monitored closely to assess the adequacy of protective fencing in reducing disturbance. If necessary, bumpouts or single nest exclosures may increase in size if disturbance to incubating birds is observed as a result of recreational activity. Tern chicks and the night roost will also be monitored and the bumpout size may be adjusted if chicks or night roosting birds are observed to remain within 328 feet of the eastern bumpout fence. ODSVRA will continue to maintain a safe vehicle corridor adjacent to the north and east fence, any bumpouts, and single nest exclosures.

Continue to provide adequate-sized bumpouts and single nest exclosures to protect snowy plover nests in or close to the open riding area

In 2018, snowy plover nests inside the Southern Exclosure and located within 100 feet of the north or east fence received temporary additional fencing to create a buffer from recreational activities in the open riding area. These bumpouts connect to the fence adjacent to the nests and extend into the open riding area. Nests inside the exclosure and more than 100 feet from the fence may also receive a bumpout if repeated disturbance from the open riding area is observed. For nests found in the open riding area, the protocol is to install a single nest exclosure with a minimum radius of 100 feet.

In 2018, two snowy plover nests (SP112 in 6 exclosure, SP103 in 8 exclosure) were given bumpouts to increase the distance from the nests to the open riding area fence to a minimum of 100 feet. The SP112 nest failed to unknown cause and SP103 hatched three chicks, two of which fledged (Appendix B).

For 2019, it is recommended to continue to install bumpouts for snowy plover nests close to the Southern Exclosure fence to create a buffer of at least 100 feet between the nest and the open riding area. Nests in the open riding area should receive a single nest exclosure with a minimum radius of 100 feet. Nests will be monitored closely to assess the adequacy of protective fencing in reducing disturbance. If necessary, bumpouts or single nest exclosures may increase in size if disturbance to incubating birds is observed as a result of recreational activity. ODSVRA will continue to maintain a safe vehicle corridor adjacent to the north and east fence, any bumpouts, and single nest exclosures.

Continue to enhance habitat in the Southern Exclosure by distributing natural materials and increase efficiency with the help of maintenance staff and heavy equipment

Natural materials such as driftwood, woodchips, and wrack (surf-cast kelp) should be distributed in large amounts within the exclosures (including the shoreline) to enhance habitat features. Exclosure areas with lower productivity should be identified, and additional habitat enhancement activities should be explored and tested, with the goal of improving nesting and chick rearing habitat in these areas. Since 2002, wrack has been gathered by hand and placed in the exclosure. Approximately 217 cubic yards of wrack were distributed on the exclosure shoreline during the 2018 season as habitat enhancement. Greater efficiencies may be possible for wrack distribution. Since 2008, ODSVRA monitoring staff has received assistance from available heavy equipment operators from park maintenance staff in loading woodchips to be distributed in the exclosure. However, a method using heavy equipment has not been found to collect and

distribute large amounts of wrack from the open riding to the seasonal shoreline exclosure. Attempts in the past resulted in more sand than wrack being collected with the equipment compared to hand collection. In 2019, it is recommended that methods to better use heavy equipment for wrack collection should be further explored. The goal would be to have heavy equipment available throughout the season to assist in loading large piles of wrack collected from the open riding area, to then be placed and distributed by permitted staff on the Southern Exclosure shore. This would increase staff efficiency and allow larger amounts of wrack to be dispersed, helping to maintain larger populations of invertebrate prey over a broader area for snowy plover chicks, fledglings, and adults. Broader distribution of wrack also provides shelter from wind and cover from predators. The use of heavy equipment needs to be balanced with other operational needs in the park.

Wrack and woodchip additions could also occur during the winter or prior to 1 March if materials and staff levels allow. As time permits, it is recommended to place large wrack piles in the winter or at the beginning of the season in the area where the seasonal exclosure will be located.

Continue to study the benefits of wrack addition to the Southern Exclosure shoreline and inoculation with wrack-associated invertebrates as a possible means to restore invertebrate species and biomass (these invertebrates are part of the prey base for snowy plover chicks, juveniles, and adults)

In 2007, a study was initiated by Drs. Jenifer Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara (UCSB), examining the responses of invertebrate numbers and diversity in areas where wrack was added to the Southern Exclosure shoreline throughout the breeding season. Preliminary findings from the five-year study (2007-11) indicated that the seven-month seasonal closure (March-September) is not a sufficient period of time for invertebrates to effectively and naturally recover species diversity and abundance on the Southern Exclosure shoreline following five months of recreational use. In 2012, invertebrate sampling (by Dr. Dugan) was more limited, with one series of transects at the beginning of the season and repeated once at the end of the season. In 2013-18, park staff, following the same methodology, performed one series of invertebrate sampling at the end of the season and a beginning season sampling survey was done in 2015-18. The survey was comprised of 10 transects in the Southern Exclosure and three transects in North Oso Flaco (as a control). Samples were sent to Dr. Dugan at UCSB for analysis and findings added to the data set. For 2019, it is recommended to continue the beginning and end of season sampling. From 2012-18, park staff has inoculated wrack added to the shoreline with invertebrates following protocols developed by UCSB and it is recommended to continue these protocols in 2019.

In 2018, drone equipment (Phantom 4 Pro with DJI Phantom camera) was used to experiment with photographing the shoreline habitat over three days on 5-7 March. The drone made seven flights at an altitude of 120 feet (covering approximately 1.5 miles of shoreline), one flight at 150 foot altitude, and one flight at 250 foot altitude (covering approximately 0.5 miles), and was found to be highly effective at assessing habitat enhancement material distributed by staff. The flight at 250 feet produced imagery of a broader area, while still providing useful information about the habitat; individual wood pieces, wrack piles, and even footprints were visible. Each flight lasted about 20 minutes and shorebirds were not observed to be disturbed by the drone. It is recommended for 2019 to perform additional experimental drone flights, in consultation with USFWS, to develop protocols to amend the USFWS permit guidelines to include drone activity if necessary. Beginning and end of season drone flights will occur, as well as during the season, if permitted by USFWS. The goal of the trial flights would be to examine wrack manipulations on the Southern Exclosure shore and identify potential means to enhance the diversity and abundance of invertebrate species that are natural prey for plovers. Prior to any drone flight, the area would be scanned for any roosting or nesting plovers or terns. The USFWS permit would be amended, as necessary, and current monitoring guidelines will be followed, including not allowing the activity during high winds, rain, high temperatures, or if predators were present. During all drone flights, the behavior of terns and plovers

would be monitored closely by park staff and, if disturbance was observed, drone activity would cease and flight height would be increased until safely away from the nesting area.

Continue weekly gull surveys at the trash dumpster area

Full park monthly gull surveys were done from 2008-15, daily gull surveys at the trash dumpster area at marker post 2 were done from 2014-17. In 2018, surveys were limited to at least weekly surveys at the trash dumpster area because of time constraints. For 2019 it is recommended to continue weekly gull surveys as was done in 2018.

Continue to look for an appropriate design to cover trash dumpsters

The predator management strategy at ODSVRA includes methods to discourage attracting predators to the site. The large trash dumpsters (22 feet long, 20 cubic yard capacity) located near marker post 2 attract a large number of gulls landing on and foraging in the dumpsters. Four to six dumpsters are present during the busy summer months. In 2012, an experimental cover was designed for one dumpster, but it was removed because the design did not stand up well in high winds and quickly became ineffective. In late September of 2016, an experimental cover that has two openings with latches was tested on one dumpster, but was removed because the design did not meet ODSVRA needs.

Surveys at the dumpster area during the 2018 nesting season resulted with the month of August having the highest daily average number of gulls (189) and the maximum number of gulls present at one time was 445 on 13 August. It is recommended for 2019 to cover all the trash dumpsters in the marker post 2 area with lids designed to exclude gulls and meet the needs of the ODSVRA staff and visitors.

Continue to maintain option to salvage and rescue eggs, chicks, juveniles, and adults under very limited circumstances

In some circumstances the abandonment of least tern or snowy plover eggs and chicks can be directly attributed to human disturbance. The option to salvage such eggs and chicks to be raised in captivity by an approved facility and released in the wild is useful. Beginning in 2003, a limited number of abandoned but likely viable snowy plover eggs or chicks from ODSVRA were brought into captivity. Chicks were raised in a manner that they did not imprint on humans and were released into the wild when fledged. All fledglings were color-banded to individual to facilitate collecting information on movements, survival, and future reproductive success. Captive care should only be used selectively and not as a substitute for responding to the primary causes of elevated egg or chick abandonment rates.

Ongoing management actions that will continue in 2019

The following are part of our ongoing management actions and monitoring procedures for which a specific recommendation is no longer necessary (see Monitoring and Management Actions section for more detail). Background information and justifications for these management actions have been discussed in detail in previous annual reports.

- Oso Flaco area protection will continue at the same monitoring and management level as set in 2005 (Site Description).
- The Arroyo Grande Creek protected area will be clearly delineated as a closed area around the Arroyo Grande Creek and lagoon by using posts, symbolic rope, and signs as practiced since 2006 (Site Description).
- Night vision equipment will continue to be used for monitoring the least tern night roost. Goggle equipment has been used for monitoring since 2007 and a new thermal scope (Trijicon REAP-IR) was acquired and will be used in 2019.
- Continue monitoring least tern juveniles and the night roost. Continue monitoring foraging activity at nearby freshwater lakes, if time allows.
- Continue use of motion detector cameras for nest monitoring and train and permit additional monitoring staff as needed.
- Continue to use an anemometer with data logger from a wind tower to record daily wind speeds and direction.
- Continue option to use tern chick shelters.
- Continue option to use least tern chick fencing on the east side of the exclosure and a method to maintain the tern chick fencing will continue to be explored.
- Predator monitoring and management actions that have been in place since 2003 and 2004 will continue.
- The Seasonal Exclosure protected area will include the use of increased fence height as practiced since 2006 and use of aprons as used since 2007 to improve the effectiveness of the perimeter fence in protecting breeding terns and plovers.
- The Southern Exclosure and North Oso Flaco shoreline will continue to be protected; this includes maintaining the posts and rope at marker post 6 and Oso Flaco boardwalk intertidal zones to minimize trespass, which has been part of the management actions in these locations since 2008.
- Continue to position a large section of the 6 and 7 shoreline exclosure fence further east (inland by approximately 100 feet of the pre-2012 shoreline fence location) to provide a wider functional shoreline habitat. The shoreline fence should continue to be installed last (after all other fencing is installed) and as close to 1 March as possible to lessen the chance of storm-driven high surf damaging the fence.
- Continue use of 10-foot by 10-foot single nest exclosures with net tops, circular exclosures with net tops, and mini-exclosures as needed to protect nests from mammalian and avian predators. These small exclosures are not without risks to incubating adults and we will continue to closely monitor and evaluate their use.
- Surveys for plovers will continue during the nonbreeding season. These weekly surveys have been conducted since the winter of 2009-10.
- Continue to document impacts and, when possible, reduce disturbance caused by low-flying aircraft over the Southern Exclosure and Oso Flaco.

- Continue to work to address water quality issues at Oso Flaco Lake.
- Continue to work on outreach methods and informational signage at ODSVRA to increase public awareness of threats to nesting and roosting terns and plovers.
- Efforts to hire and retain skilled monitors throughout the year will continue at ODSVRA.

2018 Scientific Sub-Committee

Oceano Dunes SVRA

November 30, 2018

On November 15, 2018, Oceano Dunes SVRA staff provided the members of the Scientific Sub-Committee a copy of the 2018 Oceano Dunes SVRA Snowy Plover and Least Tern Annual Report and requested e-mailed comments by November 29, 2018.

This report was provided to:

Lena Chang, U.S. Fish and Wildlife Service
Dan Robinette, Point Blue Conservation Science
Laurie Koteen, California Coastal Commission
Robert Patton, Snowy Plover and Least Tern Expert, and
Bob Stafford, California Department of Fish and Wildlife

A copy was also sent to

Doug George, Point Blue Conservation Science
Elizabeth Copper, former member of the Scientific Sub-Committee, and
Paula Hartman, MIG Inc. and former chair of the Scientific Sub-Committee

Comments Received

Two e-mailed comments were received, one from Laurie Koteen and one from Robert Patton. The responses plus the original November 15 e-mail are provided in the Attachments. Please note that Laurie Koteen provided a PDF of the annual report with comments embedded into the document. Those comments were extracted into a summary document that is attached to the report. The digital version of the 2018 report with Laurie Koteen's comments is available upon request.

Some of the comments suggest edits to the report. Those comments will not be addressed further in this 2018 Scientific Sub-Committee report but will be reviewed and considered for inclusion in either a revised 2018 Snowy Plover and Least Tern Annual Report, a supplement to the 2018 report, or in future versions of the report.

Responses are provided below to those comments that can be quickly addressed in this Scientific Sub-Committee report. Additional detail may be provided in subsequent Snowy Plover and Least Tern Annual reports, as described above.

The text of the comments are as follows:

Laurie Koteen

General Comments from e-mail

I have several comments are throughout the body of this report. Please look within to find them. I'm concerned about the very high loss rates of birds in the riding areas and as a result of predation.

Thanks,

Laurie

> State Parks Response – We appreciate your concern about predation and the loss of birds in the riding area. See responses below on specific issues.

Report Specific Comments

Note, all page numbers refer to the PDF document. Clarifications are noted in [brackets]

Comment 1, Page 17 - Are there measures in place to make sure that the dumpsters do not overflow, are latched and trash in the vicinity removed if found, in addition to counting gulls?

How about signage to encourage and educate the public about the dangers of leaving food about, the necessity to store and remove unused food?

> State Parks Response – The Department implements a trash control and removal program throughout the park with special attention paid to the Post 2 area. The trash dumpsters are regularly inspected and, if needed, heavy equipment is used to compact the trash to reduce overflow. Interpretive information about trash and the need to control trash is provided to the public through educational campaigns; signage at key locations like restrooms and entrance stations; on the internet; and through social media campaigns. The Department has developed a campaign focused on proper handling of trash that includes giving out free trashbags with targeted marketing information (tagline, "Don't Leave Me Behind").

Comment 2, Page 20 - Aren't these invertebrate populations important as food sources for birds??

Would it not be better to make the exclosure permanent?

> State Parks Response – It is correct that beach invertebrates are an important food source for western snowy plover. ODSVRA has developed and successfully implemented management activities to recover those invertebrate populations during the nesting season. There is no need to make the exclosure permanent for invertebrate food resources. See also previous Scientific Sub-Committee discussions on a year-round closure study.

Comment 3, Page 22 - Is there a way to verify that some of these adult birds at VAFB [Vandenberg Air Force Base] and RGDCP [Rancho Guadalupe Dunes County Park] are from ODSVRA? Variability is to be expected in population size inter-annually, however, this is the lowest number of breeding pairs in 7 years.

State Parks Response – The low number of breeding least terns is likely related to the predator pressure during the 2017 season. During the 2017 season, we had a substantial issue with skunk predation on near-hatch or recently hatched least tern nests. It is likely that some of the birds that breed at ODSVRA moved to adjacent sites as a result of this predation event. We are optimistic that with continued management and monitoring, the least tern breeding numbers will increase at ODSVRA.

Additional Clarification from Doug George at Point Blue Conservation Science. We have not received information from Rancho Guadalupe on banded birds from 2018. Based on their survey methods (nest searches by foot) it is unlikely that they would note banded birds. Vandenberg used nest cameras on a portion of the nests from 2018 and may have captured band information. They will look through the photos during the non-breeding season and will share information on banded birds. Doug notes that the sampling size and efficiency of the cameras to identify a banded adult will be limited.

Comment 4, Page 22 - Why was productivity for terns so low in 2017? What specific changes have been instituted to reduce predation after last year, that is the primary cause of mortality was predation, as is implied here

State Parks Response – See response to Comment 3. Additionally, we have focused our predator control efforts and closely monitored skunk activity during the early part of the 2018 nesting season.

Comment 5, Page 24 - Were any nests found outside of the exclosures? If yes, where were they and which management steps were taken to either relocate them or protect them at the locations where they were found? [Specific to Least Tern Section]

State Parks Response – All least tern and snowy plover nests were within the seasonal exclosure or at South Oso Flaco. No nests of either species were initiated in the riding area during the 2018 nesting season.

Comment 6, Page 28 - Can any more be said about the age structure of the adult terns at ODSVRA?

State Parks Response – We have not conducted analysis on the age structure on the banded least tern population at ODSVRA. Please refer to Table D.1 in Appendix D for additional information on age and observation of banded least tern at the site. See also the response to Comment 3 with clarifying information from Point Blue Conservation Science.

Comment 7, Page 31 - There has been a healthy increase in adult plovers over this time period. What factors likely explain the failure for the adult population to grow over the last 5 years, following so much population growth in the past?

State Parks Response – The growth in any population will be finite based on the available habitat and other conditions like disturbance, winter survival, predation, disease and other stochastic events. Our plover population may be limited by any of these factors. However, even with this uncertainty, we are meeting or exceeding our breeding recovery targets for snowy plover at ODSVRA.

Comment 8, Page 34 - What about the riding areas? Are there nest attempts outside the exclosures and Oso Flaco?

State Parks Response – See response to Comment 5. No plover or tern nests were located within the riding area during the 2018 season.

Comment 9, Page 39 - From Appendix H, it appears that 8 plovers and terns were lost in open riding areas due to being flattened by OHVs. This is a staggering number. This information should be in the body of the report, not buried at the end in a final appendix.

What specific steps is the park taking to ensure that plovers are not killed by OHVs? Are there speed limits in the park, for example? If yes, how are these enforced?

State Parks Response – The information on the number of all observed mortality is covered in the main text of the report, starting on Page 52 – 60 of the report (58-65 of the PDF). We have a program of education, enforcement, physical habitat protection, and intensive monitoring that is designed to provide protection to nesting and roosting birds within the SVRA. Speed limits are a part of that comprehensive effort and are enforced by law enforcement personnel.

Comment 10, Page 45 - This is a lot of nests lost to predation! [re 29 plover nests lost to predation]

State Parks Response – It is not unusual to lose nests to predation at a managed site like ODSVRA. Most of these losses occurred in the early part of our season when we had skunk and raven activity at the site. From 2013 – 2018, nests lost to predation have ranged from 1.2 – 14.5%. Even with the relatively high number of nests lost to predation in 2018, our hatch rate was 72%. Most sites within the state have nest hatch rates that are at or below 50%.

Comment 11, Page 50 - This is a very high number. Specific measures must be developed to target specific predators. Obiously, species such as the peregrine falcons should not be removed, but for species that are not raptors or special status species, more should be done to prevent predation. [re gull predation of plover chicks and young fledges]

State Parks Response – ODSVRA implements a relatively aggressive predator control program that is targeted to specific predators. We are open to additional suggestions to prevent predation.

Comment 12, Page 54 - Restoring natural ecological processes is always preferable to manually placing rack in the location of plovers. The park should study the effect of leaving the plover exclosure in place all year on invertebrate abundance and diversity. This will also provide a refuge for overwintering birds.

State Parks Response – State Parks has demonstrated strong results as a result of the monitoring and management program for snowy plover and least tern. See also previous Scientific Sub-Committee discussions on a year-round closure study. See also response to comment 2.

Comment 13, Page 55 - Its not clear why its so difficult to find a dumpster cover design.

Please pursue this goal vigorously and definitively. Gulls are obviously a major source of predation to plovers.

State Parks Response – State Parks continues to pursue options to cover the trash dumpsters. We continue to look for methods that meet our operational needs and work with the other constraints at our park.

Comment 14, Page 56 - Would any changes in the materials used be beneficial to plovers or terns? [re exclosure fencing]

State Parks Response –The fence materials meet our requirements for price, availability, and ease of installation. We are interested in suggestions for new materials and regularly consult with other sites on suitable materials.

Comment 15, Page 57 - What about threats from vehicles in riding areas? Will there be sign posting to reduce speed limits. [increasing public awareness]

State Parks Response – See also response to comment 9. We have a program to educate the public about the plover and tern management program and specific rules and enforcement efforts focused on speed limits.

Comment 16, Page 58 - If there is not enough food in the exclosure area, perhaps the size of the exclosure needs to be increased. This could explain the failure of the population of the park to grow over the last 5 years. Alternatively, keeping the exclosure in place year-round could increase the food supply naturally. This may also reduce fighting among broods.

State Parks Response – State Parks recognizes the challenges with fighting among broods and brood density on the shoreline. However, we are meeting or exceeding our recovery goals with the exclosure in its current configuration and without a year-round closure. See also previous Scientific Sub-Committee discussions on a year-round closure study.

Comment 17, Page 58 - If marker post 6 is a particular problem, the exclosure should be expanded in its vicinity. [re brood aggression at 6 shoreline]

State Parks Response – See response to comment 16

Comment 18, Page 139 - What is the assumed cause of death? [re Post 7 plover found at fenceline on 2-28]

State Parks Response – The assumed cause of death for the plover found on February 28 near the post 7 fenceline is fence strike.

Robert Patton

Another excellent report.

Comment 1 – Sorry to see your tern numbers down, but congratulations on your hatching and fledging success. At least it appears that part of the decrease resulted from adults simply shifting to Guadalupe or VAFB, so with your continued productivity hopefully the colony will increase again in the future (thankfully not as dismal as some of our sites to the south…).

State Parks Response – We note that the low least tern breeding numbers at our site are probably a result of the high level of predation of near-hatch or newly hatched nests from the 2017 season. Some of the birds noted in 2018 at Vandenberg and the Rancho Guadalupe County park could have been breeders from ODSVRA from 2017. We are hopeful that with continued monitoring and management, our breeding least tern numbers will increase.

Comment 2 – With that problem banded male peregrine returning and continuing to inflict plover losses, wondered if there'd been any discussion of attempting to trap and relocate it farther prior to next season?

State Parks Response – We have started discussion with other experts and the wildlife agencies to determine the best approach to this problem individual. Some of the options we are exploring include increasing the release distance, holding the bird in captivity longer, and other options. We are open to other suggestions and approaches that can help us effectively address known problem predators. We appreciate your suggestion.

No other comments or questions. Thanks again for all the great work you do!

Robert

Recommendations from 2015, 2016and 2017 Scientific Sub-Committee Report Not Implemented:

Note, numbering refers back to the 2014 SSC report

9. Continue to look for an appropriate design to cover trash dumpsters

11. Conduct study evaluating alternative plover/tern habitat treatment strategies – Ongoing SSC recommendation

12. Consider option to capture previously banded adult least terns to determine their origin – Ongoing SSC recommendation

2018 Response to Past Recommendations

No Action was taken on Recommendation #'s 9, 11 and 12

The Department may pursue a trash exclosure through the Public Works Plan process that is underway with various stakeholder groups. We are also examining other operational measures that can help contain trash generated within the park. There are no firm details on these changes at this point.

Recommendations from Predator Management Reports

USDA Wildlife Services:

1. WS encourages educating the public about the importance of not feeding wildlife in an effort to reduce predator attraction.

2. WS also recommends that all garbage containers have reinforced lids to prevent garbage consumption by wildlife.

3. WS recommends the state park continue maintaining the height and strength of the perimeter fence surrounding the enclosures during the nesting season. Maintenance of fencing where sand has shifted to create low spots or places where mammalian predators can breach should continue to be conducted on a regular basis to prevent predators from entering enclosures while fencing is constructed during the season.

4. WS recommends the state park continue to enforce the leash law for pets on the beach, which is crucial during nesting season.

5. WS recommends the state park continue removing animal carcasses from the beach to eliminate alternate food sources that serve as an attractant to scavenging predators such as coyotes.

6. WS recommends the selective removal of predators that are a potential or known threat to the CLTE and SNPL breeding population at ODSVRA. Removal of concerning predators prior to predation events should be the goal to protect CLTE and SNPL nesting and brooding areas.

Bloom Biological:

No specific recommendations provided

Response to Predator Control Recommendations

Oceano Dunes SVRA will implement recommendations as staffing and funding permit. Most of these recommendations have been successfully implemented in previous years.

Attachments

Full e-mail Text from Laurie Koteen dated November 29, 2018

Summary of Comments from Laurie Koteen extracted from PDF of Report

Full e-mail Text from Robert Patton dated November 29, 2018

From: Koteen, Laurie@Coastal
To: Glick, Ronnie@Parks
Cc: Kahn, Kevin@Coastal
Subject: RE: Oceano Dunes SVRA Scientific Sub-Committee
Date: Thursday, November 29, 2018 5:34:09 PM

Hi Ronnie,

I have several comments are throughout the body of this report. Please look within to find them. I'm concerned about the very high loss rates of birds in the riding areas and as a result of predation.

Thanks,

Laurie

From: Glick, Ronnie@Parks [mailto:Ronnie.Glick@parks.ca.gov]
Sent: Wednesday, November 28, 2018 3:42 PM
To: Elizabeth Copper; Robert Patton; Dan Robinette; Paula Hartman; lena_chang@fws.gov; Stafford, Bob@Wildlife; Doug George 3 (dgeorge77@gmail.com); Koteen, Laurie@Coastal
Cc: Iwanicha, Joanna@Parks
Subject: RE: Oceano Dunes SVRA Scientific Sub-Committee

Just a friendly reminder that we are expecting comments on the 2018 Snowy Plover and Least Tern report back from the Scientific Sub-Committee members back tomorrow, Thursday, November 29.

Please let me know if you will be submitting comments.

Thanks.

Ronnie

From: Glick, Ronnie@Parks
Sent: Thursday, October 25, 2018 5:36 PM
To: 'Elizabeth Copper' <ecopper@san.rr.com>; 'Robert Patton' <rpatton@san.rr.com>; 'Dan Robinette' <drobinette@prbo.org>; 'Paula Hartman' <Hartman@traenviro.com>; 'lena_chang@fws.gov' <lena_chang@fws.gov>; Stafford, Bob@Wildlife <Bob.Stafford@wildlife.ca.gov>; 'Doug George 3 (dgeorge77@gmail.com)' <dgeorge77@gmail.com>; Koteen, Laurie@Coastal <Laurie.Koteen@coastal.ca.gov>
Cc: Iwanicha, Joanna@Parks <Joanna.Iwanicha@parks.ca.gov>
Subject: Oceano Dunes SVRA Scientific Sub-Committee

Members of the Scientific Sub-Committee,

It is that time of year again and I wanted to give you a heads up about the process we are using this year. We anticipate having our annual snowy plover and

least tern report complete in the early to mid part of November. As we have done in previous years, we are not going to have a phone discussion about the report, but we will accept comments from the SSC members by e-mail and compile them into a final report to the Technical Review Team.

Right now this is our tentative schedule.

- The final plover and tern report will be available no later than November 16. I am asking for e-mailed comments back to me by November 29
- I will compile the comments into a report and send out prior to December 5 and ask for your concurrence by December 7.
- The final 2018 SSC report will be provided to the Technical Review Team by December 10

Hopefully this schedule will work for you.

Thanks for your continued support of our efforts.

Ronnie

Laurie Koteen Comments on Snowy Plover and Least Tern Report

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From: rpatton@san.rr.com
To: Glick, Ronnie@Parks; "Elizabeth Copper"; "Dan Robinette"; "Paula Hartman"; lena_chang@fws.gov; Stafford, Bob@Wildlife; "Doug George 3"; Koteen, Laurie@Coastal
Cc: Iwanicha, Joanna@Parks
Subject: RE: Oceano Dunes SVRA Scientific Sub-Committee
Date: Thursday, November 29, 2018 10:32:13 AM

Thanks Ronnie, Joanna, Doug, et al,
Another excellent report.
Sorry to see your tern numbers down, but congratulations on your hatching and fledging success. At least it appears that part of the decrease resulted from adults simply shifting to Guadalupe or VAFB, so with your continued productivity hopefully the colony will increase again in the future (thankfully not as dismal as some of our sites to the south…).
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Cc: Iwanicha, Joanna@Parks <Joanna.Iwanicha@parks.ca.gov>
Subject: RE: Oceano Dunes SVRA Scientific Sub-Committee

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Cc: Iwanicha, Joanna@Parks <Joanna.Iwanicha@parks.ca.gov>
Subject: Oceano Dunes SVRA Scientific Sub-Committee

Members of the Scientific Sub-Committee,

It is that time of year again and I wanted to give you a heads up about the process we are using this year. We anticipate having our annual snowy plover and least tern report complete in the early to mid part of November. As we have done in previous years, we are not going to have a phone discussion about the report, but we will accept comments from the SSC members by e-mail and compile them into a final report to the Technical Review Team.

Right now this is our tentative schedule.

- The final plover and tern report will be available no later than November 16. I am asking for e-mailed comments back to me by November 29
- I will compile the comments into a report and send out prior to December 5 and ask for your concurrence by December 7.
- The final 2018 SSC report will be provided to the Technical Review Team by December 10

Hopefully this schedule will work for you.

Thanks for your continued support of our efforts.

Ronnie

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Appendix F. 2018 SNPL and CLTE Breeding Season Report

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NESTING OF THE CALIFORNIA LEAST TERN AND WESTERN SNOWY PLOVER AT OCEANO DUNES STATE VEHICULAR RECREATION AREA, SAN LUIS OBISPO COUNTY, CALIFORNIA 2018 SEASON

Prepared for
California Department of Fish and Wildlife
United States Fish and Wildlife Service

Prepared by
California Department of Parks and Recreation
Off-Highway Motor Vehicle Division
Oceano Dunes District

November 2018

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Cover photo of adult California least terns at Oso Flaco Lake, Oceano Dunes SVRA, taken by Jeanette Stone on 13 June 2018 and used by permission.

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U.S. Department of Agriculture Wildlife Services. Oceano Dunes State Vehicular Recreation Area 2018 Predator Management Report

Bloom Biological, Inc. Summary of results of avian predator management activities during the 2018 season at Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California

Least tern necropsy examination report: one juvenile

Snowy plover necropsy examination report: one juvenile

Snowy plover medical examination records: one adult and two chicks

SUMMARY

Staff of Oceano Dunes State Vehicular Recreation Area (Oceano Dunes SVRA, ODSVRA) and Point Blue Conservation Science (Point Blue) monitored breeding California least terns (*Sternula antillarum browni*) (least tern, tern) and western snowy plovers (*Charadrius nivosus nivosus*) (snowy plover, plover) at ODSVRA, San Luis Obispo County, California, in 2018.

Least tern
There were an estimated 30-33 least tern breeding pairs, lower than both 2017 (42-47 pairs) and the 13-year average (41-44 pairs) for the period 2005-17. There were 35 known nesting attempts, all from known locations and within the large seasonally fenced exclosure in the southern portion of the vehicle riding area. Twenty-eight of the 35 nests hatched for a nest hatching rate of 80%, similar to the average of 83% during the previous 13 years. Seven nests failed due to the following causes: abandoned pre-term (4); abandoned post-term (2); and cause unknown (1). There was a minimum of 47 banded adults documented; 45 of these birds were identified as banded at this site as chicks.

Forty-two chicks hatched and of these 38 were color-banded to individual. Thirty-five chicks (33 banded, two unbanded) are known to have fledged (seen when 21 days old or older), for a fledging rate of 83.3% and an estimated 1.06-1.17 chicks fledged per pair. This compares with the previous 12-year period that averaged a 70% chick fledging rate, 1.12-1.19 chicks fledged per pair, and 48 juveniles produced per year.

Snowy plover
There was a minimum of 201 breeding snowy plovers (115 males and 86 females), compared to 183 in 2017, an increase of 9.8%. One hundred and one banded birds were documented as breeding, and the banding history was known for 98 of these birds. Of the known origin birds 89.8% (88/98) were banded as chicks and fledged from ODSVRA. There were 221 known nesting attempts, including 15 identified only by detection of brood (unknown nest location). Of the 206 nests from known locations, 145 (70.4%) were in the southern riding area seasonal exclosure and 61 (29.6%) in North and South Oso Flaco. Of the 200 nests with known location and fate, 144 hatched for a nest hatching rate of 72.0%, compared to the previous 17-year average of 75.8%. Fifty-six nests failed, attributed to the following causes: abandoned pre-term (11); abandoned post-term (3); abandoned unknown pre- or post-term (7); abandoned, suspected due to wind (3); overwashed by tide (1); cause unknown (2); unidentified predator (2); unidentified avian (13); coyote (*Canis latrans*) (4); common raven (*Corvus corax*) (5); and gull (5).

Of the 412 hatching chicks, 207 were color-banded to brood with 51.7% (107/207) fledging, and the fate of the 205 unbanded chicks is believed known with 45.4% (93/205) fledging. A total of 200 chicks fledged (seen when 28 days old or older) for a fledging rate of 48.5%. One chick fledged per breeding male is the estimated number needed to prevent the population of snowy plovers from declining and productivity of 1.2 chicks fledged per male should provide for moderate population growth (assuming approximately 75% annual adult survival and 50% juvenile survival) (U.S. Fish and Wildlife Service 2007). In 2018, an estimated 1.74 chicks fledged per breeding male at ODSVRA. For the 17-year period 2002-18, average productivity was 1.50 chicks fledged per breeding male.

INTRODUCTION

Oceano Dunes SVRA, located in southern coastal San Luis Obispo County, California, is a popular park with high attendance and was visited by nearly 1.4 million people in 2017 for a variety of recreational opportunities, including driving vehicles on the beach and dunes.[1] In 2017, an estimated 348,899 street-legal vehicles and 75,170 off-highway vehicles were driven on the shoreline and dunes in the designated riding area of the park.[2]

Within ODSVRA there is extensive breeding habitat for two special-status ground-nesting birds, the state and federally endangered California least tern and the federally threatened Pacific coast population of the western snowy plover. Monitoring of the least tern and snowy plover at ODSVRA during the breeding season began in 1991 and 1992, respectively. Least terns are present at ODSVRA only during the breeding season, migrating to wintering areas well south of California. The snowy plover population at the park is comprised partly of birds present year-round and partly of migrant birds present only during the breeding or wintering season.

This report summarizes the results of the 2018 nesting season for least terns and snowy plovers at ODSVRA. A limited amount of data from previous years' reports has been updated in this report to reflect information that is more accurate and conform to current analysis practices. Maps in figures and appendices use aerial imagery taken in 2016 by the National Agriculture Imagery Program, unless otherwise noted.

State park staff conducts monitoring activities at ODSVRA under U.S. Fish and Wildlife Service (USFWS) permit 10(a)(1)(A) TE-815214-9 and California Department of Fish and Wildlife (CDFW) Scientific Collecting Permits. Predator removal activities are conducted under USFWS Depredation Permit MB25976A-0. Point Blue conducts monitoring and banding activities under USFWS permit 10(a)(1)(A) TE-807078-17, Federal U.S. Geological Survey Bird Banding Laboratory Banding Permit 09316, CDFW Scientific Collecting Permit SC-9591, and a CDFW Memorandum of Understanding.

[1] ODSVRA 2017 Annual Attendance figures (source ODSVRA)
[2] ODSVRA 2017 Monthly Carrying Capacity Summaries (source ODSVRA)

SITE DESCRIPTION

ODSVRA is part of the 18-mile-long Guadalupe-Nipomo Dunes complex. The Oceano Dunes District, California Department of Parks and Recreation, manages approximately 4,900 acres with 9.1 miles of ocean shoreline on the western edge. On the northern border of the park is the city of Pismo Beach. Located to the east of the park are Phillips 66 Refinery, the cities of Grover Beach and Oceano, and private lands that consist of dunes, coastal scrub, and agricultural fields. The southern border of the park abuts the Guadalupe-Nipomo Dunes National Wildlife Refuge (Guadalupe-Nipomo Dunes NWR). Inside the park, dunes that are open to vehicles extend inland in some areas for over one mile. Eight numbered marker posts, located approximately 0.5 miles apart, are positioned along the coastal strand of the riding area to orient park visitors and staff. Street-legal vehicles are allowed throughout the riding area. Off-highway vehicles, as well as overnight camping, are allowed along the beach and dunes south of marker post 2 (approximately one mile south of Pier Avenue). In the southern portion of ODSVRA is the Oso Flaco Lake area with an ocean shoreline of approximately 1.7 miles. Pedestrians are allowed at Oso Flaco Lake area, but it is closed to camping, equestrian, dog, and vehicle use. The beach at Oso Flaco west of the foredunes is narrower than in the riding area.

The following are descriptions of sites and terms as used in this report (Figure 1, Figure 2).

ODSVRA: All areas that are administered by the Oceano Dunes District, including the Oceano Dunes SVRA, Pismo State Beach, Pismo Dunes Natural Preserve (Dunes Preserve), Pismo Lake, and Oso Flaco Lake area. Management of the Dunes Preserve and Pismo State Beach was transferred to the Oceano Dunes District in December 2004. The Pismo Lake property was acquired from the CDFW in 2007 and is currently closed to the public. ODSVRA provided tern and plover monitoring for the Dunes Preserve prior to 2004 and continues to do so. Pedestrian and equestrian use is permitted in the Dunes Preserve, but vehicles and dogs are not allowed.

Riding area: The area within ODSVRA that is open to recreational vehicles. This area changes in size based on seasonal restrictions. Street-legal vehicles are allowed along approximately 5.3 miles of beach, from the Grand Avenue park entrance south to the southern boundary of the riding area (approximately 0.4 miles south of marker post 8). Off-highway vehicles are only allowed south of marker post 2.

Open riding area: The area within ODSVRA open to recreational vehicle use during the nesting season. Fencing designates the eastern perimeter of the open riding area, however this fence is not maintained as predator fencing and coyotes and other mammals can easily move through this fencing.

Southern Exclosure: A single contiguous area within the southern portion of the riding area that is fenced and closed to entry during the breeding season to protect nesting terns and plovers. The adjoining shoreline is also part of the Southern Exclosure and is closed to public entry during the nesting season. From 2001 to 2004, the amount of seasonally protected nesting habitat in the riding area periodically increased in size. Subsequent to 2004 there has been no increase in size of this protected area. The area of the Southern Exclosure (including the area above the high tide line on the closed shoreline) for 2018 was approximately 302 acres, compared to a range of 271-301 acres (and an average of 291 acres) between 2004 and 2017. Although the basic configuration of the Southern Exclosure has remained consistent since 2004, changes in dune topography and public safety issues affect the placement of the east fence, resulting in small variations in acreage from year to year. Individually identified areas within the Southern Exclosure include the following:

> *6 exclosure*: The area from marker post 6 to marker post 7, (approximately 0.5 miles of shoreline and approximately 60.6 acres), first incorporated into the Southern Exclosure for a full season in 2004. Vegetation within the exclosure is overall sparse with limited areas of vegetated hummocks.

7 exclosure: The area from marker post 7 to the south side of 7.5 revegetation area (approximately 0.4 miles of shoreline and approximately 60.5 acres). Habitat includes extensive areas of bare sand, limited areas of vegetated hummocks, limited areas of organic surface debris (shells, driftwood, dried algal wrack), and moderate to heavy vegetation in the 7.5 revegetation area (4.8 acres, included in the 60.5 total acres) located within the 7 exclosure.

8 exclosure: The area from the south side of the 7.5 revegetation area to the North Oso Flaco fencing south of marker post 8 (approximately 0.5 miles of shoreline and approximately 85.4 acres). Habitat includes extensive areas of bare sand in the eastern portion, areas of small to moderately tall vegetated foredune hummocks, and limited areas of organic surface debris (shells, driftwood, and algal wrack).

Boneyard exclosure: The area east of the North Oso Flaco dunes. Habitat is primarily bare sand and active sand dunes. This inland area does not have a shoreline component and is approximately 95.0 acres. A portion of the west side (approximately 15.5 acres) has been closed year-round since 2005 due to the presence of a cultural resource area. Portions of this area have developed small vegetated hummocks. Straw bales, placed within the protected cultural area in 2004, to build up sand to cover and protect cultural resources, persist. The east fence of the Boneyard exclosure is not maintained as predator fencing due to the rapidly shifting open sand dunes in the area. Instead, beginning in 2003, a two-inch by four-inch mesh interior fence (six-foot-tall predator fencing) has bisected Boneyard exclosure during the nesting season, resulting in 48 acres in the western portion (contiguous with 6, 7, and 8 exclosures and North Oso Flaco) and 47 acres in the eastern portion.

Oso Flaco: The shoreline and dunes in ODSVRA located south of the riding area. The approximately 1.7 miles of shoreline is narrow in width, and the dunes are typically heavily vegetated, relative to the riding area. The area is part of the Oso Flaco Lake area, open to pedestrian use but closed to vehicles. Beginning in 2006, an additional 0.4 miles of shoreline at the southern end of the park were included in the ODSVRA (a survey conducted by the Guadalupe-Nipomo Dunes NWR in 2005 determined this area was part of ODSVRA and not the Guadalupe-Nipomo Dunes NWR, as was previously thought). For purposes of discussion in this report, Oso Flaco is divided into North Oso Flaco and South Oso Flaco (Figure 2).

North Oso Flaco: The area extending south of 8 exclosure to the pedestrian boardwalk access trail to the Oso Flaco shoreline (approximately 0.5 miles of shoreline and approximately 68 acres). Beginning in 2002, the upper beach and dunes were closed to pedestrians during the nesting season with symbolic fencing. Since 2005, the North Oso Flaco area has been part of the Seasonal Exclosure and managed in a similar manner with symbolic fencing replaced by predator fencing. Additionally, the shoreline has been closed to the public during the nesting season.

South Oso Flaco: Extends from the boardwalk to the ODSVRA southern boundary (approximately 1.2 miles of shoreline). Oso Flaco Lake drains through Oso Flaco Creek and the mouth of this creek is within the northern portion of South Oso Flaco. The shoreline is open to the public and symbolic fencing and signage have been used since 2002 to designate the seasonally closed upper beach and dune habitat. Snowy plover nests found in this area often receive single nest wire exclosures.

Seasonal Exclosure: The contiguous area enclosed by the predator fencing of Southern Exclosure and North Oso Flaco (does not include the shoreline or the eastern Boneyard area). ODSVRA fences this approximately 263-acre area during the nesting season to exclude coyotes, vehicles, and human trespass from the protected nesting habitat (see section titled Seasonal closure and fencing on page 14, Figure 2, and Figure C.1 in Appendix C). A portion of the North Oso Flaco fence along the boardwalk is left in place

year-round, however it is only maintained for predators during the nesting season (labeled as Permanent predator fence in Figure C.8 in Appendix C).

Pipeline revegetation area: Located adjacent to the east side of 8 exclosure. The area is heavily vegetated. Fencing designates the perimeter of revegetation area adjacent to the open riding area, however this fence is not maintained as predator fencing (Figure C.6 in Appendix C).

Other revegetation areas mentioned in this report: Maidenform revegetation area is located adjacent to the east side of Boneyard exclosure and the open riding area. Several named revegetation areas are 800 to 1,200 feet east of 6 exclosure including North Eucalyptus and three areas that make up Pawprint (Heather, Acacia, and Cottonwood). The areas are heavily vegetated. Fencing designates the perimeter of revegetation areas in the open riding area, however this fence is not maintained as predator fencing.

Arroyo Grande Creek: Seasonally flows into the Pacific Ocean approximately two miles north of the Southern Exclosure. The associated lagoon is variably located east of the area near marker post 1 and north of marker post 2. The upper creek area and lagoon are closed to vehicle use year-round to protect sensitive aquatic habitat. Pedestrian and equestrian entry is prohibited during the nesting season and permitted during the nonbreeding season. Posts and signs delineate the closed area during the nonbreeding season; symbolic rope fence is added during the nesting season.

Carpenter Creek: Seasonally flows into the Pacific Ocean approximately 4.5 miles north of the Southern Exclosure. No vehicles are allowed in the area as it is approximately 0.4 miles north of the riding area. The area receives a high level of pedestrian use.

Pismo Creek lagoon: Seasonally flows into the Pacific Ocean approximately 4.8 miles north of the Southern Exclosure. Standing water persists all year, with low vegetated hummocks west of the lagoon; tall vegetated dunes and developed RV campground to the east. No vehicles are allowed in the area as it is approximately 0.75 miles north of the riding area. The area receives a high level of pedestrian use. Only a small portion of the lagoon is part of state park property.

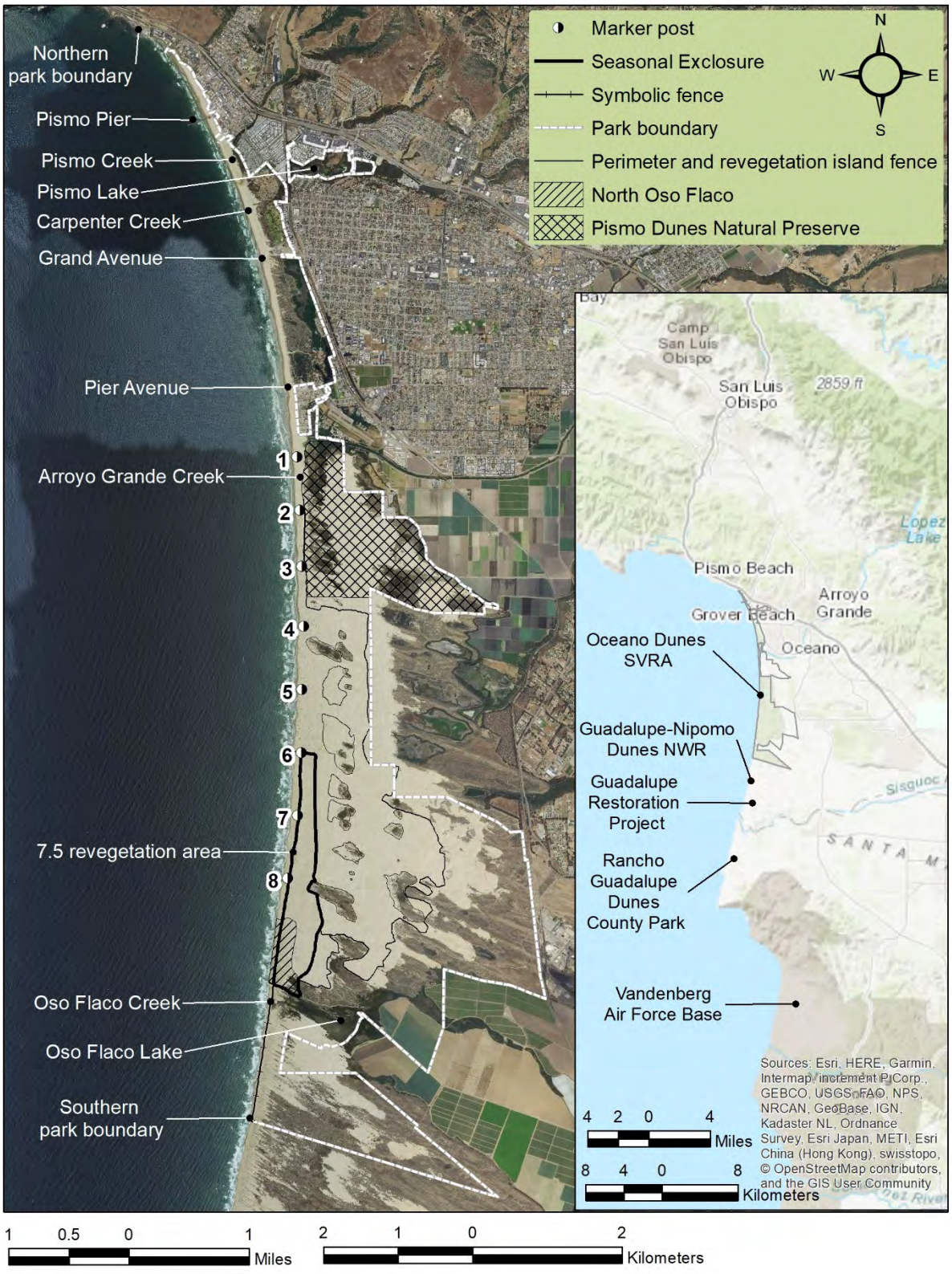


Figure 1. ODSVRA site map.

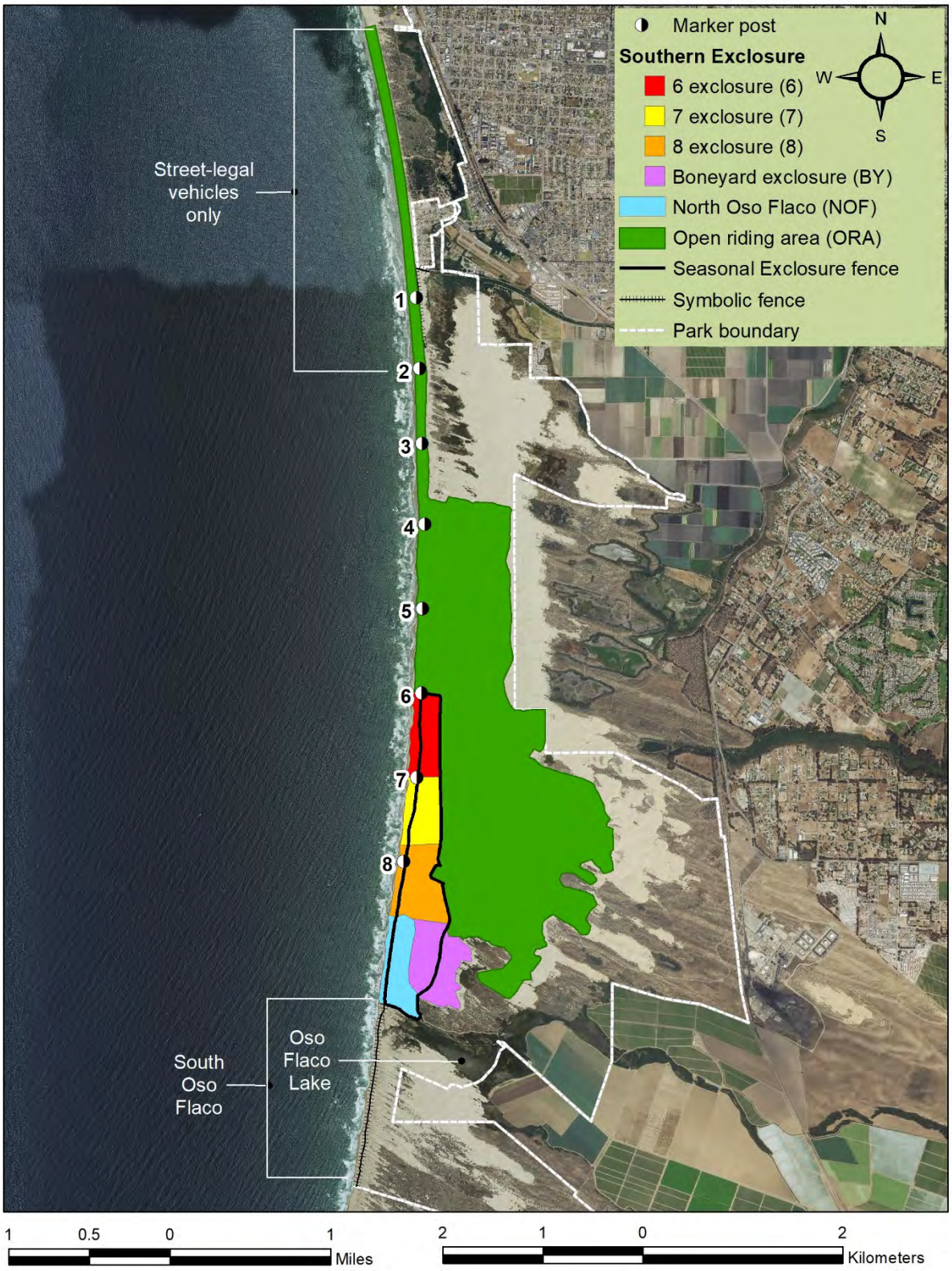


Figure 2. ODSVRA Southern Exclosure, Seasonal Exclosure, and Oso Flaco seasonally protected areas for breeding California least terns and snowy plovers in 2018.

MONITORING AND MANAGEMENT ACTIONS

MONITORING

Daily monitoring occurs from 1 March–30 September. At a minimum, ODSVRA maintains three monitors during morning and early afternoon hours. As the season progresses, monitoring increases to include the late afternoon and early evening hours. Monitoring involves walking to assess or find new nests as well as scanning for nests and broods from parked vehicles (a proven and effective blind). Monitoring occurs in a manner to minimize disturbance or adverse effects to adult birds, nests, and chicks.

Monitors collect and record data such as: nest status; brood location and count of chicks; fledgling identification; band combinations of chicks, juveniles, and adults; tern night roost location and number of birds; injuries or mortalities; predator sightings or tracks; and visitor infractions. Nest cameras placed on a small number of tern or plover nests provides additional monitoring information such as adult bands, adult behavior, nest attendance, predators, nest fates, nest fate dates, and chick numbers in areas otherwise difficult to access. Data from field notes and from nest cameras are entered into a comprehensive database system that includes a Microsoft Access database, ESRI ArcMap, Microsoft Excel sheets, and paper charts.

Open riding area

Monitoring of the open riding area by vehicle occurs daily along defined transects, as any nests initiated or chicks in this area require immediate protection from recreational activities. Staff looks for signs of nesting birds, predator presence or signs, nonpermitted visitor activities (such as off-leash dogs or kites near the exclosure), rescues sick or injured wildlife, and collects deceased wildlife. Areas along transects with plover activity indicating potential nesting interest (scraping or copulating) receive more thorough checks on foot and with increased frequency using binoculars or spotting scope. Monitors pay particular attention to the boundary of the Southern Exclosure, looking each morning for tracks or others signs of tern or plover movement into the open riding area. Close brood monitoring occurs when staff walk within the exclosure, including preventing chick movement toward the open riding area, if necessary, with staff slowly stepping out of the vehicle or walking toward the exclosure. When staff finds chicks in the open riding area, they slowly direct them back into the protected Southern Exclosure using various appropriate measures to allow the brood's safe movement, including: diverting or regulating vehicle traffic flow, flushing threats such as gulls or other predators within the travel corridor, obtaining assistance as necessary from ODSVRA patrol staff, and placing signs and/or symbolic fencing to provide a safe passage until the brood reaches the protected exclosure. Staff continues to monitor chicks to confirm they do not move back into the open riding area.

Breeding least terns and snowy plovers

Finding and monitoring nests: The least tern and snowy plover management program documents size of breeding populations and attempts to find, monitor, and determine all tern and plover nest and chick fates. Staff checks most nests daily and conducts regular nest searches using binoculars and spotting scopes from parked vehicles outside of the seasonal fencing to minimize disturbance to nesting birds and broods. Additional nest searches conducted on foot confirm egg number and document activity at the nest bowl. Staff maps nest locations using a Global Positioning System (GPS).

Estimated initiation date: Initiation date estimates arise from multiple methods that include: timing of egg-laying sequence; floating eggs for plover nests; or when hatch date is known, using average length of time for nests to hatch and backdating to nest initiation. When none of this information is available, staff cannot estimate nest initiation dates.

Nest fates:
The following categorizes nest fates used in this report:

Hatch: Nest hatched at least one egg. Nesting attempts known only by detection of brood constitute "unknown location nests" and egg numbers from such nests represent minimums derived from the number of chicks first observed (see section titled Assignment of broods to nests within this Monitoring section for more detail). When all chicks in a plover brood hatch over more than one day, this is referred to as a "split hatch" (It is common for two- or three-egg tern nests to hatch over more than one day and the term "split hatch" is not applied.).

Abandoned pre-term: Nest abandoned prior to the expected hatch date; causes may include, but are not limited to, disturbance or adult mortality.

Abandoned, suspected due to wind: Nest abandoned pre-term during periods of high wind, with eggs typically found almost or completely buried.

Beginning in 2010, staff added the category of "abandoned, suspected due to wind" to nest fates. Prior to this, nests lost where wind may have been the cause were included in the broader category of "abandoned pre-term." For the 2010 report, least tern nests in the abandoned pre-term category for the previous eight years were reviewed and a limited number were reassigned to the category of abandoned, suspected due to wind. Tables in this report include the reassigned tern nest fates for years prior to 2010.

Abandoned post-term: Nest abandoned after the expected hatch date, and includes nests with nonviable eggs.

Abandoned, unknown if pre- or post-term: Nest abandoned, but unknown if pre- or post-term.

Depredated: Nest lost to a predator. If possible, staff identifies the predator to species or group (mammalian, avian), or describes the nest as lost to an unidentified predator.

Flooded, Overwashed by tide: Nest overwashed by tide, or flooded by a shifting creek or expanding lagoon.

Failed to unknown cause: Nests that disappeared before expected hatch date with cause of failure undetermined.

Unknown fate: Nests where eggs disappear around the estimated hatch date but not enough evidence exists to determine whether they hatched or failed, or nests that have insufficient information to estimate an initiation date. To decrease disturbance to chicks, monitors limit access to nests with nearby young tern and plover broods present, which may result in nests with unknown fate.

Banding chicks: In 2018, least tern chicks received a single size 1A blank aluminum band (covered with green over yellow vinyl tape) on the left leg, and a size 1A numbered aluminum federal band on the right leg. Color tape placed on the federal band creates color band combinations unique to each individual chick for the season. Weighing chicks occurs immediately prior to banding, typically at one to three days old.

Banding of plover chicks was inconsistent prior to 2001. ODSVRA aims to band as many chicks as possible, with all chicks within one brood given the same color band combination since 2002. As of 2010, the limited number of combinations available caused ODSVRA to reuse band combinations of birds that may be alive;

therefore, the age of adult plovers with certain ODSVRA band combinations is sometimes unknown. To reduce disturbance to chicks, monitors may choose to leave chicks unbanded when broods are in areas with nearby young tern and plover broods. In addition, a number of very young unbanded chicks are lost prior to any banding opportunity. Staff tracks the fates of unbanded chicks with intense brood monitoring; in some instances, the associated adult or sibling chicks may be color-banded.

Assignment of broods to nests: Point Blue bands most chicks at the nest. Unbanded broods found outside of the immediate nest area receive assignment to one of three categories: 1) a hatched preexisting known location nest, 2) a hatched new nest with unknown location and known only from brood, or 3) a hatched unassigned nest (listed as UNA1-UNA10 in Appendix B). Staff assigns unbanded broods to either a preexisting known location nest or a new nest with unknown location based on parent bands, or when adults are unbanded, based on the brood location and age of chicks. However, staff cannot assign broods to a specific nest in circumstances where several nearby nests hatch at the same time (hatching chicks confirmed from a distance with a spotting scope), banding at the nest is impossible, and unbanded broods with chicks of similar age appear on the same section of shoreline. Such broods fall within a category of hatched unassigned (UNA) nests.

Chick monitoring: Monitors record chick observation data during daily monitoring activities. In addition, focused searching for broods occurs multiple times each week from vehicle surveys on the Southern Exclosure and Oso Flaco shorelines. Staff records band combinations, chick numbers, adults present, location and direction of movement, and any interaction or aggression with nearby broods.

Fledging success: At ODSVRA, juvenile terns can be widely dispersed over a large area. Specifically monitoring terns allows estimation of number of juveniles produced as well as identifies threats to survival. ODSVRA considers tern chicks surviving to 21 days or older as fledged (21 days after the hatch date, which counts as day zero). Tracking of juvenile terns occurs on park property: in the Southern Exclosure, at Oso Flaco Lake, Pismo Creek lagoon, and any temporary daytime roosting areas that may become established. The fledgling tern counting method varied among years as follows: single day high counts for 1991-97, and 2000-01; a single day high count at Oso Flaco Lake for 1998; count method for 1999 unknown; and three-week interval day count conducted from 2002-04 (chicks banded to site 2003-04). In 2005, chicks were color-banded to brood and since 2006 most chicks were color-banded to individual, resulting in more accurate documentation of fledge rate than previous methods. Earlier estimates prior to banding to individual may represent substantial undercounts or overcounts.

ODSVRA considers plover chicks surviving to 28 days or older from the time of hatch as fledged (28 days after the hatch date, which counts as day zero). Staff identifies and records fledglings in the course of chick monitoring as described above. Prior to 2001, monitoring in Oso Flaco and Pismo Dunes Natural Preserve was intermittent, resulting in a lack of fledgling information.

Measures describing breeding success:
The following categorizes measures describing breeding success used in this report:

> *Hatch rate:* Total number of hatching known location and fate nests divided by total number of nests with known location and fate.
>
> *Percentage chicks fledging*: Total number of chicks fledging divided by total number of chicks (includes chicks fledged from unknown location nests).
>
> *Number of chicks fledging per nest*: Total number of chicks fledging divided by total number of nests.

Productivity: Number of least tern fledglings per breeding pair (consistent with the annual statewide California least tern report produced by CDFW). Number of snowy plover fledglings per breeding male (consistent with USFWS Pacific coast western snowy plover recovery plan).

Banded adults: Documenting banded least terns and snowy plover adults can provide detailed information on history of birds including origins, age, breeding status, and movement between sites. Staff attempts to record all band combinations of adult least terns and snowy plovers.

Number of breeding adults: For least terns, ODSVRA represents the number of breeding pairs as a range. The estimated minimum number of pairs equals the maximum number of concurrently active nests and broods. The estimated maximum number of pairs equals the minimum number of pairs plus one-half of the value of the minimum number of pairs subtracted from the total number of nests (assumes nests in addition to those accounted for by the minimum number of pairs are equally divided between renesting pairs and new pairs).

Max. no. pairs = min. no. pairs + [(total no. nests - min. no. pairs) / 2]

Banding least tern chicks to brood in 2005, and to individual since 2006, provides for increased accuracy in counting the number of active broods on a given date. From 1991 to 2001, ODSVRA did not always report the estimated number of breeding pairs or based it only on the number of concurrent nests. These reports, reviewed in 2005, looking at both nests and the limited brood information, resulted in identifying an increase in the minimum number of pairs in some years; ODSVRA provides this revised information in annual reports since 2005.

Individually banded snowy plover adults provide the most accurate means to identify breeding population size but currently at ODSVRA too few adults are banded to rely solely on this method. A minimum number of breeding females derives from the maximum number of nests active on the same day plus any additional nests hatching one day before or initiated one day after this date. The minimum estimated number of breeding males equals the highest same day count of active nests and broods (males typically raise the chicks; males with broods three weeks of age or older are not included if they could be associated with a new nest) and number of nests initiated the day after the high count. Beginning in 2009, staff compiled numbers of color-banded adults confirmed breeding; staff adds any number of this group not accounted for on the same day high count, including nests or broods with unknown adults, to the same day high count for the appropriate sex. In 2018, using a database query, staff created a more accurate method to determine high counts of unbanded males and females actively associated with a nest on any given day and a total number of uniquely banded males and females associated with a nest at any point in the season.

ODSVRA also participates in the annual U.S. Pacific coast snowy plover breeding season window survey coordinated by USFWS.

Least tern night roost: During the breeding season, terns may assemble in a night roost. Monitors record the night roost location and total numbers of individuals present as the terns arrive at dusk. A set of night vision goggles are available, but have limited value for this task. On occasions when monitors cannot see terns due to darkness after dusk, terns are heard vocalizing as they arrive to roost. ODSVRA considers counts a minimum due to the inherent limited visibility of the night roost. It is typically too dark to distinguish between adults and juveniles.

Least tern use of freshwater lakes: Freshwater lakes can provide a source of prey fish in addition to the near-shore ocean. Surveying nearby small freshwater lakes documents tern use and gives a better understanding of local food resources. An important component of this monitoring is to determine if lakes provide additional appropriately-sized fish to feed chicks (chicks require fish small enough to be swallowed

whole). Monitors conduct periodic surveys at Oso Flaco Lake (located on park property approximately 1.8 miles south of the middle of tern colony) during the season, do not monitor Dune Lakes (approximately 1.5 miles to east) on private property with no access, and no longer monitor Cypress Ridge Lake (approximately 3.2 miles to east) because of terns' absence since 2013. However, staff monitors the tern colony in the Southern Exclosure daily and observations of adults in flight provide information about the direction of foraging sources and, occasionally, fish size.

Wind speed monitoring
Since 2011, ODSVRA monitors wind speed from a tower (S1 tower) located approximately 375 feet east of 6 exclosure, with anemometers at two, seven and 10 meters high. In 2010-11, ODSVRA placed a portable anemometer with data logger (from WindLog Rainwise, Inc.) in the breeding habitat. Before 2010, monitors periodically measured wind speeds by handheld weather gauges (Kestrel 2000 Weather Meter by Kestrel Meters).

Predator activity
Monitoring predator activities: Park staff and contractors (Bloom Biological Inc., U.S. Department of Agriculture [USDA] Wildlife Services, and Point Blue) collect information on predator presence at ODSVRA from February through September. From direct observation of avian and mammalian predators or their sign (e.g., tracks, scats, regurgitated pellets, prey remains, depredated nests), monitors record, as possible, species, type of sign, behavior, duration of observation, direction of travel, and characteristics that may identify an individual.

Measures describing predator activity:
Monitors record predator presence from 1 March to 10 September under the following three categories to better estimate the extent of predator activity, both temporally and spatially, in the protected areas:

> *Number of days detected*: Total number of days different avian and mammalian predators occur in the nesting area (Southern Exclosure and Oso Flaco) during the nesting season.
>
> *Sightings*: Record of avian predator activities, with most detections made by direct observation (with the notable exception of nocturnal owls). In addition, observations of an individual remaining in one area longer than one hour count as multiple sightings (one sighting per hour or portion thereof) in order to account for possible additional impacts.
>
> *Occurrences*: Record of mammalian predator activities, with most detections occurring by tracks and sign. Because direct observation of mammalian predators is very limited, information typically does not include details such as number of individuals, behavior, or duration of presence.

For both sightings and occurrences, this report separates single day detections for the different areas of the Southern Exclosure (6, 7, 8, and Boneyard exclosures) and Oso Flaco (North and South). Note that the number of recorded sightings or occurrences for the first two weeks of March may be biased lower, with less time during this period spent on predator surveys and more time spent on habitat enhancement and fencing projects.

Gull monitoring: Gulls may depredate snowy plover and least tern eggs and chicks, as well as young plover juveniles. Human activity, with its associated food resources, attracts gulls, making them a subsidized predator. Monitors count gull numbers at the trash dumpster area near marker post 2 one to two times per week in addition to general gull monitoring around the Southern Exclosure and Oso Flaco.

Nonbreeding season monitoring of snowy plovers

Beginning in 2009, more consistent weekly surveys for snowy plovers occurs during the months of October through February. During these surveys, staff divides the shoreline into the following five sections, listed from north to south:

1) approximately 0.5 miles north of Pismo Pier to Grand Avenue (pedestrian use only, no vehicle use allowed);
2) Grand Avenue to marker post 2 (street-legal vehicles and day use only, no camping);
3) marker post 2 to marker post 6 (street-legal vehicles, off-highway vehicles, and camping allowed year-round);
4) marker post 6 to the southern shoreline riding area boundary (shore and portion of upper beach closed to public use during 1 March to 30 September and open to all activities during the rest of the year); and
5) Oso Flaco (southern shoreline riding area boundary to ODSVRA's southern boundary with pedestrian use only and portion of shore and upper beach closed to pedestrian use 1 March to 30 September).

ODSVRA also participates in the annual U.S. Pacific coast snowy plover winter window survey coordinated by USFWS.

Investigation of least tern and snowy plover carcasses

As directed by CDFW, ODSVRA sends fresh carcasses of least terns to an approved facility for necropsy. This is primarily the CDFW Office of Spill Prevention and Response, Marine Wildlife Veterinary Care and Research Center, Santa Cruz, California (CDFW OSPR). If CDFW OSPR is unavailable, ODSVRA sends carcasses to UC Davis California Animal Health and Food Safety Laboratory System, Davis, California. Fresh carcasses require immediate refrigeration and then ODSVRA sends them by overnight delivery service within one day to preserve the tissue integrity for testing to determine cause of death. Since 2017, under direction from USFWS, ODSVRA places all snowy plover carcasses in a freezer for deferred necropsy, if USFWS determines it necessary.

MANAGEMENT ACTIONS

ODSVRA manages for least terns and snowy plovers to optimize breeding success and reduce the potential for take. To reduce visitor disturbance to breeding birds, ODSVRA installs fence around seasonally closed areas to visitors and posts signage. Staff augments existing habitat with branches, woodchips, and wrack (surf-cast kelp). An active predator management program reduces disturbance and depredation by mammalian and avian predators.

Informational signage and enforcement of regulations

Staff places interpretive panels and signs at public access points, at bathrooms, on A-frame placards near winter flocks, and in areas identifying closed areas, which serve to increase public awareness of threats to nesting terns and plovers. The public can access a low wattage radio station with a repeated recording of park information, including information about protection of sensitive species. Park ranger staff enforce park regulations enacted to protect terns and plovers.

Seasonal closure and fencing

Every year from 1 March through 30 September, ODSVRA closes least tern and snowy plover breeding habitat to vehicle and pedestrian use with wire mesh or symbolic fencing. The wire fencing of the Seasonal Exclosure (see Site Description section and details below), provides a higher level of protection when compared to symbolic fencing, composed of rope with signs, to keep visitors from entering sensitive areas. When nesting occurs outside of the Seasonal Exclosure, staff may choose an alternative wire exclosure type with consideration for the species, topography, proximity to recreational activities, predator threats, and duration of disturbance to the area during exclosure construction.

ODSVRA uses the following exclosure types:

Seasonal Exclosure protected area (within Southern Exclosure and North Oso Flaco): ODSVRA encloses with wire mesh fencing this 263-acre area during the nesting season to limit vehicle and human trespass into protected nesting and brood-rearing habitat. Wire fencing five feet high (bottom eight inches buried) with two-inch by four-inch mesh discourages coyote entry. Beginning in 2006, an additional layer of fence material attached to overlap the top of the fence increased fence height above the surface to approximately six feet as a further deterrent to coyotes. Staff attaches bird barrier spikes to the wood posts in an effort to discourage perching by avian predators.

Symbolic fencing (Southern exclosure shoreline, North Oso Flaco shoreline, and South Oso Flaco): Symbolic rope fencing, with the addition of tall posts with large stop signs extending into the intertidal area at marker post 6 and the south end of North Oso Flaco, clearly designate a closed shoreline to visitors. Symbolically fencing approximately 1.2 miles of nesting and brood-rearing habitat in South Oso Flaco identifies the closure area (lower shore remains open to public). Staff moves the fencing in this area westward for nests found west of or very near the symbolic fence to provide more of a buffer between nests and pedestrians. Nests in this area may also receive some type of single nest wire exclosure.

Large single nest exclosure: Staff installs a large circular single nest exclosure with height of five feet (bottom eight inches buried) around any least tern or snowy plover nest found in the open riding area. The minimum nest exclosure diameter size is 656 feet (200 meters) for tern nests and 200 feet for plover nests. (Prior to 2016, the minimum size for tern single nests exclosures was 200 feet in diameter.) ODSVRA may use single nest exclosures of differing sizes to protect snowy plover nests in areas closed to vehicles (Oso Flaco, Southern Exclosure shoreline, Arroyo Grande Creek area, and areas north of Grand Avenue).

10-foot by 10-foot exclosure, circular exclosure, and mini-exclosure: Staff selectively uses a small circular or one of two small square nest exclosures (made of two-inch by four-inch wire) around snowy plover nests

inside or outside of seasonal fencing for protection from predators, including roosting gull flocks. Permitted monitors use different exclosures based on a variety of factors including, but not limited to, weather, topography, predator threats, and proximity of young broods.

Staff builds the 10-foot by 10-foot exclosure (available for use since 2003) and seven-foot-diameter circular exclosure (available for use since 2012) with five-foot-high sides with the bottom eight inches buried when located outside of the Seasonal Exclosure. Plastic netting, 1/2-inch by 1/2-inch mesh, added to the top, protects against avian and climbing mammalian predators.

Mini-exclosures (used since 2010) are three feet by three feet by three feet with a wire mesh top, staked into the ground, and buried four to eight inches when appropriate. Of the three types, mini-exclosures take the least amount of time and staff to install.

Bumpout: A nest in the Southern Exclosure located close to the east or north fence requires temporary additional fencing extending into the open riding area to allow an adequate buffer between recreational activities and the nest. This type of extended fence is termed "bumpout." Least tern nests within 328 feet (100 meters) of the open riding area and snowy plover nests within 100 feet of the open riding area receive a bumpout. (Prior to 2016, the minimum distance of bumpouts for tern nests was 100 feet.) Staff extends bumpouts when recreational activities continue to cause disturbance to nesting birds. ODSVRA maintains a safe vehicle corridor adjacent to the east fence and any bumpouts. Nests on the shoreline close to the west fence may be exclosed by two-inch by four-inch mesh fencing extending from the Seasonal Exclosure fence; this type of single nest wire exclosure is also given the term "bumpout."

Habitat enhancement

Following the nesting season, and for the five-month period October through February, camping, street-legal vehicles, and off-highway vehicles use large portions of the Southern Exclosure. This recreational use results in large areas of flattened terrain and barren sand, with very limited scattered natural debris and vegetation.

Each year, staff place material in 6, 7, and 8 exclosures to offer more areas of disruptive cover for terns and plovers: providing shelter from wind and blowing sand, reducing exposure to predators, and augmenting potential nesting substrate. Beginning in February or March, and prior to nest initiation, staff adds natural materials such as driftwood, woodchips, and wrack to the exclosures and shoreline areas to enhance habitat features. No habitat enhancement occurs within 100 feet of the fence that borders the open riding area to discourage nesting near recreation that may cause disturbance to breeding birds.

Wrack and talitrids: Results from studies conducted by Drs. Jenny Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara, showed that invertebrate populations on the Southern Exclosure shoreline are greatly depressed during the five months when open to recreational vehicle use (October through February). The studies also showed that invertebrates cannot effectively recover species diversity and abundance on the Southern Exclosure shoreline in the following seven-month seasonal closure (March through September).

ODSVRA collects wrack in the open riding area and disperses it in the Southern Exclosure. Collection and distribution occurs by hand and relocation by truck and trailer. In addition to providing cover, wrack on the shoreline provides a food resource supporting invertebrates, which in turn become prey for plover chicks, juveniles, and adults. Staff collects talitrids (commonly called beach hoppers) from outside the vehicle use area north of Grand Avenue and occasionally from South Oso Flaco, taking care to not deplete talitrid numbers from collection sites. Inoculating the wrack addition areas of the Southern Exclosure shoreline with talitrids establishes a breeding population, thus increasing the food resources available for plover chicks and juveniles during the breeding months.

Woodchips, branches and driftwood: Staff adds woodchips to supplement the existing assorted debris that snowy plovers often choose as nesting substrate. Crews spread woodchips in patches, usually less than a quarter-acre in size, in the 6, 7, and 8 exclosures in areas of barren sand and over thinning woodchip patches remaining from previous years. ODSVRA heavy equipment assists in loading woodchips to be distributed.

Staff distributes cut branches and driftwood in patches from the mid-portion of 6 and 7 exclosures toward the west fence and upper shoreline west of the fence. Staff collects the branches and driftwood from the exclosures at the end of each season and stores them for use in the following season.

Predator management

In addition to preventative measures such as fencing, single nest wire exclosures, and cover provided by habitat enhancement, park staff removes animal carcasses (which attract scavengers) in or adjacent to nesting and brood-rearing habitat and harass predators to flush them from sensitive areas. Hazing techniques used include approaching an avian predator on foot or by vehicle, waving arms and making noise, or firing a bird whistler. A bird whistler is a handheld launcher that fires a projectile up to 300 feet that makes a loud whistling sound, hazing predatory birds without harming them. In some situations, firing the bird whistler may cause less disruption to plovers and terns compared to approaching an avian predator on foot in the breeding habitat. When ODSVRA requires additional options for managing predators, Bloom Biological, Inc. performs selective live-trapping and relocation of avian predators and USDA Wildlife Services conducts lethal removal of mammalian and avian predators (see section titled Predators and predator management on page 39 for additional information).

RESULTS AND DISCUSSION

CALIFORNIA LEAST TERN

Number of breeding pairs

In 2018, least terns were first heard at ODSVRA on 2 May flying over the exclosure, with nine seen over the exclosure on 3 May, and from this date onward terns were seen or heard daily. Terns were last seen on 27 August with two banded juveniles on the exclosure shoreline. During the previous 16 years, first sightings occurred between 8 April and 15 May (median=6 May) and last sightings occurred between 10 August and 28 September (median=30 August). To determine the minimum number of breeding pairs ODSVRA uses the single day high count of concurrent nests and broods (see Monitoring and Management Actions section for additional information on determining number of breeding adults). In 2018, there was a known minimum of 30 breeding pairs and an estimated maximum of 33 pairs. This is noticeably lower than both the 42-47 pairs in 2017 and an average of 41-44 pairs (range=23-60) for the 13-year period 2005-17 (Table 1, Figure 3). The record low productivity of the 2017 season, with many eggs and chicks in nests suspected lost to predators (including striped skunks [*Mephitis mephitis*]), may have resulted in some pairs relocating to nearby sites in 2018. This season, there was a substantial increase in breeding pairs at Vandenberg Air Force Base (VAFB), and Rancho Guadalupe Dunes County Park (RGDCP) had nesting terns for the first time in eight years.

Number, clutch size, and distribution of nests

There was a total of 35 nests, with the first nest initiated approximately 26 May and the last 18 July (Appendix A). During the 16-year period 2002-17, there was an average of 48 nests per year (range=22-79) with initiation dates for first nests ranging from 16 May to 8 June (median=30 May). In 2018, the number of nests and broods active at the same time was 30 on 12-13 July. Of the 33 nests with known complete clutch size, 14 had one egg, 19 had two eggs, and none had three eggs, with an average clutch size of 1.58 eggs. This compares to an average of 1.89 for 2005-17 (range=1.57-2.05), and a reported statewide average of 1.67 from 2007–16 (range=1.60-1.82) (Marschalek 2008-12; Frost 2013-17). Of the 35 nests, 20 were located in 6 exclosure (57%), and 15 in 7 exclosure (43%) (Figure 4).

Clutch hatching rate

Of the 35 nests, 28 hatched, four were abandoned pre-term, two were abandoned post-term, and one failed (unknown cause) for a clutch hatching rate of 80.0% (28/35) (Table 2). This compares to an average hatching rate of 83% (range=65-98%) for known fate nests during the period 2005-17 (Table 1). The hatching rate was 70.0% (14/20) in 6 exclosure and 93.3% (14/15) in 7 exclosure. Twenty-two chicks hatched from a minimum of 31 eggs in 6 exclosure, and 20 chicks hatched from a minimum of 23 eggs in 7 exclosure.

Table 1. Nesting success of California least terns at ODSVRA from 1991-2018.

Percent nests hatched calculated using number of nests with known fate. Percent chicks fledged and juveniles fledged per nest may include fledglings from unknown nest locations detected only by brood presence, but these are few. Chicks were banded to site in 2003 and 2004. In 2005, chicks were first banded to brood and from 2006-18, chicks were banded to individual.

Year	Estimated no. breeding pairs	No. nests (no. known fate)	No. hatched nests	Percent known fate nests hatched	No. chicks	Percent chicks fledged	No. juveniles	Juveniles fledged per nest	Estimated no. juveniles fledged per pair
1991	4-5	6 (6)	2	33	4	100	4	0.67	0.80-1.00
1992	3-4	4 (4)	1	25	2	50	1	0.25	0.25-0.33
1993	0	0	0	0	0	0	0	0	0
1994	2	2 (2)	0	0	0	0	0	0	0
1995	1	1 (1)	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0
1997	16-19	21 (16)	3	19	6	0	0	0.00	0.00-0.00
1998	33-37	40 (32)	26	81	40	60	24	0.60	0.65-0.73
1999	28-31	34 (31)	22	71	42	40	17	0.50	0.55-0.61
2000	4-5	5 (5)	4	80	8	50	4	0.80	0.80-1.00
2001	12-15	18 (18)	13	72	22	55	12	0.67	0.80-1.00
2002	20-21	22 (19)	15	79	27	37	10	0.45	0.48-0.50
2003	53-66	79 (77)	60	78	101	37	37	0.47	0.56-0.70
2004	47-55	63 (60)	44	73	69	36	25	0.40	0.45-0.53
2005	47-53	59 (59)	39	66	66	30	20	0.34	0.38-0.43
2006	31-35	38 (38)	28	74	45	78	35	0.92	1.00-1.13
2007	54-60	66 (66)	51	77	90	79	71	1.08	1.18-1.31
2008	55-56	56 (56)	50	89	99	72	71	1.27	1.27-1.29
2009	25-26	26 (26)	23	88	43	77	33	1.27	1.27-1.32
2010	23	23 (23)	20	87	35	83	29	1.26	1.26
2011	33-34	35 (35)	31	89	55	91	50	1.43	1.47-1.52
2012	41-44	46 (39)	32	82	51	82	42	0.91	0.95-1.02
2013	48-53	57 (52)	45	87	85	66	56	0.98	1.06-1.17
2014	47-48	49 (46)	42	91	76	76	58	1.18	1.21-1.23
2015	44-49	54 (54)	48	89	84	82	69	1.28	1.41-1.57
2016	47-48	49 (47)	46	98	78	76	59	1.20	1.23-1.26
2017	42-47	52 (34)	22	65	39	18	7	0.13	0.15-0.17
2018	30-33	35 (35)	28	80	42	83	35	1.00	1.06-1.17

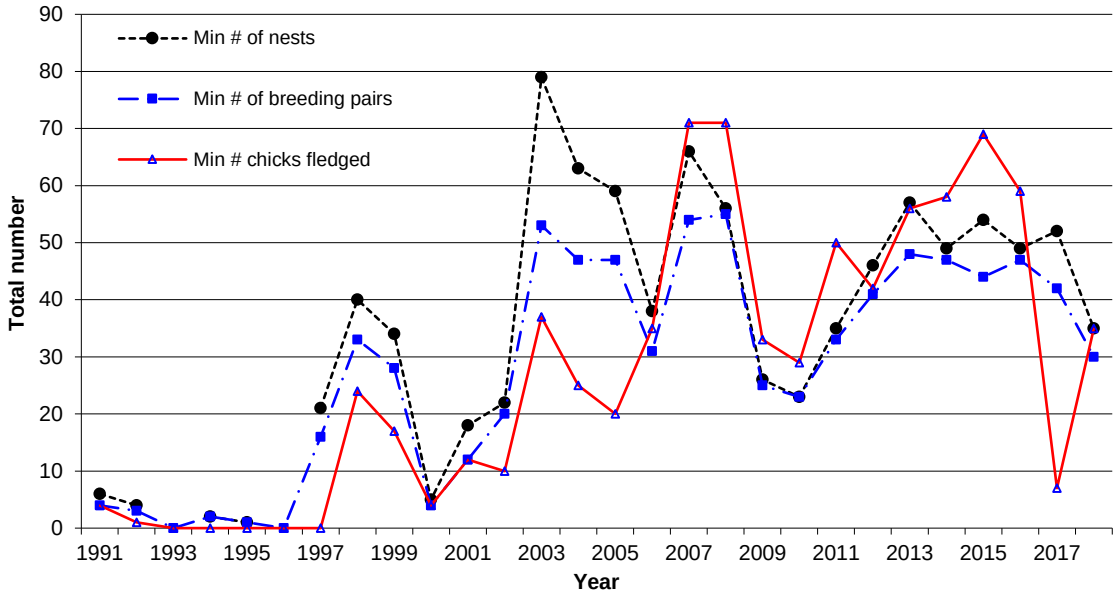


Figure 3. Number of California least tern nests, pairs, and fledglings at ODSVRA from 1991-2018.

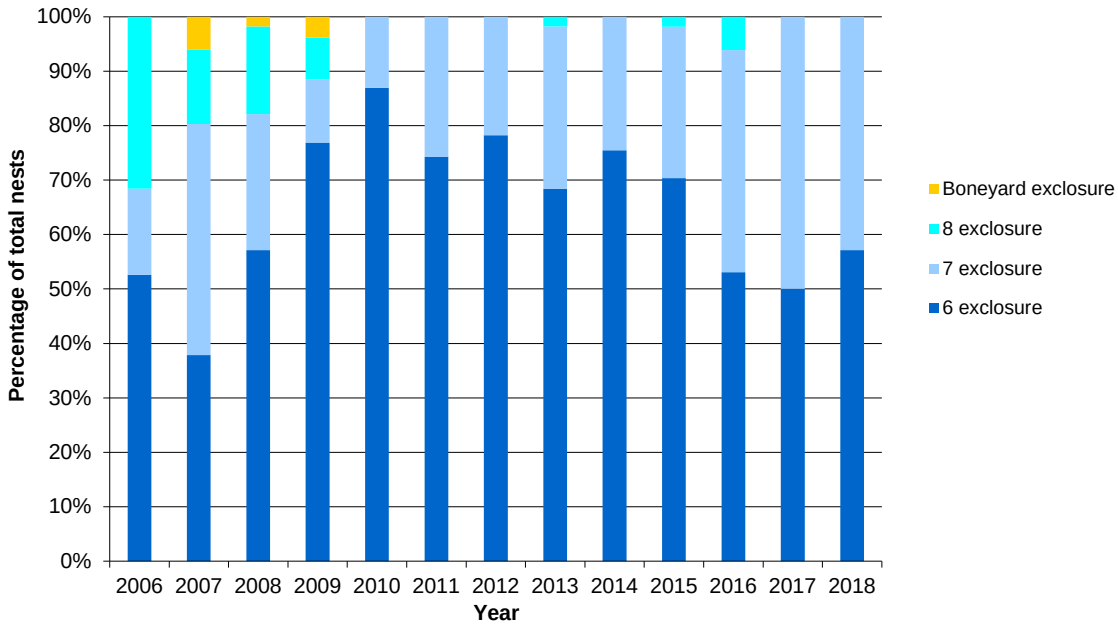


Figure 4. Distribution of least tern nests as a percent of total nests at ODSVRA from 2006-18.

Table 2. Causes of California least tern nest loss at ODSVRA from 2002-18.
Ab. = Abandoned.

Year	Ab. pre-term	Ab. post-term	Ab., suspected wind	Ab., unknown if pre- or post-term	Failed, cause unknown	Skunk	Coyote	Gull	Opossum	Raccoon	Unknown predator	Chick dies in egg at hatch	Total no. failed nests
2002	1	1					2						**4**
2003	6				5		1				2		**14**
2004	9	1			3		2				1		**16**
2005	7	3		4	4						1	1	**20**
2006	4	3		2							1		**10**
2007	2	4	4		5								**15**
2008	3	2						1					**6**
2009	1	1		1									**3**
2010		1			1				1				**3**
2011	2	2											**4**
2012	1	2		3	1								**7**
2013	2			2	1		1		1				**7**
2014	1	1		1	1								**4**
2015	1	1		1	2					1			**6**
2016				1									**1**
2017	5			1	1	5							**12**
2018	4	2			1								**7**
Total 2002-18	**49** **35.3%**	**24** **17.3%**	**4** **2.9%**	**16** **11.5%**	**25** **18.0%**	**5** **3.6%**	**6** **4.3%**	**1** **0.7%**	**2** **1.4%**	**1** **0.7%**	**5** **3.6%**	**1** **0.7%**	**139**

Chick fledging rate, juveniles produced per pair, and juvenile length of stay on-site
Thirty-eight of the 42 known hatching chicks were banded with a unique color combination. Thirty-five of the 42 chicks were seen when 21 days old or older for a fledgling rate of 83.3%. The fledging rate for banded chicks was 86.8% (33/38) and 50.0% (2/4) for unbanded chicks (Appendix A). This fledging rate compares to an average of 70% (range=18-91%) during the previous 12-year period 2006-17 when most chicks were banded to individual. In 2018, 57.1% (8/14) of the two-chick broods fledged both chicks. This compares to an average of 56% (range=0-86%) of 179 two-chick broods fledging both chicks during the previous 12 years. In 2018, the estimated number of fledglings produced per pair ranged from 1.06-1.17 and averaged 1.12-1.19 for the previous 12 years (range=0.15-1.57). This is above recent averages for all of California (Table 1). Estimated statewide fledging rates for each year are reported as a range and averaged 0.27-0.39 fledglings per pair for the 12-year period 2005-16 (highest estimate in 2014 with range=0.37-0.68) (Marschalek 2006-12; Frost 2013-17).

From 2010-15, there were six known occurrences of a least tern chick moving east of the exclosure into the open riding area (two in 2010, by the same chick on the same day; one in 2011; two in 2013; and one in 2015). These chicks were monitored and directed back into the exclosure. From 2016-18, there were no known such occurrences.

Of the current or recent breeding sites in San Luis Obispo and Santa Barbara counties, banding tern chicks occurs at ODSVRA (since 2003) and VAFB (beginning 2018 with banding to site and year). Banding least tern chicks at ODSVRA, especially with individual color band combinations, has increased the ability to detect juveniles at ODSVRA and provides greater accuracy in documenting fledging rate than the three-week count method[3]. For the six-year period 2006-11, the three-week count method at ODSVRA consistently underestimated the minimum known number of juveniles produced each year, identifying an average of 49.0% (range=38.0-66.7%) of the known minimum number (see CDPR 2011 for greater details).

[3] High counts of juveniles that are seen on dates at intervals of three weeks are added together (Marschalek 2007). This is based on the assumption that juveniles typically depart the colony with their parents within two to three weeks of fledging (at 21 days old) and that any juveniles seen are not from other sites.

ODSVRA relies on color band resighting data to derive a more accurate fledging rate and did not conduct three-week counts in 2012-18.

Color banding chicks to brood in 2005 and to individual since 2006 has also provided information on juvenile length of stay at ODSVRA. In 2018, 36.4% (12/33) of the color-banded juveniles were documented remaining at ODSVRA for 21 days or longer post-fledging. Over the 13-year period 2006-18, 552 color-banded fledglings were tracked at ODSVRA with 30.8% (170/552) remaining 21 days or longer (Table 3).

Table 3. Number of days that color-banded California least tern juveniles hatched at ODSVRA continued to be seen on-site after reaching fledge age (21 days old) during the 13-year period, 2006-18.

During this period, 552 color-banded fledglings (21 days old or older) were tracked at ODSVRA (sightings outside the park are not included). Numbers in parentheses are percentages of all banded fledglings for the year.

Year	0 - 6 days post-fledge	7 - 13 days post-fledge	14 - 20 days post-fledge	21 - 27 days post-fledge	28 - 34 days post-fledge	>35 days post-fledge
2006	4 (12%)	5 (15%)	9 (26%)	14 (41%)	2 (6%)	0 (0%)
2007	9 (14%)	14 (22%)	15 (23%)	18 (28%)	9 (14%)	1 (2%)
2008	12 (18%)	28 (41%)	16 (24%)	11 (16%)	0 (0%)	0 (0%)
2009	3 (10%)	14 (48%)	8 (28%)	3 (10%)	1 (3%)	0 (0%)
2010	3 (10%)	4 (14%)	15 (52%)	7 (24%)	0 (0%)	0 (0%)
2011	2 (4%)	5 (10%)	9 (18%)	31 (63%)	2 (4%)	0 (0%)
2012	3 (9%)	7 (20%)	11 (31%)	12 (34%)	2 (6%)	0 (0%)
2013	5 (10%)	12 (24%)	24 (47%)	10 (20%)	0 (0%)	0 (0%)
2014	2 (5%)	7 (17%)	18 (43%)	14 (33%)	1 (2%)	0 (0%)
2015	12 (21%)	10 (18%)	21 (38%)	10 (18%)	1 (2%)	2 (4%)
2016	22 (39%)	9 (16%)	19 (34%)	5 (9%)	1 (2%)	0 (0%)
2017	0 (0%)	3 (60%)	1 (20%)	1 (20%)	0 (0%)	0 (0%)
2018	3 (9%)	5 (15%)	13 (39%)	4 (12%)	8 (24%)	0 (0%)
Total 2006-18	80 (15%)	123 (22%)	179 (32%)	140 (25%)	27 (5%)	3 (1%)

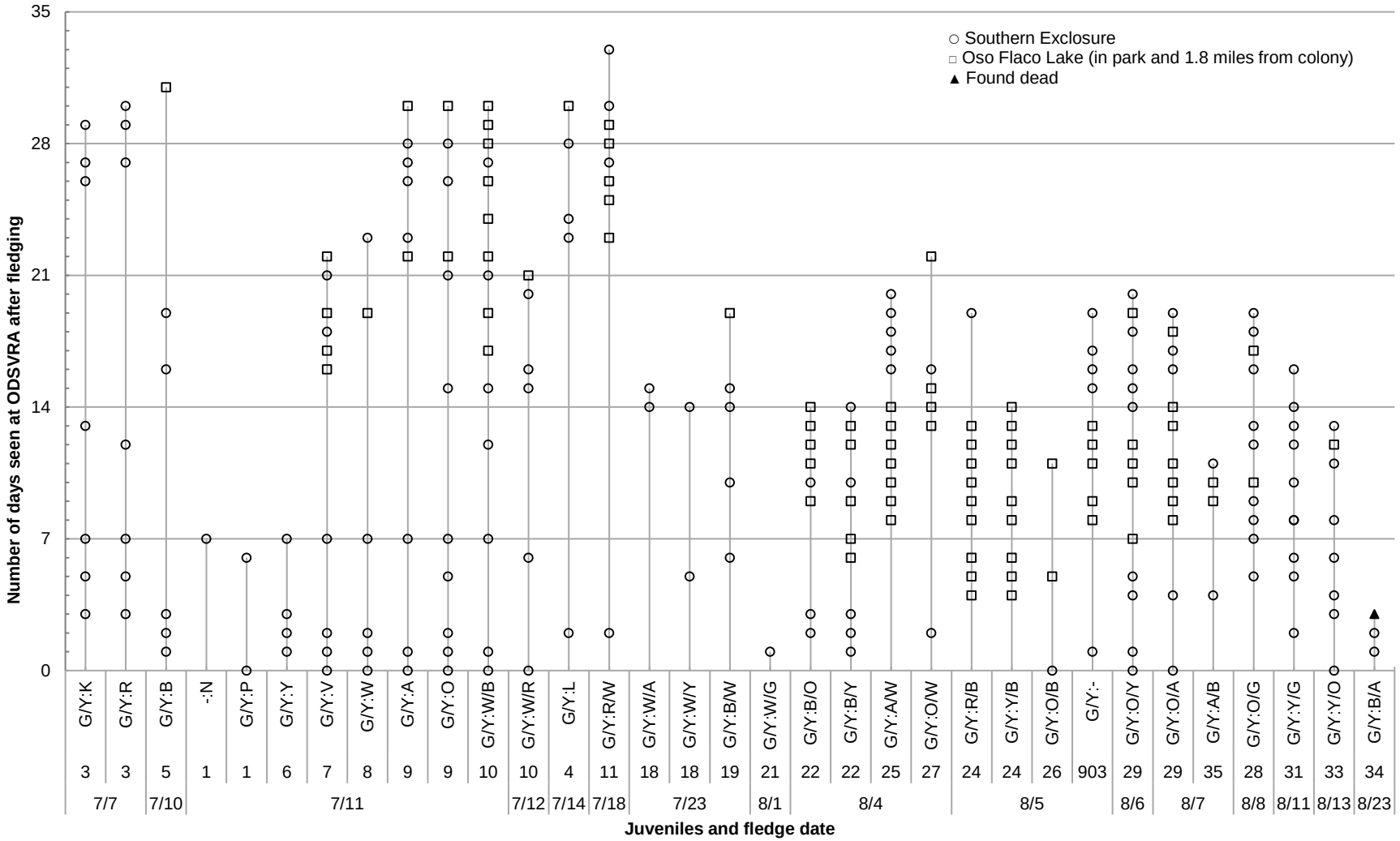


Figure 5. Number of days California least tern juveniles that hatched at ODSVRA in 2018 continued to be seen on-site after reaching fledge age (21 days old).

The horizontal axis provides the nest number from which each fledgling hatched and the date it fledged. All juveniles included in graph were color-banded to individual.

Mortality (other than eggs)
There was one documented tern mortality (other than eggs) at ODSVRA during the 2018 breeding season; the carcass of a fledgling found on 7 exclosure shoreline on 26 August. It had last been seen alive on 25 August at 23 days old (see Notes section, Appendix H).

Least tern use of nearby small freshwater lakes
At ODSVRA nearshore ocean waters are the primary source of prey fish for the tern colony. In 2018, foraging activity over the ocean was observed throughout the season. During the chick-rearing period small fish may also be taken from freshwater sources. Over the past 12 years, nearby small freshwater lakes observed with more than incidental tern activity in one or more years include Oso Flaco Lake, Dune Lakes, and Cypress Ridge Lake. Of these lakes, only Oso Flaco Lake was surveyed in 2018 (see paragraph titled Least tern use of freshwater lakes in the Monitoring and Management Actions section).

In 2018, 30 surveys at Oso Flaco Lake, averaging 85 minutes in length, were conducted by park resource staff between 27 June and 29 August; number of terns seen averaged 9.2 birds (range=0-29, high count 1 August). This compares to 2017 with an average of 4.5 birds over 12 surveys between 10 June and 19 August (range=0-12, high count 22 July). In 2018, adult terns were observed foraging, roosting, feeding juveniles, and flying with fish in the direction of the tern colony. To collect additional information on least tern presence at Oso Flaco Lake, accounts of birder visits from March through September posted to the eBird and iNaturalist websites were reviewed (eBird.org 2018, iNaturalist.org 2018). Least terns were reported on these websites on 15 days between 23 June–17 August (average number=6.6, range=1-21, high count on 2 August). Banded terns seen by resource staff or confirmed with photographs by birders included 22 juveniles and 20 adults. With the exception of one 2018 VAFB juvenile, all banded birds were confirmed to have been banded at ODSVRA as chicks.

Banded adult least terns at ODSVRA
Recording color combinations is more difficult for adult least terns than snowy plovers as the behavior of the terns provides fewer opportunities for observations. In 2018, there was a minimum of 47 banded adults documented at ODSVRA, based on observations with a spotting scope. Forty-five of these birds were identified as banded at this site as chicks (banding began in 2003). Origins of two banded birds could not be determined as they only had a single federal aluminum band without color tape. Breeding was documented for a minimum of 21 banded adults and this is likely a substantial underestimate (Appendix A). At least 16 of the 21 adults were banded as chicks at ODSVRA; the complete color combinations of the other five breeding adults could not be confirmed (Table D.1 in Appendix D).

Least terns typically first breed at three years old, with some breeding documented by two-year-old birds (Massey and Atwood 1981). A total of nine two-year-old banded terns have been documented as breeding at ODSVRA in 2012-18 (two in 2012, three in 2013, two in 2014, one in 2016, and one in 2018). In 2005, a two-year-old tern banded as a chick at ODSVRA was documented breeding at VAFB, approximately 22 miles south of the park. The oldest confirmed breeding adult at ODSVRA in 2018 was a banded 10-year-old tern (-:W/A/W, banded G/W:W/A/W as a chick at ODSVRA in 2008).

Least terns banded at other sites and seen at ODSVRA
Over the last eight years there has been only one confirmed sighting of an adult banded tern from another site. This was an adult (S:A/O) seen 28 July–11 August 2011 that was banded at the U.S. Navy North Island Maintenance and Training Facility in San Diego Bay, San Diego County, California. In 2018, VAFB first began banding least tern chicks. One of those banded juveniles (S:B) was confirmed this year at ODSVRA from 16-18 August (Table D.1 in Appendix D).

Night roost

During the breeding season, adult least terns not engaged in incubation or chick care may assemble in a communal night roost and are often joined by fledglings later in the breeding season. Reduced exposure to disturbance from predators is likely an important factor in the selection of a night roost location. There can be a high degree of site fidelity, both within a breeding season and between years, with birds continuing to roost in the same location. Surveys of the night roost were conducted on 112 days between 10 May and 31 August in 2018. The night roost was initially located in the same area of northern 6 exclosure used since 2004, the year when 6 exclosure first became available as protected habitat for a complete season. However, as in 2016 and 2017, the night roost later appeared to shift to areas in southern 6 exclosure and mid-7 exclosure, and was sometimes not located during surveys. Also, part of the roost location shifted eastward and closer to the Southern Exclosure fence. A bumpout was installed 4 August to maintain a 328-foot (100-meter) buffer between the night roost and the open riding area. Counts at the night roost are minimums, as some or all birds would often arrive after it was too dark to count individuals. In 2018, there was a high count of 64 birds at the night roost on 27 July (Figure 6). This compares to an average night roost high count of 60 (range=35-95) from 2007-17. Both adults and juveniles were seen but it typically was too dark to distinguish plumage and age class.

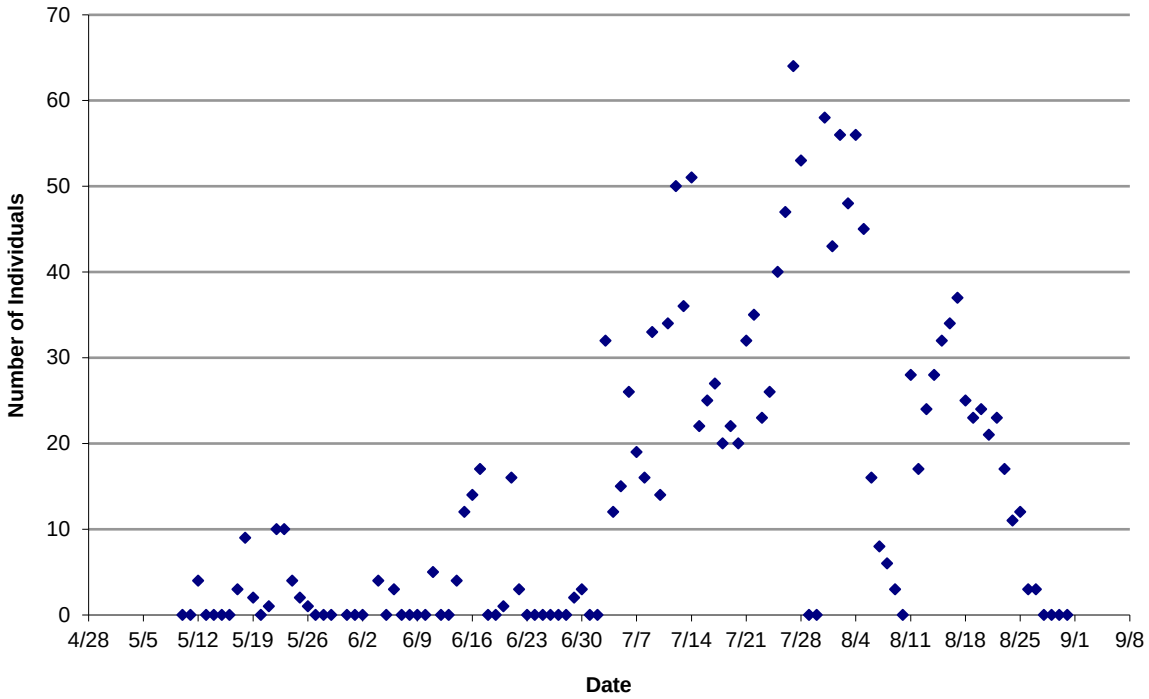


Figure 6. Number of California least terns counted at the ODSVRA night roost in 2018.
First survey on 10 May and roost first detected on 12 May.

Importance of ODSVRA least tern breeding colony

The ODSVRA least tern breeding colony has benefited from the increased level of protection and management actions provided since 2002. The colony is important in meeting statewide recovery goals as loss of breeding habitat has resulted in a fragmented population distribution and a limited number of remaining breeding sites (USFWS 1985, 2006). On a regional level, there are very few active breeding sites along the central coast of California and none remain between ODSVRA and San Francisco Bay. Within San Luis Obispo and Santa Barbara counties, there are four least tern colony sites with annual or intermittent use, all sites have management providing protective measures and monitoring. ODSVRA is the only site in

San Luis Obispo County. The RGDCP site, VAFB, and Coal Oil Point Reserve (COPR) are in Santa Barbara County and approximately seven, 22, and 85 miles south of the ODSVRA colony, respectively. For this regional population, ODSVRA has become an important source of productivity. During the period 2004-18, ODSVRA produced a minimum of 659 juvenile terns while RGDCP, VAFB, and COPR combined produced an estimated 262 juveniles (Appendix E, Table 4).

Table 4. Number of reported breeding least tern pairs and juveniles produced at ODSVRA and the combined sites of Rancho Guadalupe Dunes County Park (RGDCP), Vandenberg Air Force Base (VAFB), and Coal Oil Point Reserve (COPR) from 2004-18.

During this period, almost all tern chicks were banded at ODSVRA and observation of color-banded individuals was an important means to document juvenile production.

	ODSVRA			RGDCP, VAFB, and COPR combined	
Year	Est. no. breeding pairs	No. juveniles		Est. no. breeding pairs	No. juveniles
2004	47-55	25		15	0
2005	47-53	20		48	1
2006	31-35	36		7	7
2007	54-60	70		23	17
2008	55-56	70		19	19
2009	25-26	33		32-33	40
2010	23	29		34	31
2011	33-34	50		33	4
2012	41-44	42		18	10
2013	48-53	56		15	19
2014	47-48	58		17	20
2015	44-49	69		22	29
2016	47-48	59		25	18
2017	42-47	7		27	8
2018	30-33	35		70-71	39
Total juveniles produced		**659**			**262**

WESTERN SNOWY PLOVER

Number of breeding adults

In 2018, there was a minimum of 201 breeding adults (115 males and 86 females). This is an increase of 9.8% from a minimum number of 183 breeding adults in 2017 and compares to an average of 205 adults for the last five years and 142 for the 17-year period 2002-18 (Table 5, Figure 7).

Beginning in 2005, the USFWS has coordinated a rangewide window survey count of the U.S. Pacific coast breeding population of the snowy plover between the last week of May and first week of June. In 2018, the survey at ODSVRA counted 154 adult plovers (69 males, 72 females, and 13 of unknown sex), 77% of the minimum number documented for the entire season by known breeding activity. In 13 of the 14 years from 2005-18, the window survey count at ODSVRA was lower than the minimum number of breeding birds (54-95% of minimum number). It was higher (107%) than the minimum number in 2008. For the entire 14-year period the window survey count averaged 79% of the known minimum number of breeding adults for the season (Table 6).

Table 5. Number of snowy plover breeding adults, breeding males, fledglings, and chicks fledging per breeding male for the 17-year period 2002-18.

Year	Min. no. breeding adults	Min. no. breeding males	No. fledglings	No. fledglings per breeding male[1]
2002	32	18	35	1.94
2003	84	52	107	2.06
2004	121	67	66	0.99
2005	116	65	82	1.26
2006	107	58	17	0.29
2007	79	47	66	1.40
2008	95	54	72	1.33
2009	114	66	81	1.23
2010	137	78	103	1.32
2011	160	94	152	1.62
2012	190	105	96	0.91
2013	163	92	187	2.03
2014	226	120	196	1.63
2015	205	113	277	2.45
2016	209	110	157	1.43
2017	183	93	174	1.87
2018	201	115	200	1.74
Average for 17-year period 2002-18	142	79	122	1.50
Average for 5-year period 2014-18	205	110	201	1.82
Average for 3-year period 2016-18	198	106	177	1.68

[1]Number of fledglings per breeding male will be overestimated if the number of breeding males is undercounted.

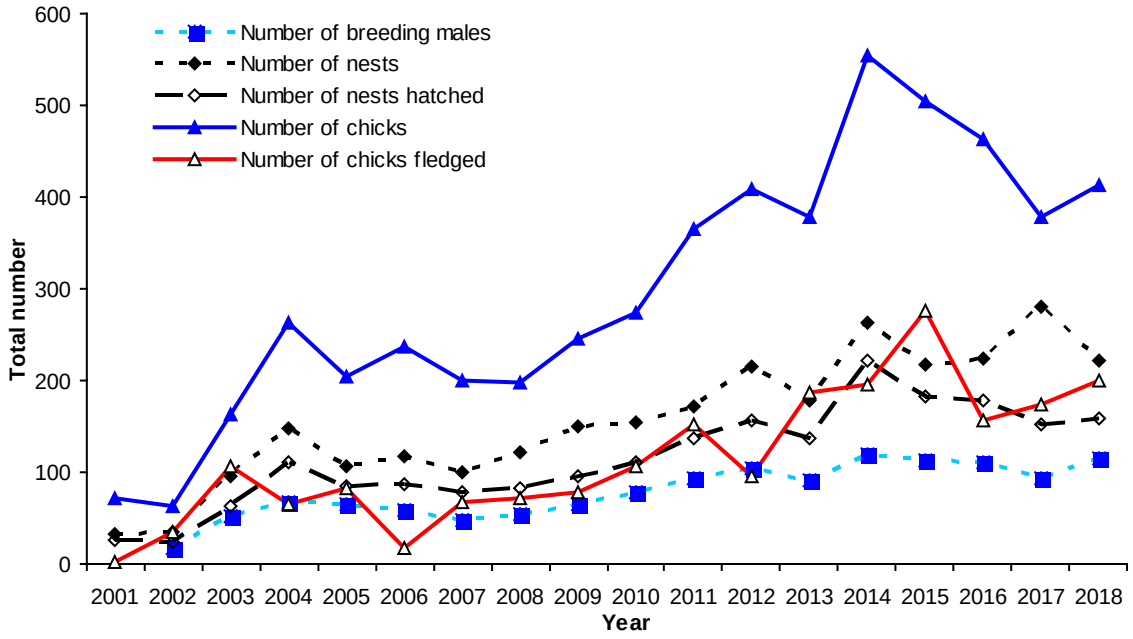


Figure 7. Number of snowy plover breeding males, nests, nests hatched, chicks, and chicks fledged at ODSVRA from 2001-18.

Prior to 2001, monitoring in Oso Flaco and Pismo Dunes Natural Preserve was intermittent and fledgling information was not obtained.

Table 6. Number of adult snowy plovers counted on USFWS breeding season window surveys versus calculated minimum number of breeding adults at ODSVRA from 2005-18.

Year	Calculated minimum number of breeding adults	Summer breeding window survey numbers	Breeding window numbers/ calculated minimum numbers
2005	116	92	79%
2006	107	87	81%
2007	79	60	76%
2008	95	102	107%
2009	114	98	86%
2010	137	74	54%
2011	160	112	70%
2012	190	145	76%
2013	163	94	58%
2014	226	180	80%
2015	205	180	88%
2016	209	160	77%
2017	183	174	95%
2018	201	154	77%

Number and distribution of nests

There were 221 known nesting attempts, including 15 with unknown nest location, initiated between 30 March–10 July (see section titled Assignment of broods to nests in the Monitoring and Management Action section for unknown nest location description). Of the 206 nests from known locations, 145 (70.4%) were in the Southern Exclosure, 21 (10.2%) in North Oso Flaco, and 40 (19.4%) in South Oso Flaco. More specifically for the Southern Exclosure, there were 63 nests in 6 exclosure, 37 in 7 exclosure, 39 in 8 exclosure, and 6 in Boneyard exclosure (Appendix C). The maximum number of known location nests active at one time was 66 on 22 June, with the highest number in 6 exclosure (23 nests) (Table 7, Table 8, Figure 9, Table F.1 in Appendix F).

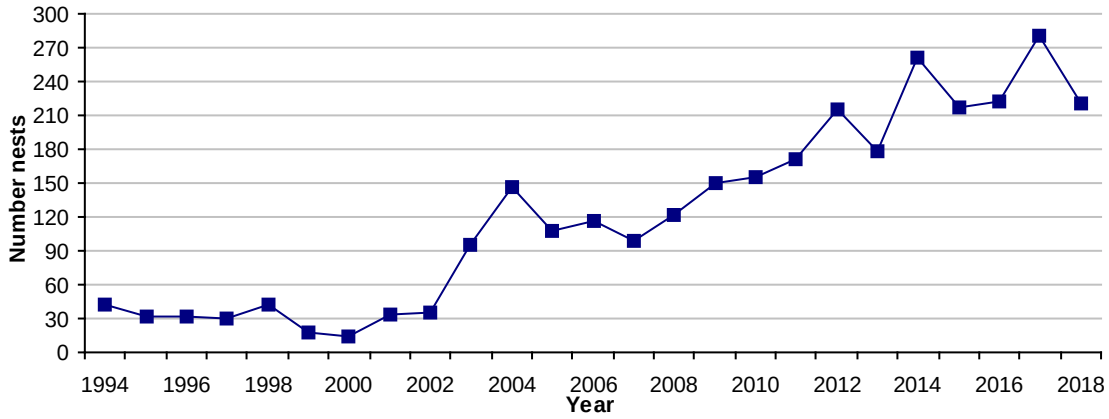


Figure 8. Number of snowy plover nests at ODSVRA from 1994-2018.

Table 7. Snowy plover nest distribution and success at ODSVRA in 2018.

Excludes 15 nests known only from detection of broods.

Location	No. nests (no. known location and fate)	Min. No. eggs laid	No. nests hatching	Percent known location and fate nests hatching
6 exclosure	63 (63)	181	51	81.0
7 exclosure	37 (34)	106	30	88.2
8 exclosure	39 (36)	103	25	69.4
BY exclosure	6 (6)	16	5	83.3
TOTAL SOUTHERN EXCLOSURE	**145 (139)**	**406**	**111**	**79.9**
North Oso Flaco	21 (21)	58	11	52.4
South Oso Flaco	40 (40)	115	22	55.0
TOTAL OSO FLACO	**61 (61)**	**173**	**33**	**54.1**

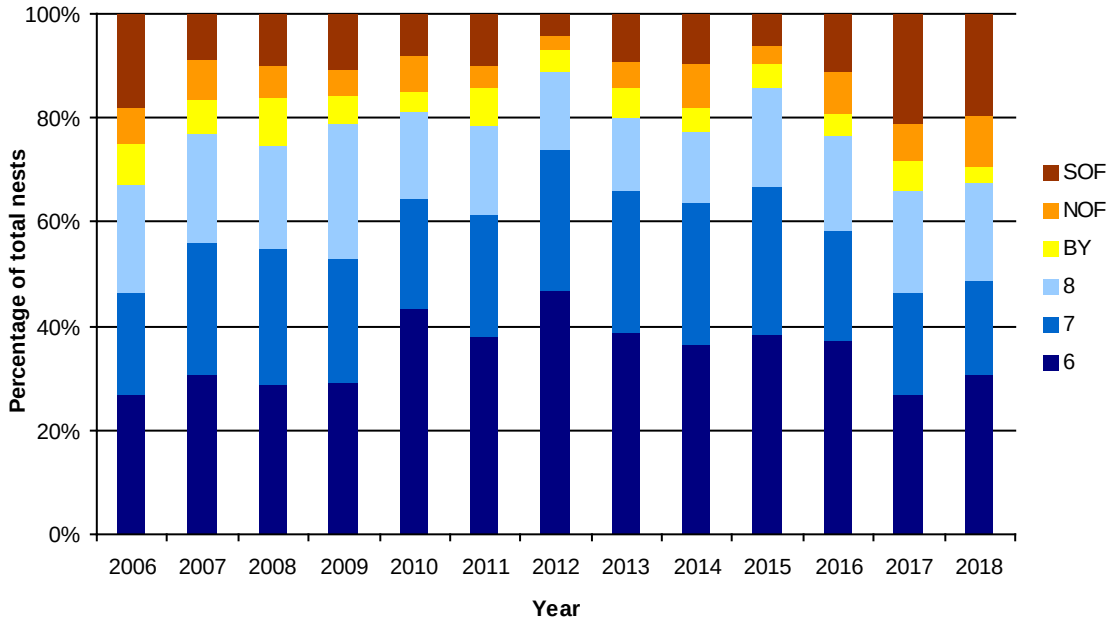


Figure 9. Distribution of snowy plover nests as a percent of total nests at ODSVRA from 2006-18.

Table 8. Nesting success of snowy plovers at ODSVRA from 2001-18.

Number of eggs from nests with unknown location is a minimum number derived from number of chicks seen. A more detailed table of nesting success for 2001-18 is included as Table F.1 in Appendix F.

na = not available

Year	No. nests (no. known location and fate)	Min. no. eggs	Ave. clutch size (no. nests known location and complete clutch size)	No. nests hatching (no. known location)	Percent hatching	No. chicks (no. known fate)	No. known fate chicks fledged (percent fledged)	No. fledglings per nest
2001	33 (30)	na	na	26 (26)	86.7	71 (71)	3 (4.2)	0.09
2002	35 (35)	99	na	25 (25)	71.4	62 (62)	35 (56.5)	1.00
2003	95 (93)	254	na	63 (62)	66.7	162 (159)	107 (67.3)	1.13
2004	147 (140)	415	2.87 (141)	110 (105)	75.0	263 (263)	66 (25.1)	0.45
2005	107 (103)	290	2.86 (96)	84 (80)	77.7	204 (204)	82 (40.2)	0.77
2006	117 (114)	336	2.89 (115)	87 (87)	76.3	230 (230)	17 (7.4)	0.15
2007	99 (91)	290	2.93 (89)	78 (70)	76.9	200 (198)	66 (33.3)	0.67
2008	121 (119)	341	2.85 (116)	83 (81)	68.1	197 (197)	72 (36.5)	0.60
2009	150 (147)	418	2.85 (144)	95 (94)	63.9	245 (245)	81 (33.1)	0.54
2010	155 (150)	431	2.88 (146)	111 (109)	72.7	275 (275)	103 (37.5)	0.66
2011	172 (160)	487	2.88 (159)	138 (131)	81.9	365 (365)	152 (41.6)	0.88
2012	216 (203)	603	2.94 (200)	157 (152)	74.9	386 (386)	96 (24.9)	0.44
2013	178 (167)	502	2.93 (162)	138 (130)	77.8	343 (343)	187 (54.5)	1.05
2014	262 (239)	725	2.86 (243)	222 (206)	86.2	547 (547)	196 (35.8)	0.75
2015	217 (195)	612	2.92 (192)	182 (167)	85.6	494 (494)	277 (56.1)	1.28
2016	223 (193)	613	2.89 (188)	179 (165)	85.5	462 (462)	157 (34.0)	0.70
2017	281 (238)	738	2.88 (228)	153 (145)	60.9	378 (378)	174 (46.0)	0.62
2018	221 (200)	615	2.95 (184)	159 (144)	72.0	412 (412)	200 (48.5)	1.00

Average clutch size, clutch loss, and nest hatching rate

There were 221 identified nesting attempts, including 15 known only by brood, and of these 159 hatched (Table 8, Figure 8, Figure 10). For 184 nests with known complete clutch size (and excluding nesting attempts known only by brood) the average number of eggs was 2.95. This compares to the average of 2.89 eggs per clutch (range=2.85-2.94) for the 14-year period 2004-17. Excluding 21 nests (6 with unknown fate and 15 detected by brood only), the clutch hatching rate was 72.0% (144/200). This compares to an average of 75.2% (range=60.9-86.2%) from 2002-17 (Table 8). The nest hatching rate in 2018 was higher in the Southern Exclosure (79.9%) than in Oso Flaco (54.1%), as has been the case in 15 of the previous 17 years (Table F.1 and Figure F.1 in Appendix F). Fifty-six nests were known to fail, with losses attributed to abandoned pre-term (11); abandoned post-term (3); abandoned unknown pre- or post-term (7); abandoned, suspected wind (3); overwashed by tide (1); cause unknown (2); unidentified predator (2); avian (13); coyote (4); raven (5); and gull (5) (Table 9).

Table 9. Attributed causes of snowy plover nest loss at specific locations at ODSVRA in 2018.

Area	Abandoned pre-term	Abandoned post-term	Abandoned unknown pre- or post-term	Abandoned, suspected wind	Overwashed by tide	Failed, cause unknown	Unidentified predator	Avian predator	Coyote	Raven	Gull
Southern Exclosure											
6 exclosure	2	3	1	0	0	1	0	1	0	4	0
7 exclosure	0	0	2	0	0	0	0	1	0	1	0
8 exclosure	6	0	2	0	1	1	0	1	0	0	0
Boneyard exclosure	1	0	0	0	0	0	0	0	0	0	0
TOTAL SOUTHERN EXCLOSURE	9	3	5	0	1	2	0	3	0	5	0
Oso Flaco											
North Oso Flaco	0	0	2	0	0	0	0	7	1	0	0
South Oso Flaco	2	0	0	3	0	0	2	3	3	0	5
TOTAL OSO FLACO	2	0	2	3	0	0	2	10	4	0	5
TOTAL ODSVRA	11	3	7	3	1	2	2	13	4	5	5

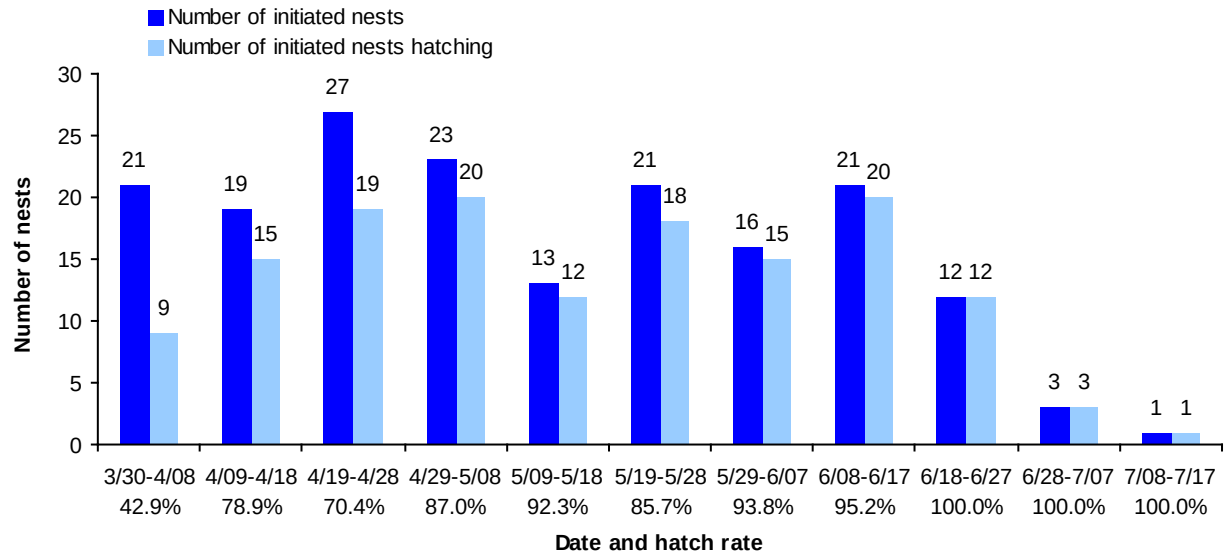


Figure 10. Number of known location and known fate snowy plover nests with known initiation date (n=177) initiated per 10-day period and number known to hatch at ODSVRA in 2018.

Thirty-seven nests with unknown initiation date are excluded and 22 of these nests failed. Excluding these nests has caused the hatch rates in the figure to inflate.

Chick fledging rate

Of the 412 snowy plover chicks hatched, 207 were banded and the fate of 205 unbanded chicks is believed known (Appendix B). In the absence of a high percentage of chicks being banded at ODSVRA, it would not be possible to obtain accurate chick survival and fledging rates. Between 13 June and 14 August, 10 unbanded broods (18 chicks) were observed on the exclosure shoreline and could not be assigned to a particular nest (listed as UNA1-10 in Appendix B). Although these broods could not be assigned to a specific nest and exclosure, all chicks were tracked and fledglings are included in totals. Additionally, there were 15 unbanded broods (36 chicks) observed on the shore from hatched nests of unknown location. Three of the 15 broods were subsequently banded (see sections titled Banding chicks and Assignment of broods to nests in the Monitoring and Management Action section for details on banded and unbanded broods). The fledging rate for banded chicks was 51.7% (107/207) and 45.4% (93/205) for unbanded chicks. The fledging rate for all chicks combined was 48.5% (200/412). This compares to 46.0% in 2017 and an average rate of 39.4% (range=7.4-67.3%) for the 16-year period 2002-17 (Table 8, Table F.1 in Appendix F) (CDPR 2007-17).

In 12 of 16 years during the period 2003-18, the fledging rate of chicks hatching in the early season (prior to 20 June) has been higher, by an average of 20 percentage points, than chicks hatching in the late season (20 June or later). (See 2012 report for how early versus late season was determined.) In 2018, the early season had a higher chick fledging rate (57%) compared to the late season (39%). Low survival was particularly apparent for chicks hatching after 10 July, representing 25.7% of all chicks produced, with only 24.5% (26 of 106 chicks) fledging (Figure 11, Figure 12, Figure 13).

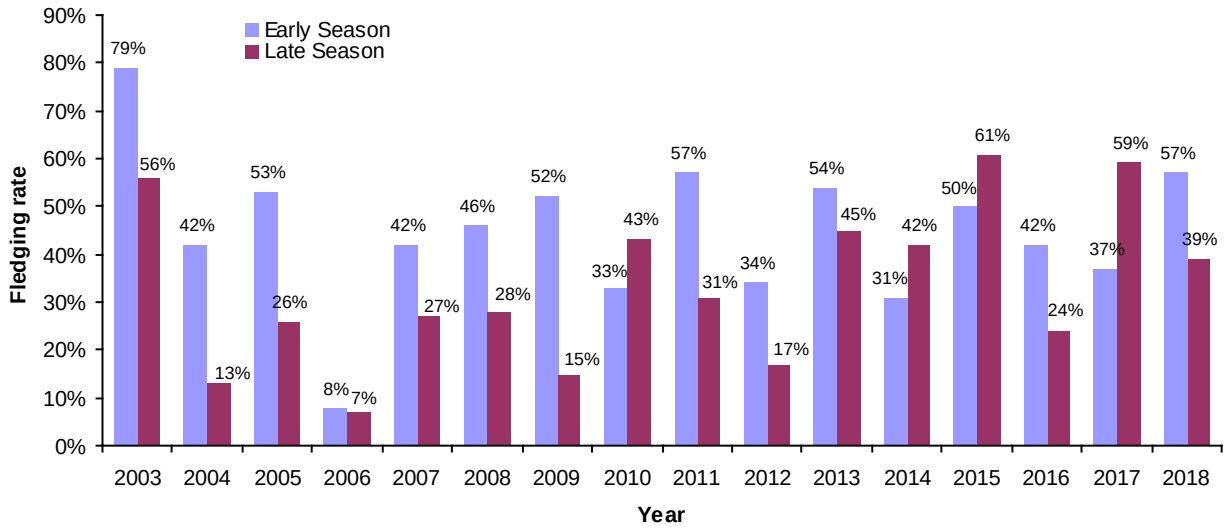


Figure 11. Fledging rate of chicks hatching in early season (prior to 20 June) and late season (20 June or later) at ODSVRA from 2003-18.

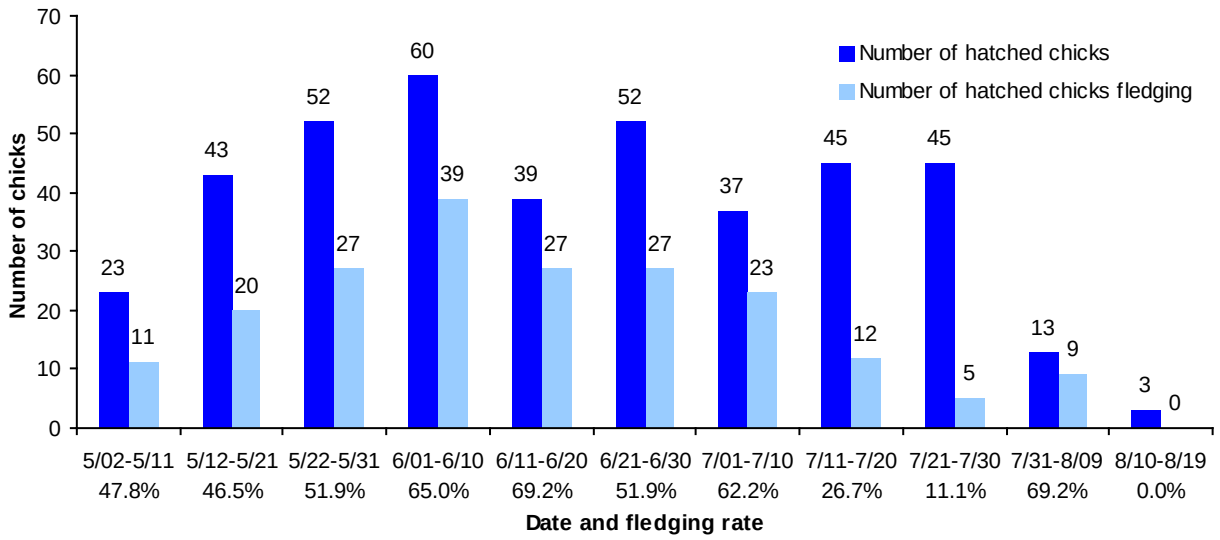


Figure 12. Number of snowy plover chicks hatching per 10-day period and number subsequently fledging at ODSVRA in 2018.

Includes all chicks with known fate (412). For broods that either originated from unknown location (36 chicks from 15 broods) or were not assigned to a specific nest (18 chicks from 10 broods) a hatch date was estimated based on chick size.

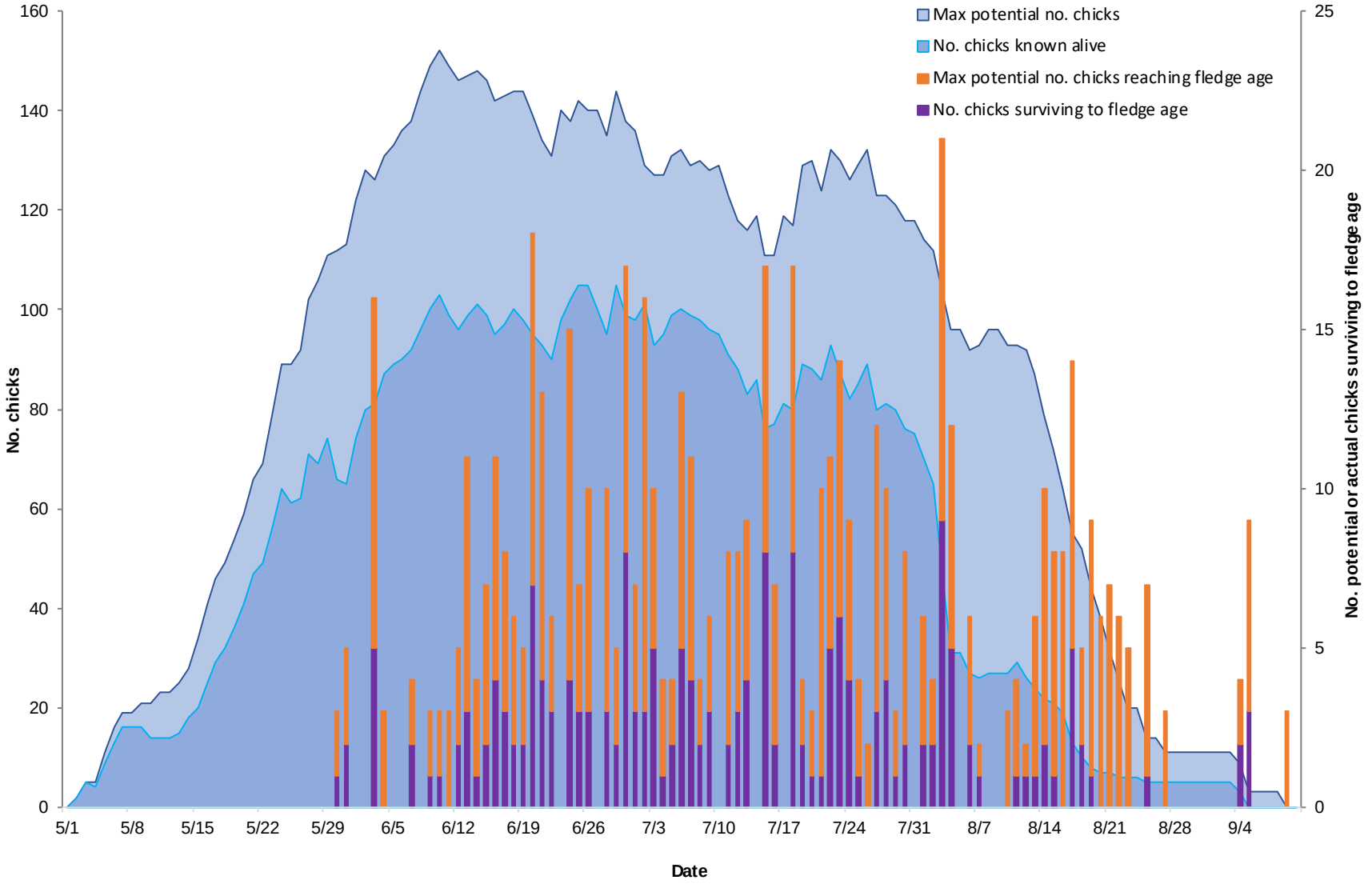


Figure 13. Chick survival and fledge rate from 23 April to 10 September at ODSVRA in 2018.
Of the total of 412 chicks hatching, 405 chicks (excludes seven chicks that were found when approximately three days old or older) are represented in this figure. Number chicks known alive calculated using date of last sighting during regular surveys of all chicks. No. = number

Age of chick loss

Of 225 carefully tracked chicks (207 banded and 18 unbanded chicks with banded siblings) from known location nests, 110 were believed lost. As has consistently been the case in previous years, chick loss in 2018 was highest for very young chicks (0-4 days of age), accounting for 44.5% of total loss (Figure 14). This compares to an average of 49% loss (range=38%-64%) from 2009-17 (CDPR 2017). For 123 chicks reaching 16 days of age in 2018, the fledge rate was 93% (115/123). This is greater than the average of 80% (range=71-93%) for the previous nine-year period 2009-17 and is equivalent to the results from a six-year (1977-82) study at Monterey Bay in Monterey County, California, that found at least 93% of the 124 chicks reaching 16 days of age fledged (Warriner et al. 1986).

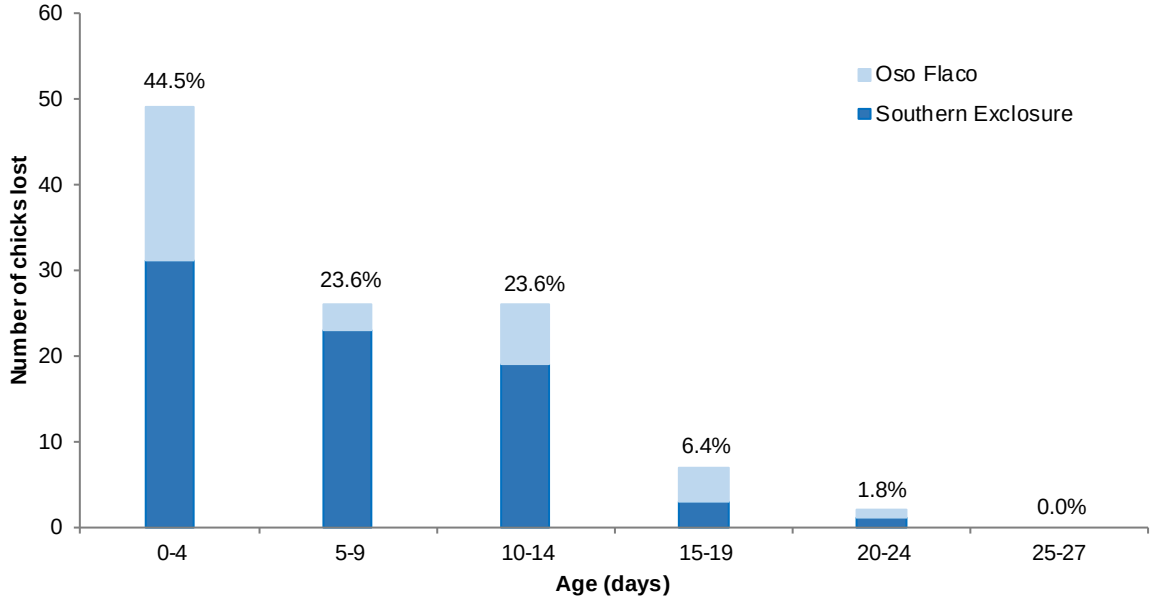


Figure 14. Loss of snowy plover chicks by age and location last seen in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

Number and percentage of total chicks lost shown for each age group. There were 225 chicks included in the analysis; 110 of these were lost. Data excludes broods that could not clearly be identified and tracked individually.

Productivity measured by number of fledglings produced per adult male

Based on a population viability analysis in the 2007 USFWS Pacific coast western snowy plover recovery plan, a rate of 1.0 fledglings produced per male is believed necessary to prevent population decline with 1.2 fledglings per male allowing for moderate population growth (assuming approximately 75% annual adult survival and 50% juvenile survival) (USFWS 2007). In 2018, the number of chicks fledging per male was 1.74, and allows for population growth. This rate is a decrease from 2017 (1.87) and below the average of 1.92 (range=1.43-2.45) for the three-year period 2015-17. During the 2002-18 period, average productivity was 1.50 fledglings per male and exceeded 1.2 fledglings per male in 14 of the 17 years (Table 5). (Note that if the number of breeding males is underestimated, the number of chicks fledged per male is an overestimate.)

Mortality (other than eggs)

There was a minimum of 36 documented snowy plover mortalities (other than eggs) at ODSVRA from November of 2017 (subsequent to last year's report) to November of 2018. Predators involved were two peregrine falcons (*Falco peregrinus*) (three plover chicks, one adult plover and one unknown juvenile or adult plover), one California gull (*Larus californicus*) (two plover chicks), and one western gull (*Larus*

occidentalis) (nine plover chicks). Documented mortality other than predation included 11 adults, two juveniles, and seven chicks. This includes: two plovers observed in distress prior to death; one adult with a left leg injury that died at Pacific Wildlife Care; and one chick collected in the field with limited mobility and unattended by its nearby associated adult, that died while being warmed in a brooder (For additional information see Predators and predator management section on page 39, Notes section, and Appendix H).

Protection of known location and fate nests with exclosures and symbolic fencing

Of the 200 nests from known location and with known fate, 94 were initiated within the wire mesh predator fencing of the Seasonal Exclosure that is installed at the beginning of the season (see Seasonal closure and fencing section description in the Monitoring and Management Actions section). These nests had a 78.7% (74/94) hatch rate.

For the 6, 7, and 8 exclosures and North Oso Flaco, there were an additional 66 nests with known location and fate established on the shoreline outside of the Seasonal Exclosure. This shoreline is closed to public use during the nesting season. One nest in North Oso Flaco was protected by an individual circular exclosure and hatched. Sixty-five nests were protected only by symbolic rope fencing and signage that provides no predator protection but is designed to discourage vehicle and pedestrian trespass. These nests did not receive single wire fence protection due to a combination of the following factors: avoiding disturbance of nearby broods, nest abandonment concerns due to adult mortality, and a continuing high hatch rate without the use of single nest wire exclosures. Of these nests 72.3% (47/65) hatched.

In South Oso Flaco there were 40 nests from known location and known fate, all ultimately within seasonal symbolic rope fencing (visitor pedestrian use allowed on beach west of symbolic fencing). On several occasions nests were found west of or very near the symbolic fence and the fence was moved westward to provide more of a buffer between nests and pedestrians. Fifteen nests did not receive any single nest wire exclosure due to concerns of avoiding disturbance of nearby broods, windblown sand potentially burying eggs or adult vulnerability to predators. Of these 15 nests, six hatched (40.0% hatch rate). An additional five nests failed before a planned circular exclosure could be installed. Twenty nests received circular exclosures and 80.0% hatched (16/20) (see Table F.3 in Appendix F for additional details of protective fencing measures for nest).

Banded snowy plovers breeding at ODSVRA in 2018

Banding of snowy plovers occurs at multiple breeding sites along the Pacific coast. The closest sites to ODSVRA where banding occurs are Monterey Bay in Monterey County, California, to the north and VAFB in Santa Barbara County, California, to the south. In 2018, the minimum number of breeding adults at ODSVRA was 201 birds, and of these 97 (48.3%) were banded and with known origins (Figure 15). The great majority (89.7%, 87/97) represent recruitment from chicks banded and fledged from ODSVRA. Nine breeding birds were banded as chicks from 2013 to 2017 at VAFB and one was banded as a chick in 2014 at Moss Landing Salt Ponds in Monterey County. An additional three breeding birds were missing one or more bands and were from unknown locations (Table D.3 in Appendix D).

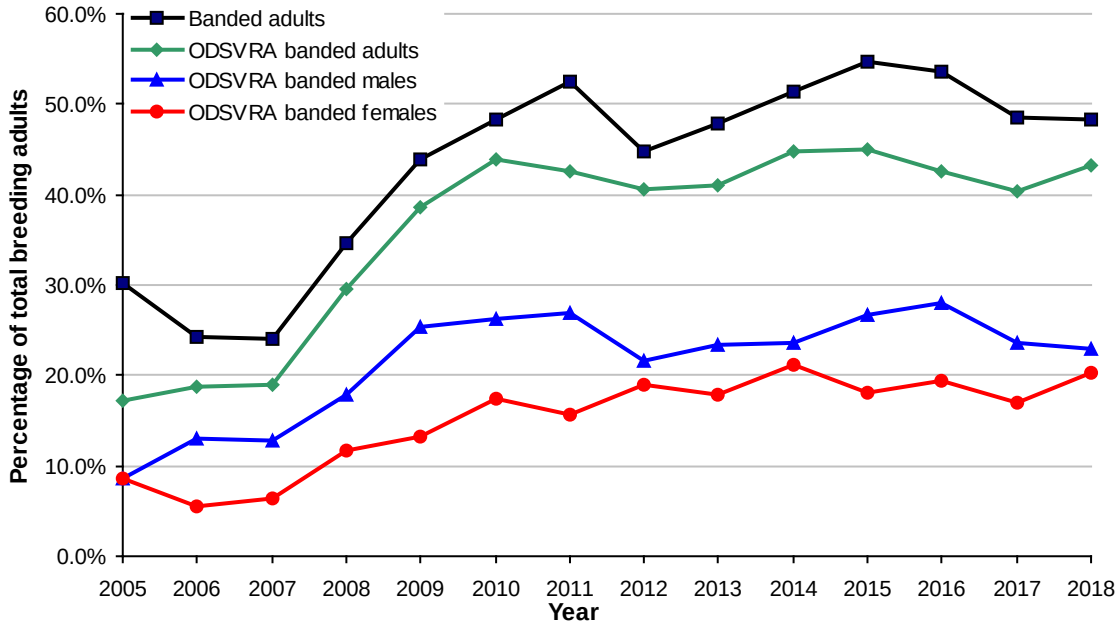


Figure 15. Percentages over the total calculated breeding population at ODSVRA of all known origin banded adults and the sum of males and females originally banded at ODSVRA breeding from 2005-18.
All ODSVRA banded adults were banded on-site when chicks.

Snowy plovers banded at ODSVRA breeding elsewhere in 2018
Throughout the snowy plover range, reports of banded plovers are collected by a coordinated effort of managers and monitors. There was a minimum of 117 banded snowy plovers fledging from ODSVRA seen at other sites during the months of March through September 2018, and 15 were confirmed breeding in five different general locations in California (two in Monterey Bay area in Monterey County, four in Morro Bay area in San Luis Obispo County, seven at VAFB in Santa Barbara County, one at Bolsa Chica in Orange County, and one at Camp Pendleton in San Diego County) (Appendix D).

Snowy plover surveys at ODSVRA during the nonbreeding season
Surveys for wintering plovers (populations of both Pacific coast breeding birds joined by interior breeding birds) were conducted four to six times a month during the five-month period October through February (see Monitoring and Management Actions for survey details). Between 4 October 2017 and 28 February 2018, single day wintering plover counts at ODSVRA ranged from 56-178 birds (single day high count on 3 January 2018). The shore was divided into five beach sections and the monthly average number of plovers (from four to six surveys) was obtained for each section. An average number of plovers for each beach section for the five-month winter period was obtained by averaging each month's average count. Of the five sections, the beach north of Grand Avenue had an average of zero plovers during the winter period (range=0-1); Grand Avenue to marker post 2 had an average of 31 (range=4-49); marker post 2 to marker post 6 had an average of 33 (range=5-75); marker post 6 to the southern boundary of the riding area, closed to public entry during the breeding season, had an average of 41 (range=18-58); and Oso Flaco had an average of 26 (range=23-28) (Figure 16).

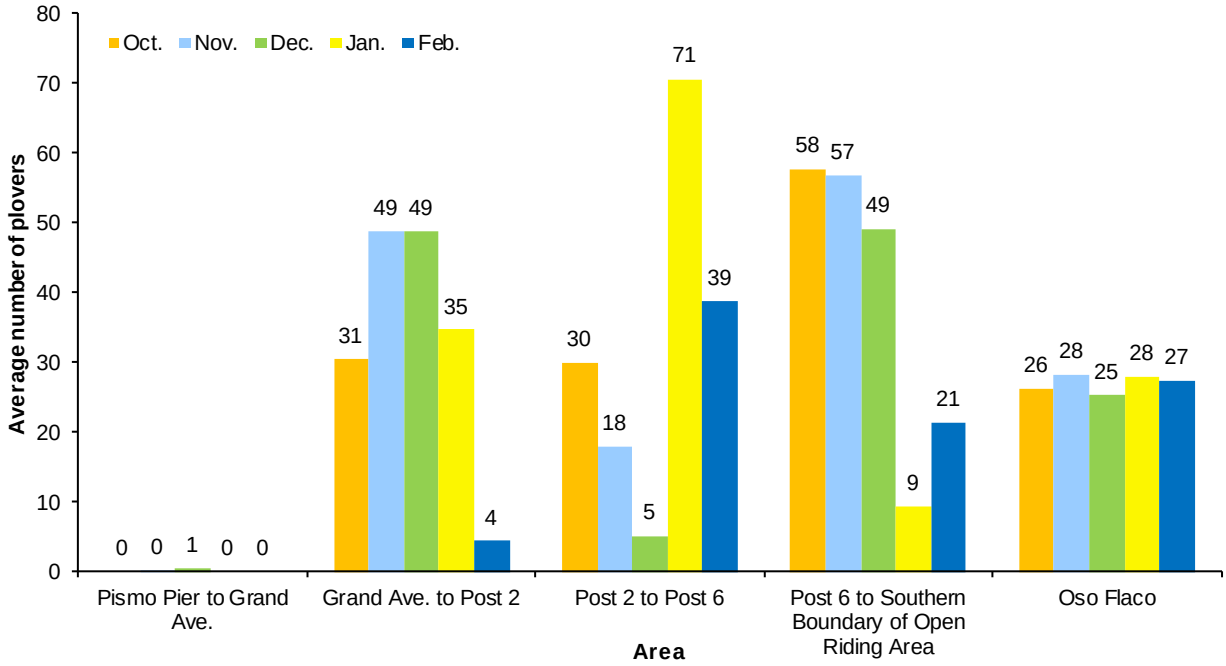


Figure 16. Monthly average number of snowy plovers observed during nonbreeding season surveys at ODSVRA from October 2017 to February 2018.
Surveys conducted four to six times a month.

Beginning in 2004, ODSVRA has participated in a snowy plover winter season window survey organized by USFWS and conducted in January throughout the U.S. Pacific coast. Plovers present during this time include birds from both the Pacific coast breeding population and interior breeding birds wintering on the coast. In 2018, the survey at ODSVRA counted 134 adult plovers, a 2.9% decrease from 138 in 2017. The 134 plovers in 2018 compares to an average winter window count of 207 (range 138-246) during the previous 3-year period 2015-2017 and 158 (range=62-261) during the 15-year period 2004-18 (Figure 17).

One hundred and thirteen banded snowy plovers were recorded during surveys from 1 October 2017 to 28 February 2018 at ODSVRA. These birds were banded at the following locations: 83 from ODSVRA, 20 from VAFB in Santa Barbara County, California, eight from the Monterey Bay area in Monterey County, California, one from Coos Bay in Coos County, Oregon and one was missing two bands and was from an unknown location (Table D.2 in Appendix D).

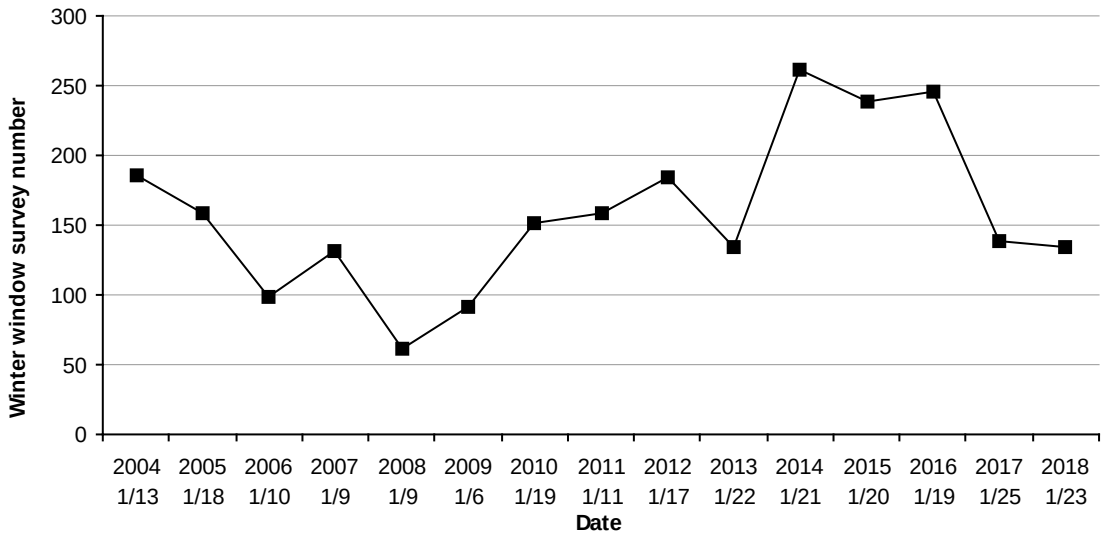


Figure 17. Number of snowy plovers counted on USFWS winter window surveys from 2004-18.

FACTORS INFLUENCING LEAST TERN AND SNOWY PLOVER REPRODUCTIVE SUCCESS

The following is a discussion of some of the factors that influence reproductive success of terns and plovers at ODSVRA. The adequacy of any single factor alone is not sufficient to achieve and sustain recovery goals.

Size of protected habitat

Maintaining an adequate size of protected habitat at ODSVRA has been important in providing sufficient area for terns and plovers to roost, nest, and raise young. Protected breeding habitat of sufficient size allows nests and chicks to be dispersed which can reduce exposure and vulnerability to predators, as well as reduce adverse disturbance from human recreational activities. For plovers, it also improves opportunities for chicks to have access to adequate invertebrate food resources.

Quality of protected habitat and food resources

During the March through September least tern and snowy plover nesting season, habitat within the seasonal Southern Exclosure is protected and closed to public entry. Following the nesting season, for the five-month period October through February, the area is open to public use, including camping, street-legal vehicles, and off-highway vehicles. This recreational use results in large areas of flattened terrain and barren sand with very limited scattered natural debris and vegetation. Areas of patchy cover can benefit plovers and terns during the nesting and chick-rearing periods and to make available more such areas park staff places material, including surf-cast kelp (wrack), branches, driftwood, and woodchips, in the 6, 7, and 8 exclosures. On the shoreline of 6, 7, and 8 exclosures talitrids may be added to help restore populations of this important invertebrate prey of snowy plover chicks, juveniles, and adults. Nearshore ocean waters provide the primary source of prey fish for the tern colony and nearby small freshwater lakes provide additional sources of appropriately-sized fish to feed chicks (see paragraph titled Least tern use of freshwater lakes in the Monitoring and Management Actions section). Of these lakes, Oso Flaco Lake has the most documented use by terns and water quality issues continue to be addressed by the park.

Predators and predator management

Predators and predation can be an important factor limiting least tern and snowy plover reproductive success (Page et al. 1995; Thompson et al. 1997). Predators may impact terns and plovers directly by depredating eggs, chicks, juveniles, or adults. Indirect predator impacts, such as disturbance, can increase time spent by adults in vigilance or avoidance behavior, and may limit incubating and brooding behavior. Presence of predators may result in a brood becoming scattered and the loss of any chick failing to reunite with the adult. Depredation of an adult tern or plover may result in egg abandonment or loss of dependent chicks. Species known to be predators of terns and plovers were documented by both number of days detected, as well as number of sightings (avian) and occurrences (mammalian) (see Monitoring and Management Actions section for more detail).

Selective live-trapping and relocation of raptors was conducted by Bloom Biological, Inc. and lethal removal of mammalian and avian predators was conducted by USDA Wildlife Services. Predator monitoring effort by Bloom Biological, Inc. was conducted from mid-February until mid-September and USDA Wildlife Services monitoring effort was conducted from early-May until mid-September. Five striped skunks, two raccoons (*Procyon lotor*), seven coyotes, one red fox (*Vulpes vulpes*), one Virginia opossum (*Didelphis virginiana*), three common ravens, three California gulls, and one western gull were removed lethally. Two peregrine falcons, one American kestrel (*Falco sparverius*) and two great horned owls (*Bubo virginianus*) were live-trapped and relocated (Table F.2 in Appendix F).

Documented Predation

Predation can occur quickly, leaving little or no evidence, and it is likely that only a small percentage of events are documented during a season. There are many hours each day (including almost all night hours)

when monitoring staff and/or predator management specialists are not present to observe predation. Even when monitors are present, there are limitations in the ability to detect predators, such as diurnal avian predators, that can travel quickly over large distances. Despite limited documentation of predation events and detection bias, predators of particular concern identified during the 2018 season included peregrine falcon, great horned owl, gull spp., common raven, American kestrel, coyote, and skunk.

In 2018, no tern nests were documented lost to predation. Twenty-nine plover nests were identified lost to the following predators: unidentified predator (2), coyote (4), common raven (5), unidentified avian (13), and unidentified gull species (5). From 2002-18, 2.6% (20/766) of all tern nests with known fate were documented lost to predators (14 mammalian, one gull, and five unidentified predator). During this same 17-year period, 8.3% (216/2587) of plover nests with known location and fate were documented lost to predation (41 mammalian, 130 avian, and 45 unidentified predator). In addition to documented loss, a number of failed nests attributed to "abandoned pre-term" and "unknown cause" are likely a result of predation.

Documented predation events, other than eggs, in 2018 included: 14 plover chicks (nine by immature western gull, two by immature California gull, and three by peregrine falcon), one juvenile or adult plover (peregrine falcon), one adult plover (peregrine falcon), and one juvenile tern (unidentified avian predator) (Appendix H). This compares to three documented losses in 2017: one plover chick (juvenile red-tailed hawk), one juvenile plover (peregrine falcon), and one adult plover (peregrine falcon).

Mammalian Predators

Opossum

Opossum tracks were documented on 23 days in the Southern Exclosure and Oso Flaco in 2018 and averaged 10 days per season (range=3-25) from 2007-17 (Figure 18). From 2002-18, known nest loss to opossum was limited to two tern nests, occurring in 2010 and 2013.

Skunk

In 2018, skunk tracks were documented on 49 days in the Southern Exclosure and Oso Flaco compared to an average of 32 days per season (range=2-87) from 2007-17 (Figure 18). There were no known tern or plover nests lost to skunk in 2018 compared to 23 (18 plover and five tern) in 2017. From 2002-16, known nest loss to skunk was limited to six plover nests: five in Oso Flaco from 2009-11 and one in Boneyard exclosure in 2016 (Table G.2 in Appendix G). In response to continued presence of tracks within sensitive habitat in 2018, and to prevent the continuation of high nest lost experienced in 2017, five skunks were removed in 2018.

Raccoon

Two non-targeted raccoons were caught in traps intended for skunks and euthanized. Raccoon tracks were documented on 55 days in the Southern Exclosure and Oso Flaco. This compares to an average of 95 days (range=39-145) for 2007-17 (Figure 18). Tracks and scat indicated that raccoons commonly traveled across the exclosure to forage in the intertidal zone on prey that included mole crabs (*Emerita analoga*). From 2002-18, known nest loss to raccoons was limited to one tern nest in 6 exclosure in 2015 and two plover nests in Oso Flaco, occurring in 2010 and 2011.

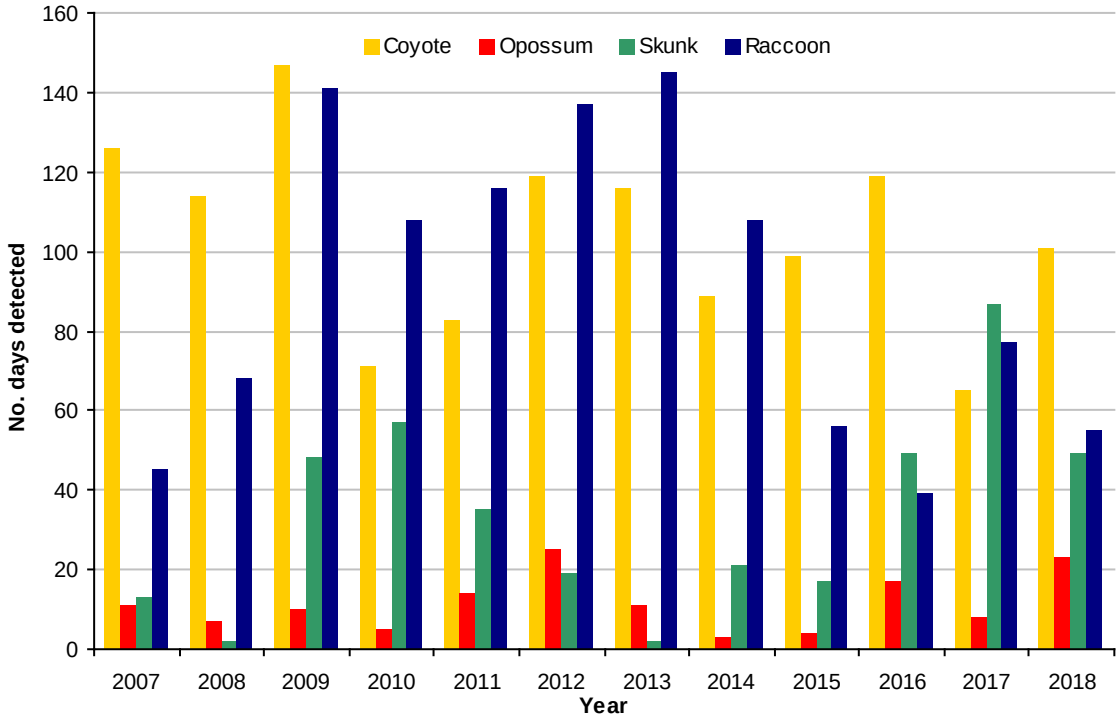


Figure 18. Number of days coyote, opossum, skunk, and raccoon were detected in the Southern Exclosure and Oso Flaco at ODSVRA from 2007-18.

Coyote

Live sightings of coyotes have rarely been documented in the Seasonal Exclosure or along the shoreline during daytime hours. The lack of diurnal sightings, as well as timing of observed fresh tracks relative to windblown sand and tides, indicate that coyote activity is primarily nocturnal in these areas.

Seven coyotes were removed in an effort to reduce the threat of predation and disturbance due to coyote presence documented within sensitive nesting habitat. This compares to an average of six removed per year from 2007-17 (range=4-11). As part of monitoring at ODSVRA, coyote scat encountered by monitoring staff and contractors was checked in the field for plastic or aluminum bands used for banding least terns and snowy plovers. Bands were found in coyote scat for the first time in 2012, with four scats having a total of 11 bands (representing a minimum of one plover chick, two unknown age plovers, and one unknown age tern) (CDPR 2012). No bands were found in coyote scat in 2013-18 (CDPR 2013, 2014, 2015, 2016, 2017).

In the combined Southern Exclosure and Oso Flaco areas, coyote presence was recorded on 101 days, which includes 11 days inside the Seasonal Exclosure and is equal to the average of 101 days (range=65-147) during the previous nine-year period 2009-17 (Table 10). There were 198 recorded coyote occurrences in distinct areas in 2018. This compares to an average of 189 (range=73-307) for the previous nine years. One hundred and seven occurrences were recorded on the Southern Exclosure and North Oso Flaco shoreline this season, compared to an average of 102 (range =5-193) for the last nine years (Figure G.1 in Appendix G). It should be noted that predator tracks are documented opportunistically and counts represent a minimum level of activity. In addition, shoreline accessibility for monitoring staff may vary between years making direct comparison difficult.

From 2002-18, documented coyote depredation of nests has been limited to fifteen plover nests and six tern nests (Table G.2 in Appendix G).

Table 10. Coyote occurrence in the Southern Exclosure and Oso Flaco at ODSVRA from 2009-18.
Date range is from 1 March to 10 September (a 194-day period).

Year	Inside Southern Exclosure and North Oso Flaco predator fencing	6, 7, 8 exclosure shoreline	North Oso Flaco shoreline	South Oso Flaco	Total no. occurrences (Total no. days detected)
2009	19	99	94	95	307 (147)
2010	5	24	23	47	99 (71)
2011	10	17	20	55	102 (83)
2012	92	100	47	35	274 (119)
2013	49	55	38	60	202 (116)
2014	28	115	38	42	223 (89)
2015	48	104	32	29	213 (99)
2016	36	61	49	63	209 (119)
2017	25	1	4	43	73 (65)
2018	22	55	52	69	198 (101)

Avian Predators

In 2018, one adult female American kestrel, one adult male peregrine falcon, one juvenile male peregrine falcon, and two adult great horned owls were live-trapped and relocated. In addition, three California gulls, one western gull, and three common ravens were lethally removed. Unsuccessful efforts were made to trap one juvenile male merlin (*Falco columbarius*). Avian predators perched in sensitive areas within the Southern Exclosure and Oso Flaco were hazed when possible.

Loggerhead shrike

From 8 July–8 September a minimum of one loggerhead shrike (*Lanius ludovicianus*) was documented on five days in 2018 in the Southern Exclosure and Oso Flaco. Shrike observations included perch-hunting and flying over Boneyard and North Oso Flaco.

Merlin

From 4 April–9 May, a minimum of two merlins were documented on 20 days (72 sightings) in 2018 actively hunting shorebirds in the Southern Exclosure and Oso Flaco (Table 11). In the 11-year period 2007-17, merlin activity averaged seven days (range=2-16) a year. From 2004-2018, merlins were documented taking four adult plovers (one in each of the years 2004-06 and one in 2015) at ODSVRA. In addition, an adult female merlin was observed eating a small shorebird that may have been a plover in 2011. In 2014, their presence coincided with several plover nests being abandoned pre-term with adult mortality suspected as the cause.

American kestrel

There were 126 documented sightings on 34 days of American kestrels in specific areas of the Southern Exclosure and Oso Flaco (Table 11). Kestrels were primarily observed in August and September perch-hunting and flying over all sensitive areas. Kestrels were hazed out of sensitive areas on 20 different occasions when perched. For the 11-year period 2007-17, kestrels were seen an average of 15 days per season (range=6-28) (CDPR 2007-17).

Owl

The majority of owl "sightings" are from detection of tracks with very few visual sightings. The level of owl activity, as evidenced by tracks, is difficult to estimate during daytime monitoring as there is limited entry into the nesting and chick-rearing areas to look for tracks. The tracks may extend only a short distance and can be covered quickly by windblown sand. In addition, accessibility to areas where tracks have often been noted previously (e.g., North Oso Flaco, 8 exclosure, 7.5 revegetation area) may vary between years, making direct comparison difficult. Most owl tracks documented at ODSVRA are likely from great horned owls; barn owls (*Tyto alba*) have also been documented but to a much lesser extent. Burrowing owls (*Athene cunicularia*) have been seen at ODSVRA but tracks would not be confused with other species and they have typically migrated out of the area before the tern and plover breeding season.

In 2018, owl tracks were periodically documented in sensitive nesting and chick-rearing habitat, with owl presence detected on 32 days with 38 separate sightings (Table 11, Figure 19). In the 11-year period 2007-17, owl activity was documented on an average of 27 days (range=5-53). Two adult great horned owls were live-trapped in Pipeline revegetation area on 16 May and 24 May and relocated.

Red-tailed hawk

Red-tailed hawks were primarily observed perching and flying in the North and South Oso Flaco foredunes. In 2018, based on concurrent sightings and age, there was a minimum of four individuals (two adults, one sub-adult, and one juvenile) observed in or adjacent to the nesting area. Red-tailed hawk presence was documented on 30 days (47 sightings) (Table 11, Figure 19). From 2007-17, activity was recorded on an average of 45 days (range=7-74). In 2017, a juvenile red-tailed hawk was observed eating a plover chick. This was the first known predation by a red-tailed hawk at ODSVRA, but they have been a documented predator of plovers and terns at other sites.

Northern harrier

Northern harrier (*Circus hudsonius*) has been documented as a predator of nests, chicks, and juveniles of plovers and/or terns at ODSVRA in past years. In 2018, there were 59 sightings of northern harriers on 25 days. In the 11-year period 2007-17, activity was recorded on an average of 42 days (range=25-68) (Table 11, Figure 19). Based on age and sex, there was a minimum of three individuals (one adult female, one sub-adult male, and one juvenile) observed during this season.

Table 11. Sightings of merlin, American kestrel, large owl spp., red-tailed hawk, northern harrier, and peregrine falcon in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA in 2018.
Date range is from 1 March to 10 September (194-day period). Note most owl "detection" based on tracks.

Location	Merlin	American kestrel	Large owl spp.	Red-tailed hawk	Northern harrier	Peregrine falcon	Total
6 exclosure	8	18	1	0	3	60	**90**
7 exclosure	6	22	2	5	7	55	**97**
8 exclosure	10	28	9	3	16	52	**118**
Boneyard exclosure	18	11	18	2	4	17	**70**
North Oso Flaco	25	26	6	17	13	55	**142**
South Oso Flaco	5	21	2	20	16	56	**120**
TOTAL	**72**	**126**	**38**	**47**	**59**	**295**	**637**

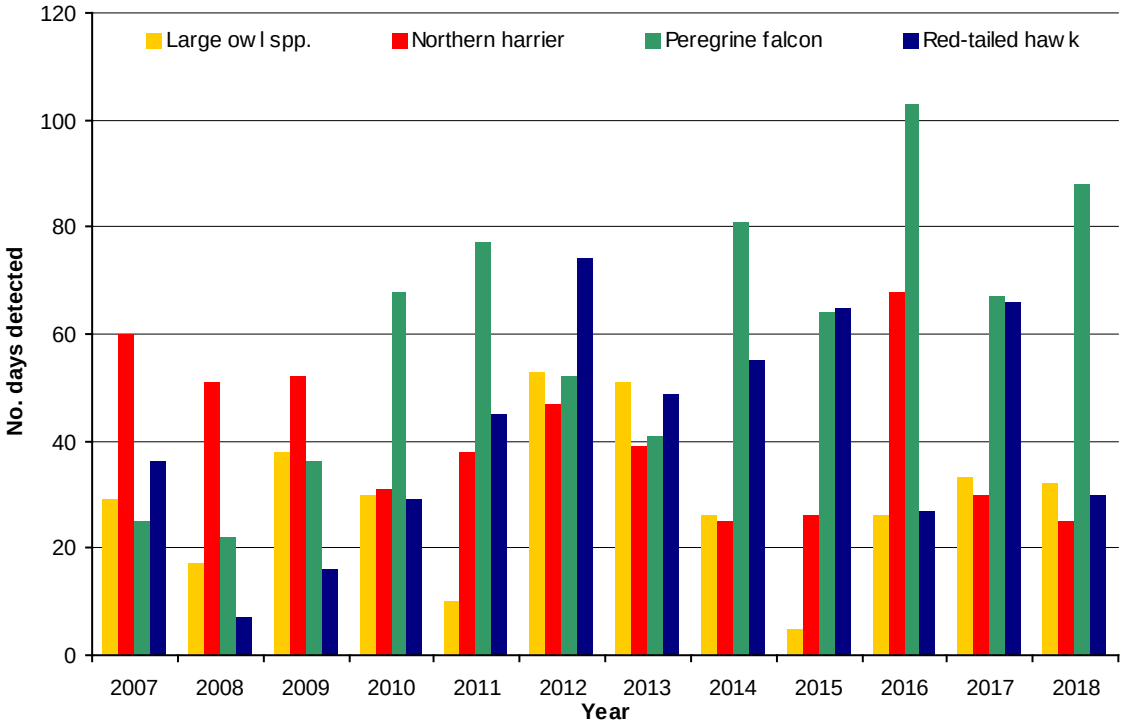


Figure 19. Number of days large owl spp., northern harrier, peregrine falcon, and red-tailed hawk were detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2007-18.
Date range is from 1 March to 10 September (194-day period).

Peregrine falcon

Peregrines were commonly observed actively hunting, perching, and consuming prey in the Southern Exclosure and Oso Flaco. Peregrines hunting on the exclosure shoreline, even when not focused on plovers and terns, can cause disturbance that limits foraging time for plover chicks while increasing the risk of broods being separated or moved. Peregrines perched in the nesting area for an extended period of time were hazed on 38 days in 2018 (sometimes requiring repeated efforts before the bird left the nesting area). Hazing peregrines out of sensitive areas provided a temporary solution but did not deter individual falcons from returning to ODSVRA.

On 26 June, a banded adult male peregrine (unread white characters on black VID band on left leg, federal band on right leg) was observed eating an adult plover on the 7 exclosure shoreline. On the following day, an adult peregrine with the same combination (black VID band on the left leg and federal band on the right leg), was documented landing, running after, and eating what are believed to be three plover chicks from inside 7 exclosure, 7 exclosure shoreline, and North Oso Flaco shoreline (Appendix H). A banded adult male peregrine falcon ("74D" white characters on black VID band on left leg and federal band on right leg) with similar plumage was trapped in South Oso Flaco on 10 July. This bird is known to be an adult male associated with the "Lion's head" nest site on VAFB property. On 13 July, a VAFB avian predator specialist affixed a GPS transmitter using a backpack harness and the bird was released at the Butte Valley Wildlife Area, Siskiyou County, California, 475 miles north of ODSVRA. On 10 August, this bird was observed back on-site. In addition, this same banded peregrine was observed eating a plover chick, tern juvenile, and suspected adult plover in 2016.

On 19 August, an unbanded juvenile peregrine was observed catching and eating an older juvenile or adult plover on 8 exclosure shore. On 31 August, an unbanded juvenile peregrine with similar plumage was trapped in South Oso Flaco, and on 3 September was released in Inyo National Forest, Inyo County, California, 179 miles northeast of ODSVRA. The bird was banded with a federal band (2206-85657) on the right leg and VID band (W03, white characters on black band) on the left leg.

In 2018, there were 295 sightings of peregrine falcons on 88 days, a 54% increase in sightings from the previous year (192 sightings on 67 days). This also represents a 75% increase from the average of 169 (range=38-362) sightings from 2008-17 (Table 12). The average number of days peregrine falcons were recorded during the period 2008-17 was 61 (range=22-103) (Table 11, Table 12).

A minimum of five individual peregrine falcons were identified at ODSVRA this season: one banded adult female (VID band "17D"), one banded adult male (VID band "74D"), one unbanded sub-adult, one unbanded adult, and one unbanded juvenile live-trapped and banded (VID band "W03"). The adult female with VID band "17D" was banded as a nestling in 2013 in southern California and was seen at ODSVRA the previous two years.

Table 12. Sightings of peregrine falcon in specific areas of the Southern Exclosure and Oso Flaco at ODSVRA from 2008-18.

Date range is from 1 March to 10 September (a 194-day period).

Location	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
6 exclosure	11	13	37	39	41	28	75	41	54	31	60
7 exclosure	11	13	29	45	37	23	85	31	50	35	55
8 exclosure	5	13	25	40	31	19	67	28	45	40	52
Boneyard exclosure	6	6	11	32	9	2	11	15	16	8	17
North Oso Flaco	4	9	24	37	27	14	69	19	32	37	55
South Oso Flaco	1	20	18	12	11	14	55	29	57	41	56
Total no. sightings	**38**	**74**	**144**	**205**	**156**	**100**	**362**	**163**	**254**	**192**	**295**
No. days detected	**22**	**36**	**68**	**77**	**52**	**41**	**81**	**64**	**103**	**67**	**88**
No. peregrines trapped	**0**	**1**	**3**	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**2**

Corvids (American crow and common raven)

American crows (*Corvus brachyrhynchos*) and common ravens are efficient predators at many tern and plover nesting sites and can have pronounced impacts over a short period of time. American crow sightings were limited to 15 sightings over seven days, including two events of two crows flying over North Oso Flaco. There were 12 sightings of common raven on six days. During the 11-year period 2007-17, American crows were seen annually an average of five days (range=1-10) and common ravens on six days (range=1-14) (CDPR 2007-17). In 2018, documented nest loss to raven were five plover nests during a 13-day period from 5-17 April and additional plover nest loss is suspected. On 25 April, an adult common raven was lethally removed approximately 0.25 mile east of Oso Flaco Lake. On 27 April, two additional adult common ravens were lethally removed from the same area.

Gulls

On 30 May, an immature western gull was observed eating two plover chicks on 6 exclosure shoreline and then quickly lost from view. Four hours later, what is believed to be the same gull (and for the purposes of this report will be considered the same gull) was observed eating a plover chick on 6 exclosure shoreline and was lethally removed. The gull's stomach contents contained nine (five banded and four unbanded) plover chick carcasses. On two separate occasions (17 June and 27 July), an immature California gull exhibiting suspicious behavior on the Southern Exclosure shoreline was lethally removed. On 7 August, an

immature California gull observed eating two plover chicks on the Southern Exclosure shoreline was lethally removed. These events represent a minimum of 11 plover chicks lost to gulls this season (Table G.2 in Appendix G).

Gulls can pose a significant threat to snowy plover breeding success at ODSVRA, especially individual gulls that key in on adults with broods. Such gulls can become "specialists" searching for and preying on chicks over a wide area, and depredation events can happen quickly and easily go undetected. In 11 of the 15 years from 2004-18, gulls have been documented taking plover chicks. Between 2011-18, gulls took a minimum of 42 plover chicks, juveniles, and unknown age birds. In 2011, three gulls took a minimum of six chicks, three juveniles, one juvenile or adult, and five plovers of unknown age over a four-day period from 28-31 July. In 2012, a regurgitated gull pellet found on 6 exclosure shoreline contained nine bands, representing a minimum of three unknown-age plovers; none of these predation events were observed. In 2013, no plovers were known depredated by gulls. In 2014, two gulls took a minimum of two plover chicks and one juvenile or adult. In 2015, one gull took a minimum of one plover chick. In 2016, two gulls took a minimum of five plover chicks and four juveniles.

RECOMMENDATIONS

Continue monitoring
Monitoring is critical for effective protection of nesting terns and plovers. As problems and threats arise for adult birds, nests, and chicks, timely information from monitoring can help guide appropriate management actions and evaluate their effectiveness. Monitoring efforts at ODSVRA should have adequate funding, resources, and flexibility to address anticipated problems (e.g., nesting failure, causes of chick loss, predator pressure) as well as unanticipated problems.

Continue banding least tern and snowy plover chicks
Continue banding least tern and snowy plover chicks to better understand chick behavior and factors promoting or threatening survival of chicks (e.g., feeding rates for tern chicks, foraging activity and movements of plover chicks, age and location of disappearance of different cohorts of chicks). Banding also provides a means to document fledging success. Without this information, the seasonal productivity of terns and plovers at ODSVRA would be unknown and management effectiveness could not be assessed. Additionally, bands provide an opportunity to gain insight into predator impacts on chicks and fledglings. Over time, banding of tern and plover chicks will provide information on natal site fidelity of terns and plovers fledged at ODSVRA, as well as migration to other sites.

Continue banding least tern chicks to individual
Beginning in 2006, least tern chicks were banded to allow individual chicks to be identified. This was done, in part, by placing one or two different colors of tape on the federal band, creating a unique combination for each chick. Banding to individual provides the opportunity to gain additional information that otherwise may not be obtainable, including:

1) providing the most accurate means to count the number of juveniles produced;
2) identifying if different areas within the colony are having different fledging success during a season;
3) identifying if broods hatching more than one chick are fledging more than one chick;
4) tracking individual chick and juvenile movement within the ODSVRA colony;
5) providing information on the length of stay of individual juveniles at the colony site after fledging;
6) tracking recruitment of juveniles into ODSVRA's breeding population; and
7) tracking movement of individuals to other colonies in California.

Banding to individual provides valuable information to assist in developing and assessing site management actions directed toward the recovery of the least tern.

Continue option to band adult snowy plovers
The occurrence of abandoned plover nests can raise concern about possible mortality of adult plovers. If elevated adult mortality rates occur or are suspected, it could prove beneficial to band certain adults. This would allow monitors to verify if mortality was taking place and possibly identify the causes.

Provide adequate-sized bumpouts and single nest exclosures to protect least tern nests and chicks in or close to the open riding area
Least tern nests inside the Southern Exclosure and located close to the north or east fence receive temporary additional fencing to create a buffer from recreational activities in the open riding area. These bumpouts connect to the fence adjacent to the nests and extend into the open riding area. Earlier practice has been to provide a 100-foot buffer between a nest and the open riding area, using bumpout fencing for nests inside the Southern Exclosure and a 100-foot-radius circular single nest exclosure for nests in the open riding area. In 2016-18, as recommended by CDFW, the minimum distance between least tern nests and the open riding area was increased, and where needed bumpouts were used to provide a buffer of 300 feet in 2016 and 328 feet (100 meters) in 2017-18. Sixty percent (21/35) of nests were within 328 feet of the exclosure fence in 2018 and bumpouts were installed to increase the buffer from the open riding area. This is slightly higher

than in 2017 and 2016 when 54% (28/52) and 50% (24/48) of known location nests, respectively, were within 328 feet of the exclosure fence. In 2016-18, all nests receiving bumpouts were in close proximity and near the eastern side of 6 and 7 exclosures, and therefore the bumpout fencing was moved and connected several times over the course of the nesting season as additional nests were initiated. In 2018, a bumpout was also installed to maintain a 328 foot buffer between the night roost and the open riding area. By the end of the season, the night roost bumpout and several nest bumpouts had coalesced into one large bumpout with multiple layers of fencing (Appendix C). Of the nests with bumpouts 81% (17/21) were documented to hatch. This compares to 79% (11/14) for all other nests not within 328 feet of the exclosure fence and open riding area (Appendix A).

For 2019, it is recommended to continue to provide a bumpout for tern nests within 328 feet (100 meters) of the open riding area fencing, as approved by CDFW. Nests in the open riding area should receive a single nest exclosure with a minimum radius of 328 feet. Nests will be monitored closely to assess the adequacy of protective fencing in reducing disturbance. If necessary, bumpouts or single nest exclosures may increase in size if disturbance to incubating birds is observed as a result of recreational activity. Tern chicks and the night roost will also be monitored and the bumpout size may be adjusted if chicks or night roosting birds are observed to remain within 328 feet of the eastern bumpout fence. ODSVRA will continue to maintain a safe vehicle corridor adjacent to the north and east fence, any bumpouts, and single nest exclosures.

Continue to provide adequate-sized bumpouts and single nest exclosures to protect snowy plover nests in or close to the open riding area

In 2018, snowy plover nests inside the Southern Exclosure and located within 100 feet of the north or east fence received temporary additional fencing to create a buffer from recreational activities in the open riding area. These bumpouts connect to the fence adjacent to the nests and extend into the open riding area. Nests inside the exclosure and more than 100 feet from the fence may also receive a bumpout if repeated disturbance from the open riding area is observed. For nests found in the open riding area, the protocol is to install a single nest exclosure with a minimum radius of 100 feet.

In 2018, two snowy plover nests (SP112 in 6 exclosure, SP103 in 8 exclosure) were given bumpouts to increase the distance from the nests to the open riding area fence to a minimum of 100 feet. The SP112 nest failed to unknown cause and SP103 hatched three chicks, two of which fledged (Appendix B).

For 2019, it is recommended to continue to install bumpouts for snowy plover nests close to the Southern Exclosure fence to create a buffer of at least 100 feet between the nest and the open riding area. Nests in the open riding area should receive a single nest exclosure with a minimum radius of 100 feet. Nests will be monitored closely to assess the adequacy of protective fencing in reducing disturbance. If necessary, bumpouts or single nest exclosures may increase in size if disturbance to incubating birds is observed as a result of recreational activity. ODSVRA will continue to maintain a safe vehicle corridor adjacent to the north and east fence, any bumpouts, and single nest exclosures.

Continue to enhance habitat in the Southern Exclosure by distributing natural materials and increase efficiency with the help of maintenance staff and heavy equipment

Natural materials such as driftwood, woodchips, and wrack (surf-cast kelp) should be distributed in large amounts within the exclosures (including the shoreline) to enhance habitat features. Exclosure areas with lower productivity should be identified, and additional habitat enhancement activities should be explored and tested, with the goal of improving nesting and chick rearing habitat in these areas. Since 2002, wrack has been gathered by hand and placed in the exclosure. Approximately 217 cubic yards of wrack were distributed on the exclosure shoreline during the 2018 season as habitat enhancement. Greater efficiencies may be possible for wrack distribution. Since 2008, ODSVRA monitoring staff has received assistance from available heavy equipment operators from park maintenance staff in loading woodchips to be distributed in the exclosure. However, a method using heavy equipment has not been found to collect and

distribute large amounts of wrack from the open riding to the seasonal shoreline exclosure. Attempts in the past resulted in more sand than wrack being collected with the equipment compared to hand collection. In 2019, it is recommended that methods to better use heavy equipment for wrack collection should be further explored. The goal would be to have heavy equipment available throughout the season to assist in loading large piles of wrack collected from the open riding area, to then be placed and distributed by permitted staff on the Southern Exclosure shore. This would increase staff efficiency and allow larger amounts of wrack to be dispersed, helping to maintain larger populations of invertebrate prey over a broader area for snowy plover chicks, fledglings, and adults. Broader distribution of wrack also provides shelter from wind and cover from predators. The use of heavy equipment needs to be balanced with other operational needs in the park.

Wrack and woodchip additions could also occur during the winter or prior to 1 March if materials and staff levels allow. As time permits, it is recommended to place large wrack piles in the winter or at the beginning of the season in the area where the seasonal exclosure will be located.

Continue to study the benefits of wrack addition to the Southern Exclosure shoreline and inoculation with wrack-associated invertebrates as a possible means to restore invertebrate species and biomass (these invertebrates are part of the prey base for snowy plover chicks, juveniles, and adults)

In 2007, a study was initiated by Drs. Jenifer Dugan and Mark Page, researchers from the Marine Science Institute at the University of California Santa Barbara (UCSB), examining the responses of invertebrate numbers and diversity in areas where wrack was added to the Southern Exclosure shoreline throughout the breeding season. Preliminary findings from the five-year study (2007-11) indicated that the seven-month seasonal closure (March-September) is not a sufficient period of time for invertebrates to effectively and naturally recover species diversity and abundance on the Southern Exclosure shoreline following five months of recreational use. In 2012, invertebrate sampling (by Dr. Dugan) was more limited, with one series of transects at the beginning of the season and repeated once at the end of the season. In 2013-18, park staff, following the same methodology, performed one series of invertebrate sampling at the end of the season and a beginning season sampling survey was done in 2015-18. The survey was comprised of 10 transects in the Southern Exclosure and three transects in North Oso Flaco (as a control). Samples were sent to Dr. Dugan at UCSB for analysis and findings added to the data set. For 2019, it is recommended to continue the beginning and end of season sampling. From 2012-18, park staff has inoculated wrack added to the shoreline with invertebrates following protocols developed by UCSB and it is recommended to continue these protocols in 2019.

In 2018, drone equipment (Phantom 4 Pro with DJI Phantom camera) was used to experiment with photographing the shoreline habitat over three days on 5-7 March. The drone made seven flights at an altitude of 120 feet (covering approximately 1.5 miles of shoreline), one flight at 150 foot altitude, and one flight at 250 foot altitude (covering approximately 0.5 miles), and was found to be highly effective at assessing habitat enhancement material distributed by staff. The flight at 250 feet produced imagery of a broader area, while still providing useful information about the habitat; individual wood pieces, wrack piles, and even footprints were visible. Each flight lasted about 20 minutes and shorebirds were not observed to be disturbed by the drone. It is recommended for 2019 to perform additional experimental drone flights, in consultation with USFWS, to develop protocols to amend the USFWS permit guidelines to include drone activity if necessary. Beginning and end of season drone flights will occur, as well as during the season, if permitted by USFWS. The goal of the trial flights would be to examine wrack manipulations on the Southern Exclosure shore and identify potential means to enhance the diversity and abundance of invertebrate species that are natural prey for plovers. Prior to any drone flight, the area would be scanned for any roosting or nesting plovers or terns. The USFWS permit would be amended, as necessary, and current monitoring guidelines will be followed, including not allowing the activity during high winds, rain, high temperatures, or if predators were present. During all drone flights, the behavior of terns and plovers

would be monitored closely by park staff and, if disturbance was observed, drone activity would cease and flight height would be increased until safely away from the nesting area.

Continue weekly gull surveys at the trash dumpster area
Full park monthly gull surveys were done from 2008-15, daily gull surveys at the trash dumpster area at marker post 2 were done from 2014-17. In 2018, surveys were limited to at least weekly surveys at the trash dumpster area because of time constraints. For 2019 it is recommended to continue weekly gull surveys as was done in 2018.

Continue to look for an appropriate design to cover trash dumpsters
The predator management strategy at ODSVRA includes methods to discourage attracting predators to the site. The large trash dumpsters (22 feet long, 20 cubic yard capacity) located near marker post 2 attract a large number of gulls landing on and foraging in the dumpsters. Four to six dumpsters are present during the busy summer months. In 2012, an experimental cover was designed for one dumpster, but it was removed because the design did not stand up well in high winds and quickly became ineffective. In late September of 2016, an experimental cover that has two openings with latches was tested on one dumpster, but was removed because the design did not meet ODSVRA needs.

Surveys at the dumpster area during the 2018 nesting season resulted with the month of August having the highest daily average number of gulls (189) and the maximum number of gulls present at one time was 445 on 13 August. It is recommended for 2019 to cover all the trash dumpsters in the marker post 2 area with lids designed to exclude gulls and meet the needs of the ODSVRA staff and visitors.

Continue to maintain option to salvage and rescue eggs, chicks, juveniles, and adults under very limited circumstances
In some circumstances the abandonment of least tern or snowy plover eggs and chicks can be directly attributed to human disturbance. The option to salvage such eggs and chicks to be raised in captivity by an approved facility and released in the wild is useful. Beginning in 2003, a limited number of abandoned but likely viable snowy plover eggs or chicks from ODSVRA were brought into captivity. Chicks were raised in a manner that they did not imprint on humans and were released into the wild when fledged. All fledglings were color-banded to individual to facilitate collecting information on movements, survival, and future reproductive success. Captive care should only be used selectively and not as a substitute for responding to the primary causes of elevated egg or chick abandonment rates.

Ongoing management actions that will continue in 2019

The following are part of our ongoing management actions and monitoring procedures for which a specific recommendation is no longer necessary (see Monitoring and Management Actions section for more detail). Background information and justifications for these management actions have been discussed in detail in previous annual reports.

- Oso Flaco area protection will continue at the same monitoring and management level as set in 2005 (Site Description).
- The Arroyo Grande Creek protected area will be clearly delineated as a closed area around the Arroyo Grande Creek and lagoon by using posts, symbolic rope, and signs as practiced since 2006 (Site Description).
- Night vision equipment will continue to be used for monitoring the least tern night roost. Goggle equipment has been used for monitoring since 2007 and a new thermal scope (Trijicon REAP-IR) was acquired and will be used in 2019.
- Continue monitoring least tern juveniles and the night roost. Continue monitoring foraging activity at nearby freshwater lakes, if time allows.
- Continue use of motion detector cameras for nest monitoring and train and permit additional monitoring staff as needed.
- Continue to use an anemometer with data logger from a wind tower to record daily wind speeds and direction.
- Continue option to use tern chick shelters.
- Continue option to use least tern chick fencing on the east side of the exclosure and a method to maintain the tern chick fencing will continue to be explored.
- Predator monitoring and management actions that have been in place since 2003 and 2004 will continue.
- The Seasonal Exclosure protected area will include the use of increased fence height as practiced since 2006 and use of aprons as used since 2007 to improve the effectiveness of the perimeter fence in protecting breeding terns and plovers.
- The Southern Exclosure and North Oso Flaco shoreline will continue to be protected; this includes maintaining the posts and rope at marker post 6 and Oso Flaco boardwalk intertidal zones to minimize trespass, which has been part of the management actions in these locations since 2008.
- Continue to position a large section of the 6 and 7 shoreline exclosure fence further east (inland by approximately 100 feet of the pre-2012 shoreline fence location) to provide a wider functional shoreline habitat. The shoreline fence should continue to be installed last (after all other fencing is installed) and as close to 1 March as possible to lessen the chance of storm-driven high surf damaging the fence.
- Continue use of 10-foot by 10-foot single nest exclosures with net tops, circular exclosures with net tops, and mini-exclosures as needed to protect nests from mammalian and avian predators. These small exclosures are not without risks to incubating adults and we will continue to closely monitor and evaluate their use.
- Surveys for plovers will continue during the nonbreeding season. These weekly surveys have been conducted since the winter of 2009-10.
- Continue to document impacts and, when possible, reduce disturbance caused by low-flying aircraft over the Southern Exclosure and Oso Flaco.

- Continue to work to address water quality issues at Oso Flaco Lake.
- Continue to work on outreach methods and informational signage at ODSVRA to increase public awareness of threats to nesting and roosting terns and plovers.
- Efforts to hire and retain skilled monitors throughout the year will continue at ODSVRA.

NOTES

Snowy plover chicks at north end of 6 exclosure shoreline and movement toward or into open riding area

Shoreline habitat provides a source of invertebrate prey for plovers and is an important area for raising chicks. At marker post 6 the boundary between the exclosure shore and the open riding area is signed and symbolically fenced to limit trespass of park visitors, but because of the changing tidal conditions it cannot be fenced to prevent chick movement into the open riding area. Each year there are snowy plover broods raised close to marker post 6 or found moving outside of the protected shoreline. In 2016 and 2017, there were seven broods (16 chicks, five fledged) and four broods (10 chicks, four fledged), respectively, observed in or very close to the open riding area. In 2018, there were five broods (12 chicks, three fledged) raised in this area. The broods were monitored closely, often during all daylight hours, and were directed away from the riding area when necessary. The gull flock that forms at the northern 6 exclosure shoreline, individual gulls, or other potential predators were also monitored. Several of these broods were raised in close proximity to each other and aggression between the associated adults or aggression towards chicks was observed. Possible reasons broods move from the north end of 6 exclosure into the open riding area may include the search for food; spacing out of broods to avoid territorial fighting of adults and attacks on chicks; and efforts to avoid predators, especially gulls forming a flock at the north end of 6 exclosure.

Two chicks from the SP28 nest were often foraging very close to the open riding area near marker post 6 and were monitored closely from 11 May, when one to two days old, until fledge age. Aggression between the adult of the SP28 brood and the associated adults of nearby broods was seen on multiple occasions. The SP28 brood was observed moving a short distance into the open riding area on seven occasions from 20 May to 6 June when 10 to 28 days old, and was directed back into the exclosure. Both chicks fledged but continued to be monitored closely while they were not yet flight confident. They were observed moving in the adjacent open riding area on multiple occasions and were directed back into the exclosure.

Three chicks from the SP33 brood were raised just south of marker post 6 at the border of the open riding area. They were monitored closely beginning on the 15 May hatch date and were seen very close to the open riding area on several occasions. Three chicks were last seen on 28 May at 12 to 13 days old and the brood was not seen subsequently.

The three chicks from the SP77 brood, two banded BB:WW and one unbanded, were raised on the northern 6 exclosure shoreline near the open riding area and the brood was monitored closely. Territorial aggression was observed on multiple occasions between the adult with the SP77 brood and adults associated with the nearby SP28 and SP78 broods. On 7 June, the three SP77 chicks (three to five days old) with an attending adult were seen in the open riding area approximately 125 feet north of marker post 6. Vehicle traffic was directed away from the area while the adult and chicks were directed back toward the exclosure. Aggression between the adult of the SP77 brood and another adult associated with a nearby brood prevented the SP77 brood from moving back into the exclosure until over an hour later. On the morning of 8 June, the three chicks and associated adult were seen moving slightly north of marker post 6 into the open riding area and the brood was directed back into the exclosure. Territorial aggression between the adults caused the unbanded chick to become slightly separated and the chick was aggressively attacked by the SP78 adult. The unbanded chick remained unattended through the evening and was not subsequently seen after 8 June. On 11 June, both banded chicks were seen but one was less active. Later the same day, the associated male was observed dragging a dead chick and no chicks were subsequently seen (see section titled Snowy plover carcasses collected or observed in this Notes section).

Three chicks from the SP78 nest were raised very close to the open riding area near marker post 6 and were monitored closely beginning 7 June. The brood was observed moving a short distance into the open riding area on two occasions, on 7 June when the three chicks were three and four days old, and on 12 June when

the remaining two chicks were eight to nine days old. On each occasion, the chicks were directed back into the exclosure. Aggression between the adult of the SP78 brood and the associated adult of nearby SP77 brood (and occasionally with the SP28 and SP38 adults) was observed on multiple occasions. A chick from this brood was observed attacked by an adult on five occasions between 12-15 June with observations including a chick being pecked at, picked up and dropped, or picked up and thrown. Three chicks were last seen on 10 June, two chicks last seen 14 June, and one chick fledged 2 July and continued to be seen near marker post 6 until 13 July.

One SP161 chick was raised just south of marker post 6 at the border of the open riding area and was monitored closely beginning on 19 July when one day old. Aggression between the associated male and nearby adults was seen on five occasions from 19 July to 31 July, but the chick was never observed to be attacked. Between 29 July to 6 August, the chick (11 to 19 days old) was observed moving a short distance into the open riding area multiple times, and on 7 August, the 20-day-old chick was depredated by a California gull at the north end of 6 exclosure.

Injured least tern, none sighted
No injured least terns were observed during the 2018 season.

Injured or sick snowy plover sightings
During the 2018 season, there were two to three adults, four juveniles, and three chicks observed sick or with injuries. If it was determined to be appropriate, an effort was made to capture the plover and take it to Pacific Wildlife Care in Morro Bay under the care of Dr. Shannon Riggs, DVM. In addition, two abandoned and immobile chicks were collected from the shoreline, both recovered after warmed in a brooder, and were taken to the Santa Barbara Zoo (see section titled Selective collection and transfer of abandoned chicks and potentially viable eggs in this Notes section).

Injured adult sightings
On 14 February, an unbanded plover was seen with an injured left leg or foot south of marker post 8 in the riding area. It was observed putting no weight on the left leg and the left foot appeared dark in color. On 26 April, an unbanded female was observed on the 8 exclosure shoreline with a left leg injury and was possibly the same individual seen on 14 February. It was also putting little weight on the left leg, which appeared swollen with fine hair attached. The bird was captured and transported to Pacific Wildlife Care the same day. The veterinarian surgically removed the fine hair-like material and one toe that was necrotic. It was treated with antibiotics and pain medication over the following days. On the morning of 30 April, the bird was found dead at Pacific Wildlife Care. USFWS was notified and the carcass was placed in a freezer at ODSVRA (medical record attached).

On 11 June, a male plover banded GA:WR was observed on the 6 exclosure shoreline with a left foot injury. It was putting no weight on the left leg and the middle toe on the left foot was swollen. The left leg was not swollen and the bands appeared to move freely. The bird was again seen 14 June at the southern boundary of Oso Flaco occasionally putting some weight on the left leg while walking.

Injured juvenile sightings
On 20 July, a 48- to 49-day-old juvenile banded GG:PG from the SP92 nest was seen on the northern 6 exclosure shoreline with a right leg injury. The bird was holding up the right leg and putting slight weight on the toes when walking. There were three GG:PG fledglings from the SP92 nest and one was last seen 11 August on the 8 exclosure shoreline without injury, but it is unknown if this was the bird previously seen injured.

From 4 to 9 August, a 40- to 45-day-old juvenile banded BB:WR from the SP141 nest was seen occasionally holding up its right leg and walking with a slight limp. The injured bird was seen actively foraging on the

shoreline in several locations from north of marker post 6 to South Oso Flaco. Two chicks hatched (both banded BB:WR) and fledged from the SP141 nest. One juvenile was last seen 25 August walking normally and without any noticeable injury, but it is unknown if this was the bird previously seen injured.

From 13 to 21 August, an unbanded juvenile plover was observed with a right wing injury on the shoreline of 7 and 8 exclosures. The wing was in an irregular position with the feathers extending across the back over the left side. On 20 August, capture was briefly attempted, and the plover was observed to fly low and out of sight. The juvenile was last seen 25 August on the 8 exclosure shoreline.

On 23 and 25 August, a 37- to 39-day-old juvenile banded VG:AR from the SP167 nest was seen on the 8 exclosure and North Oso Flaco shoreline with a left leg injury. The bird was occasionally lifting the left leg and putting slight weight on the leg. Only one chick was known to fledge from the SP167 nest. From 27 August to 9 September, the VG:AR juvenile was seen four additional times and no injury noted.

Injured or sick chick sightings

On 13 May, an unbanded seven-day-old chick from the SP29 nest was observed laying immobile on its side on the 8 exclosure shoreline. The associated adult attempted to brood the immobile chick briefly with the two banded siblings and the chick's legs moved slightly, indicating it was still alive. The adult and siblings moved away while the chick remained on the ground and immobile. The chick was placed in a warmed brooder with food and water, but the chick did not react to the talitrids and remained inactive. On the following morning, the chick was found dead in the brooder. USFWS was notified and the carcass was placed in a freezer. This chick was last seen actively foraging on 8 May at two days old. The two banded chicks from this brood were last seen 15 May and one chick fledged.

On 6 July, an unbanded 14- to 15-day-old chick from the SP120 nest was observed with missing neck feathers and the exposed skin appeared swollen. The chick was foraging and behaving normally with its unbanded sibling in South Oso Flaco. Two chicks hatched from this nest, only one chick was seen subsequent to 6 July, and one fledged.

On 6 July, an 11-day-old chick, banded PG:WY from the SP119 nest, was observed on the 6 exclosure shoreline with a right leg injury. The bird was foraging while the non-functioning right leg was limp and dragged on the ground. The bird was captured 8 July and transported to Pacific Wildlife Care where the right leg was treated for nerve injury, the free moving bands on right leg were removed, a splint placed on the curled under foot, and the bird was given antibiotics and anti-inflammatory medication. On 17 July, the veterinarian reported the bird was walking more normally and not limping but there was a small abrasion and swelling that developed on the right foot and it needed continued treatment. The leg and foot slowly improved and the bird was transferred to the Santa Barbara Zoo on 28 August at 64 days old (medical record attached). On 14 September, the plover was in a flight pen and reported to be moving well, keeping up with other plovers, and gaining weight. The fledgling continued to do well in the flight pen and was released (banded P W/G:- with white tape added to the top portion of green band and no bands on right leg) at McGrath State Beach, Ventura County, on 11 October at 108 days old.

Least tern carcass found

On 26 August, a dead least tern fledgling, banded G/Y:B/A from the LT34 nest, was found on the 8 exclosure shoreline near the waterline. The carcass was wet and intact, with a wound on the back of neck with fresh blood. CDFW was notified and the carcass was sent on 27 August to CDFW OSPR for necropsy. The report indicates the bird died from acute trauma with the wounds presumably caused by attempted predation by an avian predator (necropsy report attached). The fledgling was last seen alive 25 August on the 7 exclosure shoreline at 23 days old.

Snowy plover carcasses collected or observed

In 2018, a total of 15 carcasses (10 adults, two juveniles, and three chicks) were collected and three additional chick carcasses were observed but not collected. The proximity of young plover broods prevented the chick carcasses from being recovered. For carcasses found in the riding area, USFWS was notified and the carcasses were placed in a freezer at ODSVRA. For carcasses that received a necropsy, reports are attached. (There were also two plovers observed prior to death, one adult with a left leg injury that died at Pacific Wildlife Care and one unattended chick with limited mobility, both reported on in section titled Injured or sick snowy plover sightings in this Notes section.)

Carcasses of eight adult snowy plovers in the riding area

Details on eight adult snowy plover carcasses found to date in 2018 (1 January to 14 November) are provided below (no carcasses were found 7 November to 31 December 2017, subsequent to the 2017 annual report). No suggestion of predation was evident at any of the carcasses. USFWS was notified and, unless otherwise noted, the carcasses found in the riding area were placed in a freezer at ODSVRA. The eight carcasses in 2018, along with seven found in both 2017 and 2016 calendar years, is higher than the average of two carcasses (range=1-4) (all adults or juveniles) found per year in the riding area during the seven-year period 2009-15 (CDPR 2009-17).

On 1 February, a dead plover, banded VV:YB, was found in tire tracks north of marker post 6 in the riding area. The carcass was not flattened and appeared fresh. The bird fledged from ODSVRA in 2017.

On 9 February, a dead unbanded plover was found near the shoreline south of marker post 4 in the riding area. The bird was found in a fresh tire track and appeared flattened.

On 28 February, a dead female plover, banded GG:GG, was found at the base of the exclosure fence north of marker post 7 in the riding area. The carcass was partially buried but appeared fairly fresh. There were no vehicle tracks in the area of the carcass and it is likely that the bird died as a result of a fence strike. The bird fledged from ODSVRA in either 2011 or 2013 and was a known breeder at our site in 2014, 2016 and 2017. The bird was last seen in this general area on 19 February.

On 1 March, a dead unbanded plover was found east of marker post 7 in the riding area (area closed to riding later that morning) in an area with multiple vehicle tracks. One wing of the bird appeared twisted and no predator tracks were seen.

On 22 September, a dead unbanded adult plover was found east of the camping area north of marker post 5 in the riding area. The carcass appeared fresh and was found in an area with multiple vehicle tracks.

On 30 September, two dead unbanded adult plovers were found approximately 10 feet apart near the camping area north of marker post 5 in the riding area. The birds were found in an area with multiple vehicle tracks, appeared flattened, and were partially buried.

On 12 October, a dead unbanded adult plover was found east of the camping area between marker post 4 and 5 in the riding area. The carcass appeared fresh and was found in an area with multiple vehicle tracks.

Carcass of one snowy plover adult on the 8 exclosure shoreline

On 1 September, desiccated partial remains from an adult plover banded RR:BG were found on the 8 exclosure shoreline. Two chicks banded RR:BG fledged from ODSVRA in 2016. A male with this combination was known breeding at our site in 2017 and was last seen 19 November 2017.

Carcass remains of one snowy plover, suspected adult, in South Oso Flaco

On 6 September, the desiccated partial remains of a snowy plover, suspected adult, were found in South Oso Flaco. Parts found included a partial bill, leg, and feathers.

Carcasses of two snowy plover juveniles on the 8 exclosure shoreline

On 2 July, a dead juvenile snowy plover, banded BB:VG from the SP64 nest, was found on the immediate edge of the active SP174 nest bowl on the 8 exclosure shoreline. (The SP174 nest was a renest by the SP64 associated banded male and both nests were in similar locations.) The intact carcass was in rigor and appeared fresh. USFWS was notified and the carcass was placed in a freezer at ODSVRA. Two chicks banded BB:VG fledged from the SP64 nest and both were last seen alive on the 8 exclosure shoreline on 30 June when 38 to 39 days old. U.S. Geological Survey National Wildlife Health Center performed a necropsy and the report indicates it died from pulmonary hemorrhage, but the cause of the hemorrhage was not determined (see attached necropsy report). The SP174 nest hatched three chicks on 21 July.

On 9 August, a dead, unbanded juvenile plover was found on the 8 exclosure shoreline. The intact carcass was wet, possibly washed by the ocean, and some blood was seen on the underside of the bird. USFWS was notified and the carcass was sent to CDFW OSPR for necropsy. Radiographs of the carcass did not show any fractures and it was too desiccated for additional analysis. The remains were donated to the California Academy of Sciences in San Francisco.

Carcass of one snowy plover chick in 7 exclosure

On 14 August, the carcass of an unbanded, newly hatched sized chick was found five feet from the SP200 nest bowl in 7 exclosure. The nest bowl was empty and chick likely hatched from the nest. The carcass was extremely desiccated with large openings on the right side of the body and right side of the head. On 3 August, the SP200 nest hatched one chick (banded PV:PR) and the two remaining eggs had no cracks. On 6 August, the PV:PR chick was seen on the 8 exclosure shoreline with a SP200 adult banded PG:OW. The following day, the four-day-old chick was adopted by the SP220 brood on the North Oso Flaco shoreline and this chick fledged. A bird continued attending the original SP200 nest from 3-10 August. On 7 August, a second chick hatched (banded GG:RY) and the remaining egg was pipped and peeping (assumed to hatch and found as carcass on 14 August). The GG:RY chick was not subsequently seen.

Carcasses of two snowy plover chicks in South Oso Flaco

On 6 September, one small, desiccated chick carcass, banded VV:YB from the SP49 brood, was found on the South Oso Flaco shoreline in the general area of the nest and where the brood was raised. Three chicks were last seen 28 May, two last seen on 13 June, and the remaining chick was last seen on 15 June at 19 days old.

On 23 September, the desiccated partial remains of a small chick were found in South Oso Flaco. Remains were partially buried and the pink and violet bands found indicate it was likely a chick banded PV:AY from the nearby SP105 nest. Three chicks from this brood were raised in close proximity to the nest location and were last seen 28 June at 10 days old.

Carcasses of three snowy plover chicks on the shoreline of 6 and 7 exclosures not collected

On 11 June, one chick banded BB:WW from the SP77 brood, raised on the north end of the 6 exclosure shoreline, was observed to be alive but less mobile than the sibling. The brood was monitored closely and the associated adult male occasionally brooded both chicks but attendance to the less mobile chick was minimal throughout the day. In the afternoon of the same day, only the one immobile chick was seen with the adult periodically attempting to brood, and at 6:30 pm the adult was observed dragging a chick. The chick appeared dead and the carcass could not be recovered due to the proximity of young plover broods. The brood was not seen after this date and no chicks are known to have fledged (see section titled Snowy

plover chicks at north end of 6 exclosure shoreline and movement toward or into open riding area in this Notes section).

On 12 July, the carcass of one unbanded chick from the SP169 brood was observed on the 7 exclosure shoreline with the sibling and associated adults nearby. Two chicks hatched from this nest and both chicks were seen 11 July at four days old. The carcass could not be recovered due to the proximity of young plover broods.

On 24 July, an unbanded chick carcass (unknown nest number) was observed held in the bill of a whimbrel (*Numenius phaeopus*) on the 6 exclosure shoreline. The carcass was limp and may have been dead prior to the whimbrel picking it up. The whimbrel shook the carcass, attempted to eat the chick, and flew a short distance with it after it was briefly chased by a gull. The chick carcass was not relocated.

Selective collection and transfer of abandoned chicks and potentially viable eggs

Management strategies may include the collection of abandoned but potentially viable eggs or chicks under select circumstances. Such eggs or chicks may be considered for collection if disturbance factors from visitors or park management efforts may have been a factor in the abandonment. Examples of such factors include but are not limited to: abandoned eggs or chicks from a nest in the open riding area; abandoned eggs or chicks from a nest with a single wire nest exclosure such as a circular exclosure, with suspected adult mortality; or abandoned eggs or chicks from a nest near the park's two-inch by four-inch fencing that may have increased the amount of windblown sand on the nest. Collected potentially viable eggs are first assessed for transfer to nests which are being actively incubated but determined to have nonviable eggs (well past estimated hatch date). When no nest is available, and in consultation with USFWS, potentially viable eggs are transported to the Santa Barbara Zoo for captive-rearing. Collected abandoned chicks are first assessed for possible reuniting with their associated adults; if not possible, they are transported to the Santa Barbara Zoo for captive-rearing. In 2018, two abandoned chicks were collected in the field and transported to the Santa Barbara Zoo for captive-rearing (one was initially treated at Pacific Wildlife Care). Five nests abandoned pre-term had their eggs (n=14) collected in the field and were transported to the Santa Barbara Zoo for captive-rearing.

<u>One chick from an unknown nest transported to Pacific Wildlife Care and later to the Santa Barbara Zoo</u>

On the morning of 27 July, one small, unbanded chick of unknown age (less than a week old) from an unknown brood was observed on the 7 exclosure shoreline not moving and lying unnaturally on its back. The chick was unattended by an adult and a male plover was aggressively pecking and carrying the chick. The chick was collected and found to be alive but cold and not breathing normally. It was placed in a warmed brooder and immediately transported to Pacific Wildlife Care (medical record attached). The chick recovered and was transferred to the Santa Barbara Zoo on 3 August. It was banded PA:GY and was released as a fledgling at McGrath State Beach, Ventura County, on 11 October at approximately 80 days old.

<u>One chick from the SP201 nest transported to the Santa Barbara Zoo</u>

On 17 August, one nine-day-old chick banded PG:RG and from the SP201 nest was observed lying face down with wings out on the 8 exclosure shoreline and separated from the adult and two siblings. The brood was monitored from a distance and the chick had some slight movements indicating it was alive, but appeared weak and the chick remained unattended by the adult. The chick was collected, placed in a warmed brooder, and quickly became active and was fed talitrids. The chick could not be reunited the same day because of the close proximity of young snowy plover broods and was kept in the brooder overnight. The following morning, reuniting the chick with its brood was attempted but unsuccessful. The chick was rebanded PA:RG and transported to the Santa Barbara Zoo 18 August. The chick fledged and was released at McGrath State Beach, Ventura County, on 11 October at 64 days old.

Three eggs from the SP9 nest transported to the Santa Barbara Zoo

The SP9 nest in South Oso Flaco was found as a one-egg nest on 4 April. A circular exclosure and a camera were installed on 10 April when at three eggs, and the nest was incubated by an adult after the installations. The nest had inconsistent incubation by an unbanded female from 12-19 April. On 21 April, the nest was determined to be abandoned and the three eggs were collected, placed in a warmed brooder, and transported to the Santa Barbara Zoo the same day. Upon examination, one egg was determined to be nonviable and two eggs had active embryos. Of the two active eggs, one stopped development 7 May and the other egg hatched on 11 May. The chick reached fledge age, was banded PA:AG (pink band above joint), and was released at VAFB, Santa Barbara County, on 1 August at 82 days old.

Three eggs from the SP90 nest transported to the Santa Barbara Zoo

On 11 May, the three-egg SP90 nest was found in South Oso Flaco and a bird was seen incubating. The same day, a circular exclosure was installed and the symbolic fence was moved west to decrease possible pedestrian disturbance. The following day, no bird was seen on the nest, but the associated male banded NR:WB was nearby, and a nest camera was installed. Daily nest checks and the nest camera confirmed inconsistent incubation from 12-14 May and nest was abandoned 14 May. On 17 May, the three eggs (mostly buried) were collected and transported to the Santa Barbara Zoo. All three eggs were viable and two chicks hatched 9 June. The third chick died in the process of hatching. Both chicks reached fledging age, and were banded PA:AR and PA:AW (pink bands placed above the joint). The fledglings were released at VAFB on 1 August at 53 days old.

Three eggs from the SP80 nest transported to the Santa Barbara Zoo

The SP80 nest in South Oso Flaco was found as a two-egg nest on 7 May. A circular exclosure and a camera were installed on 9 May when at three eggs. On the morning of 18 May, no bird was present and no eggs were visible. Three eggs were found fully buried within the circular and they were placed on the sand surface. The following day, no bird was on the nest, and the three eggs were partially buried and unmoved. Camera information indicated there were high winds on 17 May beginning at 11:35 am, the adult was unable to keep the eggs from being buried while inside the circular exclosure, and abandoned the nest that afternoon at 3:30 pm. The three eggs were collected 19 May, placed in a warmed brooder, and transported to the Santa Barbara Zoo the same day. Upon examination, two eggs showed no development and fertility could not be confirmed. The remaining egg hatched on 8 June. The chick reached fledge age, was banded PA:AY (pink band above the joint), and was released at VAFB on 1 August at 54 days old.

Two eggs from the SP59 nest transported to the Santa Barbara Zoo

The SP59 nest in eastern 8 exclosure was found as a one-egg nest on 24 April. The nest progressed to three eggs but one egg was lost after 13 May. The nest had consistent incubation but on two occasions a bird was observed moving off the nest when monitors moved on foot east of the exclosure to access a nest viewing blind. On 26 May, both eggs were tapping and expected to hatch. On 27-29 May, no bird was on the nest or nearby. On 29 May, the two abandoned eggs with hatching cracks were mostly buried, the eggs were collected, placed in a warmed brooder, and transported to the Santa Barbara Zoo. Both chicks in the eggs were alive on arrival and the eggs were opened a bit to assist the hatching process. The two chicks hatched 30 May, but one chick was quite weak and did not survive. The other chick reached fledge age, was banded PA:BR (pink band above the joint), and was released at VAFB on 1 August at 63 days old.

Three eggs from the SP118 nest transported to the Santa Barbara Zoo

The SP118 nest in South Oso Flaco was found as a three-egg nest on 28 May and a circular exclosure was installed the same day. The nest had an incubating adult from the date found to 9 June. On 12 June, no bird was present, the three eggs were found completely buried within the circular exclosure, and the eggs were placed on the sand surface. The following day, the nest was determined to be abandoned and the three eggs were collected, placed in a warmed brooder, and transported to the Santa Barbara Zoo the same day. One

egg had no development and one died in late embryonic stage. The remaining egg hatched 26 June, but the chick had a malformed beak, was weak, and was euthanized the same day.

LITERATURE CITED

CDPR. 2017. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2017 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2016. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2016 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2015. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2015 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2014. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2014 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2013. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2013 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2012. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2012 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2011. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2011 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2010. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2010 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2009. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2009 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2008. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2008 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

CDPR. 2007. Nesting of the California least tern and western snowy plover at the Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California 2007 Season. Unpublished Report, CDPR, Off-Highway Motor Vehicular Recreation Division.

eBird. 2018. eBird: An online database of bird distribution and abundance (web application). eBird, Ithaca, New York. Available: http://www.ebird.org (accessed: September 2018).

iNaturalist 2018. Available: http://www. iNaturalist.org (accessed: September 2018).

Frost, N. 2017. California least tern breeding survey, 2016 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2017-03. Sacramento, CA.

Frost, N. 2016. California least tern breeding survey, 2015 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2016-01. Sacramento, CA.

Frost, N. 2015. California least tern breeding survey, 2014 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2015-01. Sacramento, CA.

Frost, N. 2014. California least tern breeding survey, 2013 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2014-06. Sacramento, CA.

Frost, N. 2013. California least tern breeding survey, 2012 season. California Department of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report, 2013-01. Sacramento, CA.

Marschalek, D.A. 2012. California least tern breeding survey, 2011 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2011. California least tern breeding survey, 2010 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2010. California least tern breeding survey, 2009 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2009. California least tern breeding survey, 2008 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2008. California least tern breeding survey, 2007 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2007. California least tern breeding survey, 2006 season. California Department of Fish and Game. Sacramento, CA.

Marschalek, D.A. 2006. California least tern breeding survey, 2005 season. California Department of Fish and Game. Sacramento, CA.

Massey, B.W. and J.L. Atwood. 1981. Second-wave nesting of the California least tern: age composition and reproductive success. Auk 98:595-605.

Page, G.A., J.S. and J.C. Warriner, and P.W.C. Paton. 1995. Snowy Plover (*Charadrius alexandrinus*). In The Birds of North America, No. 154, (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington DC.

Thompson, B.C., J.A. Jackson, J. Burger, L.A. Hill, E.M. Kiroch, and J.L. Atwood. 1997. Least Tern (*Sterna antillarum*). In The Birds of North America, No. 290, (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

USFWS. 2007. Recovery Plan for the Pacific Coast Population of the western Snowy Plover (*Charadrius alexandrinus nivosus*). In two volumes. Sacramento, CA. xiv+751pp.

USFWS. 2006. Five-Year Review Summary and Evaluation for the California Least Tern (*Sterna antillarum browni*). USFWS, Carlsbad, CA. September 2006.

USFWS. 1985. Recovery Plan for the California Least Tern (*Sterna antillarum browni*). USFWS, Portland, OR. 112 pp.

Warriner, J.S., J.C. Warriner, G.W. Page and L.E. Stenzel. 1986. Mating system and reproductive success of a small population of polygamous snowy plovers. Wilson Bulletin 98(1):15-37.

APPENDICES

APPENDIX A. CALIFORNIA LEAST TERN NESTS AT ODSVRA IN 2018.

Least tern chicks were banded with green over yellow vinyl tape on a size 1A blank aluminum band on the left leg and a size 1A numbered aluminum federal band on the right. Color tape was placed on the federal band to create combinations unique to individual. Chicks were weighed immediately prior to banding, typically at one to three days old. Four chicks from four hatching nests were not banded. Two unbanded young fledglings were confirmed separately in 7 exclosure on 29 July and 11 August (with obvious age and plumage differences) but unknown from which nests. Evidence supports these two unbanded fledglings originated at ODSVRA. One additional G/Y:- banded fledgling was documented after it lost the right band and could not be associated with a nest number, but is known to have originated at ODSVRA. Information on adult pair is provided where known. Sex of adults is typically not known. Contents of several nonhatching eggs were examined for fertilization post-season at the Santa Barbara Museum of Natural History.

Location: 6 = 6 exclosure, 7 = 7 exclosure, 8 = 8 exclosure

U = unbanded

unk = unknown

na = estimated date not available due to insufficient information

? = unconfirmed band combinations or colors

≥ = minimum of one egg in nest and unable to confirm final egg number

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
1	6	banded	27-May	Hatch	20-Jun	2	2 (2)	G/Y:P (7.3) -:N (6.6)	G/Y:P -:N	Bumpout Seasonal Exclosure	One chick originally banded G/Y:N on 22 June lost band from left leg and first seen as -:N at 28 days old.
2	6	U	na	Abandoned pre-term	17-Jun	2	0 (0)			Bumpout Seasonal Exclosure	Nest seen incubated on 18 days from 29 April-16 June. Two eggs collected 21 August. One egg had approximately 2.5-week-old dead embryo when contents examined.
3	6	W/B:W U	26-May	Hatch	16-Jun	2	2 (2)	G/Y:K (6.0) G/Y:R (6.0)	G/Y:K G/Y:R	Bumpout Seasonal Exclosure	
4	7	W/B:W/Y	30-May	Hatch	22-Jun	2	2 (1)	U G/Y:L (6.2)	G/Y:L	Bumpout Seasonal Exclosure	One unbanded chick last seen on 24 June at 2 days old.
5	7	banded	29-May	Hatch	19-Jun	1	1 (1)	G/Y:B (5.9)	G/Y:B	Seasonal Exclosure	

Appendix A. California least tern nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
6	7	B/R:(W/B)?	30-May	Hatch	20-Jun	2	1 (1)	G/Y:Y (8.5)	G/Y:Y	Seasonal Exclosure	One egg had inward dent and nonhatching cracks when nest walked to on 20 and 22 June. No egg was found when nest walked to 27 August.
7	7	Y/O:W/B U	26-May	Hatch	20-Jun	1	1 (1)	G/Y:V (9.0)	G/Y:V	Bumpout Seasonal Exclosure	
8	7	(W:B/W)?	30-May	Hatch	20-Jun	2	2 (1)	G/Y:W (10.2) G/Y:G (4.6)	G/Y:W	Seasonal Exclosure	G/Y:G chick last seen 10 July at 19 days old.
9	7	U	30-May	Hatch	20-Jun	2	2 (2)	G/Y:A (5.5) G/Y:O (6.2)	G/Y:A G/Y:O	Seasonal Exclosure	
10	6	Y/G:B/W U	30-May	Hatch	20-Jun	2	2 (2)	G/Y:W/R (7.3) G/Y:W/B (9.2)	G/Y:W/R G/Y:W/B	Bumpout Seasonal Exclosure	
11	7	U	4-Jun	Hatch	27-Jun	2	1 (1)	G/Y:R/W (10.6)	G/Y:R/W	Seasonal Exclosure	On 30 June, 1 chick was banded and 1 egg with large crack and dead chick inside. No egg found when nest walked to 27 August.
12	6		na	Failed, unknown cause	(10-Jun)	1	0 (0)			Bumpout Seasonal Exclosure	On 5 June, 1 egg seen at nest. Nest seen incubated on 6 days from 4-9 June. Unable to confirm incubation 10-11 June. No eggs found when nest walked to 12 June. Fate occurred during period of high winds.
13	6		na	Abandoned pre-term	10-Jun	2	0 (0)			Bumpout Seasonal Exclosure	On 5 June, 2 eggs seen at nest. Nest seen incubated on 5 of 7 days from 3-9 June. Nest was not seen incubated 11-12 June. Two eggs were found 25% buried at nest bowl when walked to on 11 June and were collected on 22 August. Fate occurred during period of high winds. No sign of fertilization when egg contents examined.

Appendix A. California least tern nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
14	6		na	Abandoned pre-term	(7-Jun)	≥1	0 (0)			Seasonal Exclosure	Nest location known by multiple observations of incubating adult from 4-6 June. Unable to confirm incubation 7-9 June. No eggs found when nest walked to 25 August. Fate occurred during period of high winds.
15	7		na	Abandoned pre-term	(9-Jun)	1	0 (0)			Seasonal Exclosure	Nest found at 1 egg on 6 June. Nest seen incubated on 2 of 3 days from 6-8 June. One egg found 50% buried at nest bowl when walked to on 12 June and was collected on 27 August. Fate occurred during period of high winds. No sign of fertilization when egg contents examined.
16	6		3-Jun	Hatch	29-Jun	1	1 (unk)	U		Bumpout Seasonal Exclosure	One unbanded chick seen 4 times from 10-18 July, and based on size and location is believed to be from this nest. Chick last seen on 18 July at 19 days old.
17	6	banded	na	Abandoned post-term	16-Jul	2	0 (0)			Bumpout Seasonal Exclosure	On 10 June, nest found at 2 eggs. One egg had dried yolk material around small indented hole and on 11 June was 6 inches outside nest bowl. Nest seen incubated on 36 days from 10 June to 15 July. On 13, 17, and 31 July only 1 egg (not cracked) in nest bowl and was collected 22 August. No sign of fertilization when egg contents examined.
18	6		10-Jun	Hatch	2-Jul	2	2 (2)	G/Y:W/Y (10.3) G/Y:W/A (9.3)	G/Y:W/Y G/Y:W/A	Bumpout Seasonal Exclosure	

Appendix A. California least tern nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
19	6	U ?:G/Y	11-Jun	Hatch	2-Jul	1	1 (1)	G/Y:B/W (9.1)	G/Y:B/W	Bumpout Seasonal Exclosure	
20	6	U	13-Jun	Hatch	4-Jul	1	1 (unk)	U		Bumpout Seasonal Exclosure	One unbanded chick seen 6 times from 4-12 July, and based on size and location is believed to be from this nest. Chick last seen on 12 July at 8 days old.
21	6	U	20-Jun	Hatch	11-Jul	2	2 (1)	G/Y:W/O (6.7) G/Y:W/G (7.3)	G/Y:W/G	Bumpout Seasonal Exclosure	G/Y:W/O chick last seen 1 August at 20 days old.
22	7	-:W/A/W Y/G:W/R/W	22-Jun	Hatch	13-Jul	2	2 (2)	G/Y:B/O G/Y:B/Y	G/Y:B/O G/Y:B/Y	Bumpout Seasonal Exclosure	
23	7	U	23-Jun	Hatch	15-Jul	1	1 (0)	G/Y:G/W (4.5)		Seasonal Exclosure	G/Y:G/W chick last seen 30 July at 15 days old.
24	6	U W/B:R/Y	22-Jun	Hatch	15-Jul	2	2 (2)	G/Y:R/B (11.1) G/Y:Y/B (9.2)	G/Y:R/B G/Y:Y/B	Bumpout Seasonal Exclosure	
25	6	-:A/B U	23-Jun	Hatch	14-Jul	1	1 (1)	G/Y:A/W (6.7)	G/Y:A/W	Bumpout Seasonal Exclosure	
26	6	Y/R:W/B	23-Jun	Hatch	14-Jul	2	2 (1)	G/Y:Y/W (6.3) G/Y:O/B (8.0)	G/Y:O/B	Bumpout Seasonal Exclosure	On 15 July, 1 chick banded G/Y:Y/W, lost the band from the left leg by 16 July, and band replaced 17 July (chick weighed 9.0 grams). G/Y:Y/W chick last seen 17 July at 3 days old.
27	7		23-Jun	Hatch	14-Jul	1	1 (1)	G/Y:O/W (8.6)	G/Y:O/W	Seasonal Exclosure	
28	6	U B/W:(A/W)?	24-Jun	Hatch	17-Jul	2	2 (1)	G/Y:O/G (7.2) G/Y:G/O (9.5)	G/Y:O/G	Bumpout Seasonal Exclosure	G/Y:G/O chick last seen 5 August at 19 days old.
29	7	Y/G:(R/B)? U	25-Jun	Hatch	16-Jul	2	2 (2)	G/Y:O/A (8.2) G/Y:O/Y (10.3)	G/Y:O/A G/Y:O/Y	Bumpout Seasonal Exclosure	
30	6	(R or B)?:W/B U	28-Jun	Hatch	22-Jul	1	1 (1)	U	U	Symbolic fence	Nest located on 6 exclosure shoreline outside of Seasonal Exclosure fencing.
31	6	banded	29-Jun	Hatch	21-Jul	1	1 (1)	G/Y:Y/G (8.9)	G/Y:Y/G	Seasonal Exclosure	

Appendix A. California least tern nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledge)	Chick band combination and weight (grams)	Confirmed fledged	Nest protection type	Notes
32	6	U	na	Abandoned post-term	29-Jul	1	0 (0)			Seasonal Exclosure	On 29 June, nest found at 1 egg and seen incubated on 30 days from 29 June to 28 July. One egg collected 8 August. Egg had approximately 2.5-week-old dead embryo when contents examined.
33	7	U banded	30-Jun	Hatch	23-Jul	1	1 (1)	G/Y:Y/O (9.1)	G/Y:Y/O	Seasonal Exclosure	
34	7	U	12-Jul	Hatch	2-Aug	1	1 (1)	G/Y:B/A (5.6)	G/Y:B/A	Bumpout Seasonal Exclosure	On 26 August, G/Y:B/A fledgling found dead on 7 exclosure shoreline, last seen alive 25 August at 23 days old (see report Notes section).
35	7	R/W:W/B	21-Jun	Hatch	12-Jul	2	2 (1)	G/Y:B/R (15.8) G/Y:A/B (22.3)	G/Y:A/B	Seasonal Exclosure	On 17 July, two chicks found with two adults in 7 exclosure, banded same day. Nest assumed to have been in 7 exclosure based on earlier sightings of adult behavior suggesting a nest and then location of brood.

APPENDIX B. SNOWY PLOVER NESTS AT ODSVRA IN 2018.

Plover chicks were banded to brood. Split hatch noted for nests when hatching of all chicks in the brood may have occurred over more than one day. Contents of several nonhatching eggs were examined for fertilization post-season at the Santa Barbara Museum of Natural History. The majority of unbanded chicks were not banded to avoid disturbing nearby young snowy plover broods.

In reading the codes of color-banded birds the left leg is shown first and separated by a colon from the right leg. If two bands are on a single leg the upper band is shown first. Colors for letter codes: A = aqua (light blue), B = dark blue, G = dark green, L = lime (light green), K = black, N = brown, O = orange, P = pink, R = red, S = silver (bare metal federal band), V = violet, W= white, Y = yellow.

Location: 6 = 6 exclosure, 7 = 7 exclosure, 8 = 8 exclosure, BY = Boneyard exclosure, NOF = North Oso Flaco, SOF = South Oso Flaco

Adult pair: M = male, F = female, U = unbanded

Nest protection type: see Management Actions for description of Seasonal Exclosure, circular exclosure, symbolic fence, and bumpout.

na = estimated date not available due to insufficient information

? = unconfirmed band combinations or colors

≥ = minimum of one or two eggs in nest and unable to confirm final egg number

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
1	BY	F= M=U	1-Apr	Hatch	6-May	3	3 (2)	3 VV:AG	Seasonal Exclosure	
2	7	F=U M=PV:WY	3-Apr	Hatch	6-May	3	2 (2)	2 VG:YG	Seasonal Exclosure	One egg (with hatching-like cracks) abandoned post-term. Band combination also used on 3 chicks hatching from SP25 on 4 May and 2 known to fledge.
3	6	F= M=	na	Depredated, avian	8-Apr	2	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
4	7	F=U M=U	30-Mar	Hatch	2-May	3	2 (1)	2 VG:GB	Seasonal Exclosure	One egg (with hatching-like cracks) abandoned post-term.
5	6	F= M=	na	Depredated, raven	5-Apr	3	0 (0)		Seasonal Exclosure	
6	6	F=U M=	31-Mar	Depredated, raven	5-Apr	3	0 (0)		Seasonal Exclosure	
7	6	F= M=	30-Mar	Depredated, raven	5-Apr	3	0 (0)		Seasonal Exclosure	
8	8	F=U M=U	3-Apr	Abandoned pre-term	20-Apr	3	0 (0)		Seasonal Exclosure	Nest camera confirmed inconsistent incubation with nest ultimately abandoned.
9	SOF	F=U M=U	4-Apr	Abandoned pre-term	20-Apr	3	0 (0)		Circular excl. with top Symbolic fence	Nest camera confirmed inconsistent incubation prior to abandonment. On 21 April, 3 eggs taken to Santa Barbara Zoo. One egg hatched, chick fledged and banded PA:AG (see report Notes section).
10	SOF	F=U M=GA:WW	4-Apr	Depredated	12-Apr	3	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
11	SOF	F=VV:GW M=	4-Apr	Depredated, gull	13-Apr	3	0 (0)		Symbolic fence	
12	SOF	F=U M=-:YG	4-Apr	Hatch	7-May	3	3 (0)	3 PG:RW	Circular excl. with top Symbolic fence	
13	SOF	F=U M=	2-Apr	Depredated, gull	13-Apr	3	0 (0)		Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
14	8	F=U M=U	2-Apr	Depredated, avian	19-Apr	3	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
15	SOF	F=U M=U	2-Apr	Hatch (Split)	5-May	3	3 (0)	3 VG:WG	Circular excl. with top Symbolic fence	Last chick sighting on 11 May and not known to fledge. Band combination reused on 3 chicks hatching from SP198 on 11 August.
16	8	F= M=	4-Apr	Abandoned pre-term	7-Apr	2	0 (0)		Symbolic fence	
17	NOF	F= M=	na	Depredated, avian	7-Apr	3	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
18	NOF	F= M=	4-Apr	Depredated, avian	8-Apr	2	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
19	NOF	F=U M=	4-Apr	Depredated, avian	10-Apr	3	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
20	7	F= M=	na	Depredated, avian	13-Apr	2	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
21	8	F= M=	9-Apr	Overwashed by tide	12-Apr	1	0 (0)		Symbolic fence	On 9 April, found as 1 egg in defined nest bowl with tracks.
22	NOF	F=U M=GG:OR	9-Apr	Depredated, avian	16-Apr	2	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
23	7	F=U M=U	7-Apr	Hatch (Split)	11-May	3	2 (1)	2 VG:PG	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
24	7	F=U M=U	9-Apr	Hatch	15-May	3	3 (2)	3 BB:GW	Seasonal Exclosure	
25	7	F=U M=U	1-Apr	Hatch	3-May	3	3 (2)	3 VG:YG	Seasonal Exclosure	Band combination also used on 2 chicks from SP2, both fledged.
26	6	F=?:YG M=U	10-Apr	Hatch	14-May	3	3 (0)	3 VG:PW	Seasonal Exclosure	Last sighting of brood on 19 May when an unbanded adult male observed picking up, dropping, and pecking at chick. Immediately afterward chick continued to forage, with no attending adult or sibling in area (see report Notes section).
27	SOF	F= M=	8-Apr	Depredated, avian	13-Apr	3	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
28	6	F=U M=U	7-Apr	Hatch (Split)	9-May	2	2 (2)	2 GG:OY	Seasonal Exclosure	Band combination also used on 3 chicks hatching from SP215 on 19 June and 2 were known to fledge. Brood raised on northern 6 exclosure shoreline near the open riding area. On 7 occasions between 20 May-1 June the brood was observed to enter the open riding area (see report Notes section).
29	8	F=VV:GR M=U	3-Apr	Hatch (Split)	5-May	3	3 (1)	2 BB:RG 1 unbanded	Seasonal Exclosure	On 13 May, unbanded 7-day-old chick observed immobile, placed in brooder, and was dead the following morning (see report Notes section).
30	8	F=U M=PV:YB	11-Apr	Hatch	16-May	2	2 (2)	2 VV:OW	Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
31	NOF	F= M=	na	Depredated, avian	13-Apr	2	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
32	6	F=U M=BB:BG	11-Apr	Hatch	20-May	3	3 (3)	3 VV:AB	Seasonal Exclosure	
33	6	F= M=U	11-Apr	Hatch (Split)	15-May	3	3 (0)	3 VG:WY	Symbolic fence	Brood raised on northern 6 exclosure shoreline near the open riding area (see report Notes section).
34	6	F=U? M=(GG)?:PW	na	Depredated, raven	17-Apr	1	0 (0)		Symbolic fence	
35	6	F=RR:BW M=U	13-Apr	Hatch	20-May	3	2 (0)	2 unbanded	Symbolic fence	One egg (without cracks) abandoned post-term. On 30 May, both 10-day-old chicks observed depredated by western gull (see Appendix H).
36	SOF	F= M=	13-Apr	Depredated, avian	17-Apr	2	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
37	SOF	F=PG:- M=PG:OW	11-Apr	Hatch	13-May	3	2 (1)	2 RR:WY	Circular excl. with top Symbolic fence	One egg unknown fate. On 25 May, one 12- to13-day-old chick observed south of southern park boundary with associated male and fledged in same area.
38	6	F=BB:YW M=U	16-Apr	Hatch	19-May	3	3 (2)	3 GA:BB	Seasonal Exclosure	On 22 May, SP38 male adopted a banded chick from SP44. This chick was last seen on 26 May at 9 days old. On 27 May, the male adopted a 3-day-old chick from SP72 and this chick fledged.
39	7	F=U M=	na	Depredated, raven	17-Apr	3	0 (0)		Seasonal Exclosure	
40	6	F= M=	na	Failed, unknown cause	18-Apr	1	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
41	8	F=U M=GA:OW	13-Apr	Hatch	16-May	3	3 (1)	3 VV:VY	Symbolic fence	
42	8	F=U M=U	17-Apr	Hatch	21-May	3	1 (1)	1 PV:VB	Seasonal Exclosure	Two eggs unknown fate.
43	6	F=(GG:GR)? M=	9-Apr	Abandoned pre-term	3-May	3	0 (0)		Seasonal Exclosure	Nest last seen incubated on 30 April. On 1 May, 3 eggs 1 inch apart with no nest bowl. Eggs marked and placed in shallow bowl. Eggs found slightly rotated on 2 May. Three eggs had approximately 1-week-old embryos when contents examined.
44	6	F=VV:RY M=AG:GA	17-Apr	Hatch	17-May	3	3 (1)	3 BB:BW	Seasonal Exclosure	One 5-day-old chick adopted by SP38 brood beginning 22 May, chick last seen 26 May and not known to fledge.
45	6	F=VV:BG M=U	21-Apr	Hatch	24-May	3	2 (0)	2 unbanded	Symbolic fence	One egg unknown fate.

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
46	7	F=U M=Y-:GO	21-Apr	Hatch (Split)	21-May	3	3 (2)	3 unbanded	Seasonal Exclosure	
47	BY	F= M=RR:OR	14-Apr	Hatch (Split)	16-May	3	2 (2)	1 BB:BR 1 unbanded	Seasonal Exclosure	On 29 April, 1 egg 6 inches from nest bowl and mostly buried, egg marked and reset with other 2 eggs. This egg hatches. One egg (without cracks) abandoned post-term.
48	8	F=U M=	21-Apr	Abandoned pre-term	29-Apr	3	0 (0)		Seasonal Exclosure	On 28 April, 1 egg 2 feet away from nest bowl with tracks at all 3 eggs. Egg reset with other 2 eggs. No sign of fertilization when egg contents examined.
49	SOF	F=U M=GA:WW	23-Apr	Hatch	27-May	3	3 (0)	3 VV:YB	Circular excl. with top Symbolic fence	On 20 May, 3 eggs recentered in circular. On 6 September, 1 small, dead and desiccated VV:YB chick found in area of nest and where brood was seen (see report Notes section).
50	SOF	F=VV:GW M=U	21-Apr	Hatch (Split)	23-May	3	2 (2)	2 GG:GB	Circular excl. with top Symbolic fence	On 14 May, 3 eggs recentered in circular. One egg (without cracks) abandoned post-term.
51	SOF	F= M=	23-Apr	Depredated, gull	29-Apr	3	0 (0)		Symbolic fence	
52	SOF	F=U M=	21-Apr	Depredated, gull	28-Apr	3	0 (0)		Symbolic fence	
53	SOF	F= M=	23-Apr	Depredated, avian	29-Apr	3	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
54	NOF	F= M=	24-Apr	Depredated, avian	29-Apr	2	0 (0)		Symbolic fence	Lost during period of known nest loss to gull and raven.
55	NOF	F=U M=	13-Apr	Depredated, avian	28-Apr	3	0 (0)		Seasonal Exclosure	Lost during period of known nest loss to gull and raven.
56	8	F= M=PG:VG	22-Apr	Hatch (Split)	24-May	3	3 (3)	2 BB:VW 1 unbanded	Seasonal Exclosure	
57	6	F=U M=U	15-Apr	Hatch (Split)	17-May	3	2 (0)	1 GA:VB 1 unbanded	Seasonal Exclosure	On 1 May, 1 egg found fully buried at nest. Egg marked and reset in nest. One egg unknown fate.
58	6	F=U M=BB:WB	22-Apr	Hatch (Split)	27-May	3	2 (2)	1 GA:YB 1 unbanded	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
59	8	F=U M=	24-Apr	Abandoned pre-term	27-May	3	0 (0)		Seasonal Exclosure	On 26 May, 1 egg missing pre-term and bird not seen on nest afterwards. On 29 May, 2 eggs found abandoned and mostly buried. Both eggs had cracks and taps and were collected and transported to Santa Barbara Zoo. Both eggs hatched and 1 chick (banded PA:BR) fledged (see report Notes section).

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
60	6	F=NO:AB? M=	20-Apr	Abandoned pre-term	30-Apr	3	0 (0)		Seasonal Exclosure	On 29 April, 2 eggs missing pre-term and 1 remaining egg in nest bowl marked. Egg found buried 1 May.
61	6	F=PV:- M=GA:AR	21-Apr	Hatch	23-May	3	3 (2)	3 unbanded	Symbolic fence	
62	7	F=U M=U	25-Apr	Hatch (Split)	26-May	3	3 (3)	3 VG:AG	Symbolic fence	
63	8	F=GA:YY M=VG:VY	19-Apr	Hatch	21-May	3	3 (1)	3 BB:BB	Symbolic fence	From 2-4 July, a 42-day-old BB:BB fledgling brooded at SP180 nest while female incubated eggs. Adult bands were not confirmed at SP180.
64	8	F=U M=GG:OR	20-Apr	Hatch (Split)	22-May	3	3 (2)	3 BB:VG	Seasonal Exclosure	On 2 July, 1 BB:VG juvenile found dead at SP174 nest site, a subsequent nest by the SP64 banded male. Two fledges were last seen on 30 June at 38 to 39 days old (see report Notes section and Appendix H).
65	6	F=U M=U	16-Apr	Hatch	18-May	3	3 (0)	3 BB:PB	Seasonal Exclosure	On 30 May, one 12-day-old chick eaten by western gull (see Appendix H).
66	6	F=(RR)?:AA M=VG:AG	21-Apr	Hatch	23-May	3	3 (1)	3 GG:BB	Seasonal Exclosure	On 26 June, GG:BB fledgling brooding with an unbanded female at SP166 while female incubated eggs. SP166 is a subsequent nest of the banded male with SP66.
67	NOF	F=RR:PW M=BB:VR	28-Apr	Hatch	31-May	3	2 (0)	1 unbanded	Seasonal Exclosure	One egg unknown fate. On 31 May, camera identifies 2 chicks. One remaining chick last seen 4 June at 4 days old and not known to fledge. On 12 June, male with SP67 adopted a 6-day-old banded chick from SP87. This chick fledged.
68	6	F=PG:YB M=BB:VY	27-Apr	Hatch	4-Jun	3	1 (0)	1 VG:WW	Seasonal Exclosure	One egg unknown fate and 1 egg (without cracks) abandoned post-term.
69	8	F=U M=VV:WR	17-Apr	Hatch	19-May	2	2 (2)	2 GG:AW	Seasonal Exclosure	
70	NOF	F=U M=U	1-May	Hatch	4-Jun	2	2 (1)	2 GA:GB	Seasonal Exclosure	
71	SOF	F=U M=VV:VB	1-May	Hatch (Split)	4-Jun	3	3 (3)	3 VG:YW	Circular excl. with top Symbolic fence	On 11 May, symbolic fence moved west to decrease possible pedestrian disturbance.
72	6	F=U M=BB:RB	22-Apr	Hatch	24-May	3	3 (2)	3 GG:WW	Seasonal Exclosure	One 3-day-old chick adopted by SP38 brood beginning 27 May and fledged. On 30 May, one 6-day-old chick eaten by western gull (see Appendix H).

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
73	7	F=U M=GG:OR	26-Apr	Hatch	28-May	3	2 (1)	2 GA:GW	Seasonal Exclosure	On 22 May, 1 egg with pale colored shell around cracks. This egg abandoned post-term. On 30 May, one 2-day-old chick eaten by western gull (see Appendix H).
74	6	F=GG:AB M=	2-May	Abandoned post-term	23-Jul	2	0 (0)		Seasonal Exclosure	On 11 May, 1 egg with small hole on side of egg. On 2 June, egg with hole missing pre-term. One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
75	8	F=U M=BB:OB	27-Apr	Hatch	29-May	3	2 (0)	2 unbanded	Symbolic fence	One egg unknown fate.
76	6	F=GA:OR M=U	30-Apr	Hatch	31-May	3	2 (2)	2 PG:WB	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
77	6	F=U M=U	2-May	Hatch (Split)	2-Jun	3	3 (0)	2 BB:WW 1 unbanded	Seasonal Exclosure	Brood raised on northern 6 exclosure shoreline near the open riding area and territorial adult aggression seen on several occasions. On 7 and 8 June, the brood was observed to enter the open riding area. On 8 June, an adult chased and aggressively attacked the unbanded chick; the chick became separated from the associated male and was not seen again. On 11 June, the associated male was observed dragging a dead chick. Both banded chicks were last seen on this day (see report Notes section).
78	6	F=U M=U	2-May	Hatch (Split)	3-Jun	3	3 (1)	2 BB:PY 1 unbanded	Seasonal Exclosure	Brood raised on northern 6 exclosure shoreline near the open riding area and territorial adult aggression seen on several occasions. On 7 and 12 June the brood was observed to enter the open riding area (see report Notes section). Unbanded chick fledged.
79	6	F=VV:AA M=GG:WB	25-Apr	Hatch	27-May	3	3 (1)	3 VV:WW	Seasonal Exclosure	On 30 May, two 3-day-old chicks eaten by western gull (see Appendix H).
80	SOF	F=U M=	5-May	Abandoned, suspected wind	18-May	3	0 (0)		Circular excl. with top Symbolic fence	On 17 May, camera showed eggs were buried during high winds and nest abandoned. On 18 May, 3 eggs were unburied and placed on sand surface. Eggs were collected and taken to Santa Barbara Zoo on 19 May (See report Notes section).
81	8	F=U M=	24-Apr	Abandoned pre-term	28-May	3	0 (0)		Symbolic fence	

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
82	6	F=GA:RY M=VV:YG	1-May	Hatch	2-Jun	3	1 (1)	1 unbanded	Symbolic fence	Two eggs unknown fate.
83	SOF	F= M=	1-May	Depredated	10-May	3	0 (0)		Symbolic fence	
84	6	F=U M=PG:PW	27-Apr	Hatch	29-May	3	3 (1)	3 unbanded	Symbolic fence	
85	SOF	F=GA:RY M=U	3-May	Hatch	4-Jun	3	2 (0)	2 BB:RY	Circular excl. with top Symbolic fence	On 25 May, 1 egg missing pre-term and found half-buried on 6 September.
86	SOF	F=U M=BB:PY	7-May	Hatch	9-Jun	3	2 (1)	2 PG:GY	Circular excl. with top Symbolic fence	On 9 June, 1 egg missing pre-term and found fully buried on 10 August. One 2-day-old chick adopted by SP93 brood beginning 11 June and chick fledged (only chick of SP86 to fledge).
87	6	F=U M=RR:AB	5-May	Hatch	6-Jun	3	3 (1)	3 VG:VR	Seasonal Exclosure	One 6-day-old VG:VR chick adopted by SP67 male beginning 12 June and chick fledged.
88	7	F=PV:YY M=U	30-Apr	Hatch	1-Jun	3	3 (2)	3 unbanded	Symbolic fence	
89	8	F=U? M=RR:AW?	na	Abandoned pre-term	(11-May)	≥1	0 (0)		Seasonal Exclosure	On 1 May, active scrape present. Egg found abandoned pre-term on 11 May.
90	SOF	F= M=NR:WB	na	Abandoned pre-term	15-May	3	0 (0)		Circular excl. with top Symbolic fence	On 11 May, symbolic fence moved west to decrease possible pedestrian disturbance. Camera confirmed inconsistent incubation from 12-14 May, and nest abandoned on 14 May. On 17 May, eggs collected and taken to Santa Barbara Zoo (see report Notes section).
91	SOF	F=U M=U	6-May	Hatch (Split)	7-Jun	3	2 (1)	2 unbanded	Circular excl. with top Symbolic fence	One egg abandoned post-term.
92	6	F=U M=O-:PB	30-Apr	Hatch (Split)	1-Jun	3	3 (3)	3 GG:PG	Seasonal Exclosure	On 20 July, juvenile (48 to 49 days old) seen with a right leg injury (see report Notes section).
93	SOF	F=PV:PR M=U	10-May	Hatch	10-Jun	3	2 (2)	2 unbanded	Circular excl. with top Symbolic fence	One egg abandoned post-term. On 11 June, male adopted a 2-day-old VG:VR chick from SP86. This chick fledged.
94	7	F=BB:OW M=RR:BW	7-May	Hatch	8-Jun	3	2 (2)	1 GA:AY 1 unbanded	Seasonal Exclosure	One egg (without cracks) abandoned post-term. No sign of fertilization when egg contents examined.
95	8	F= M=U	2-May	Hatch (Split)	3-Jun	3	2 (1)	2 BB:AR	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
96	7	F=U M=GG:AY	28-Apr	Hatch (Split)	30-May	3	3 (1)	3 unbanded	Symbolic fence	
97	7	F=U M=U	8-May	Hatch	9-Jun	3	2 (1)	2 GG:YY	Seasonal Exclosure	One egg (without cracks) abandoned post-term.

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
98	6	F= M=GG:PW	7-May	Hatch	8-Jun	3	1 (1)	1 unbanded	Symbolic fence	Two eggs abandoned post-term.
99	SOF	F=U M=GA:PR	7-May	Hatch	8-Jun	3	3 (1)	3 PV:WG	Circular excl. with top Symbolic fence	On 4 June, 3 eggs recentered in circular.
100	6	F=VG:BW M=NB:OY	9-May	Hatch (Split)	10-Jun	3	3 (3)	3 GG:RB	Seasonal Exclosure	
101	6	F= M=U	30-Apr	Hatch (Split)	1-Jun	3	3 (2)	3 unbanded	Symbolic fence	
102	6	F=U M=U	13-May	Hatch (Split)	14-Jun	3	2 (2)	2 unbanded	Symbolic fence	One egg abandoned post-term.
103	8	F=U M=U	18-May	Failed, unknown cause	10-Jun	3	0 (0)		Bumpout Seasonal Exclosure	Both eggs had approximately 2.5-week-old embryos when contents examined.
104	7	F=PV:VY M=U	2-May	Hatch	3-Jun	3	2 (1)	2 VG:GG	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
105	SOF	F=U M=U	18-May	Hatch	18-Jun	3	3 (0)	3 PV:AY	Symbolic fence	All 3 chicks last seen alive on 28 June, at 10 days old. On 23 September, desiccated remains of 1 partially banded (PV:-) chick found near nest location (see report Notes section).
106	7	F=U M=U	12-May	Hatch	13-Jun	3	3 (0)	3 unbanded	Symbolic fence	
107	8	F=U M=U	16-May	Hatch	17-Jun	3	3 (2)	3 PG:BY	Seasonal Exclosure	
108	7	F=BB:GR M=NB:BW	20-May	Hatch (Split)	19-Jun	3	3 (3)	3 unbanded	Seasonal Exclosure	
109	7	F= M=GA:Y-	12-May	Hatch (Split)	13-Jun	3	3 (2)	2 VG:YY 1 unbanded	Seasonal Exclosure	One banded and one unbanded chick fledged.
110	6	F=PV:VW M=GA:WR	16-May	Hatch	17-Jun	3	3 (3)	3 GA:YG	Seasonal Exclosure	
111	BY	F=PV:PG M=U	21-May	Hatch	21-Jun	3	2 (2)	2 GA:AW	Seasonal Exclosure	On 3 June, 1 egg missing pre-term. On 13 June, 1 egg in nest and 1 egg found buried below nest bowl. Buried egg marked and reset in nest.
112	6	F=NR:BR M=BB:RR	12-May	Hatch	13-Jun	3	3 (2)	3 unbanded	Bumpout Seasonal Exclosure	
113	6	F=U M=U	15-May	Hatch (Split)	16-Jun	3	3 (3)	3 unbanded	Symbolic fence	
114	NOF	F=VG:GW M=U	4-May	Hatch	5-Jun	3	2 (2)	2 unbanded	Circular excl. with top Symbolic fence	One egg abandoned post-term.
115	SOF	F=PG:OW M=U	19-May	Hatch	20-Jun	3	3 (3)	3 unbanded	Symbolic fence	
116	SOF	F=U M=U	26-May	Abandoned, suspected wind	27-May	1	0 (0)		Symbolic fence	
117	NOF	F=VV:WY M=U	17-May	Hatch	18-Jun	3	2 (2)	2 unbanded	Symbolic fence	One egg unknown fate.

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
118	SOF	F=U M=	21-May	Abandoned, suspected wind	10-Jun	3	0 (0)		Circular excl. with top Symbolic fence	On 12 June, 3 eggs unburied from center of circular and marked. On 13 June, the 3 eggs were confirmed abandoned and taken to Santa Barbara Zoo (see report Notes section).
119	6	F=GG:GR M=U	24-May	Hatch (Split)	25-Jun	3	3 (1)	2 PG:WY 1 unbanded	Seasonal Exclosure	On 6 July, one 11-day-old banded chick seen with serious right leg injury. Chick was taken to Pacific Wildlife Care 8 July and transferred to Santa Barbara Zoo 28 August (see report Notes section). One unbanded chick fledged.
120	SOF	F=PG:- M=U	20-May	Hatch (Split)	21-Jun	3	2 (1)	2 unbanded	Symbolic fence	One egg unknown fate. On 6 July, one 14- to 15-day-old chick seen with injury to neck (see report Notes section).
121	7	F=U M=RR:AW	25-May	Hatch	26-Jun	3	3 (2)	3 VG:AY	Seasonal Exclosure	
122	6	F=NR:YG M=U	23-May	Hatch (Split)	24-Jun	3	3 (1)	3 unbanded	Symbolic fence	From 26-29 June, SP122 and SP141 broods became mixed and the respective adults associated with each brood raised one chick from the other brood. Both adopted chicks fledged.
123	NOF	F=U M=BB:AR	22-May	Hatch	23-Jun	3	2 (1)	2 unbanded	Symbolic fence	One egg abandoned post-term.
124	7	F=U M=U	23-May	Hatch	24-Jun	3	2 (2)	2 PV:GY	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
125	NOF	F=U M=GN:RR	24-May	Hatch	25-Jun	3	3 (3)	3 unbanded	Symbolic fence	
126	8	F=U M=GA:YB	22-May	Hatch	24-Jun	2	2 (1)	2 GA:YY	Seasonal Exclosure	
127	8	F=B-:G- M=U	31-May	Hatch	1-Jul	3	2 (1)	2 unbanded	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
128	NOF	F=U M=GG:PR	20-May	Depredated, coyote	15-Jun	3	0 (0)		Symbolic fence	
129	6	F=U M=GA:WW	25-May	Hatch	26-Jun	3	2 (2)	2 PV:RB	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
130	8	F=U M=	na	Abandoned, unknown if pre- or post-term	9-Jun	3	0 (0)		Symbolic fence	No sign of fertilization when egg contents examined.
131	7	F=U M=GA:WG	3-Jun	Hatch	2-Jul	3	3 (0)	2 PG:AY 1 unbanded	Seasonal Exclosure	
132	6	F=banded M=U	22-May	Hatch	23-Jun	3	1 (0)	1 unbanded	Seasonal Exclosure	Two eggs (without cracks) abandoned post-term.
133	7	F= M=	27-May	Unknown	28-Jun	3	0 (0)		Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
134	SOF	F=PV:BY M=NR:WB	28-May	Hatch	29-Jun	3	3 (3)	3 unbanded	Symbolic fence	
135	6	F=PV:- M=U	na	Abandoned post-term	27-Aug	3	0 (0)		Seasonal Exclosure	No sign of fertilization when egg contents examined.
136	NOF	F=VG:GR M=U	28-May	Hatch	29-Jun	3	3 (0)	3 unbanded	Symbolic fence	
137	7	F=RR:BB M=GA:RY	4-Jun	Hatch (Split)	6-Jul	3	3 (3)	3 GG:YR	Seasonal Exclosure	
138	SOF	F=U M=VV:OW	30-May	Depredated, coyote	18-Jun	3	0 (0)		Symbolic fence	
139	SOF	F=VV:GW M=U	29-May	Hatch	30-Jun	3	3 (2)	3 GA:WY	Circular excl. with top Symbolic fence	Brood raised north and south of southern park boundary.
140	SOF	F=U M=U	28-May	Hatch (Split)	29-Jun	3	3 (2)	3 unbanded	Symbolic fence	
141	6	F=U M=U	24-May	Hatch	25-Jun	3	2 (2)	2 BB:WR	Seasonal Exclosure	One egg (without cracks) abandoned post-term. Between 26-29 June, SP141 and SP122 broods became mixed and the respective adults associated with each brood raised one chick from the other brood. Both adopted chicks fledged. From 4-9 August, BB:WR juvenile (40 to 45 days old) seen with a right leg injury (see report Notes section).
142	8	F=U M=U	7-Jun	Hatch	9-Jul	3	1 (1)	1 GG:PY	Seasonal Exclosure	Two eggs (without cracks) abandoned post-term.
143	6	F=U M=U	6-Jun	Hatch (Split)	8-Jul	3	3 (1)	3 unbanded	Symbolic fence	
144	SOF	F=U M=U	1-Jun	Hatch (Split)	3-Jul	3	3 (2)	3 unbanded	Symbolic fence	
145	6	F=BB:VG M=U	13-May	Hatch	14-Jun	3	2 (1)	2 VV:AY	Seasonal Exclosure	One egg (with cracks and small hole with adhering sand) abandoned post-term.
146	6	F=U M=U	4-Jun	Hatch	6-Jul	3	3 (2)	3 PG:RB	Seasonal Exclosure	
147	6	F=banded M=U	5-Jun	Hatch	7-Jul	3	1 (0)	1 unbanded	Symbolic fence	Two eggs abandoned post-term.
148	7	F=VO:BW M=PV:WY	31-May	Hatch	2-Jul	3	3 (2)	3 PV:OG	Seasonal Exclosure	
149	7	F=U M=U	8-Jun	Hatch	10-Jul	3	1 (1)	1 unbanded	Symbolic fence	Two eggs abandoned post-term.
150	8	F=U M=VV:BW	19-May	Hatch	20-Jun	3	3 (2)	3 PG:VR	Symbolic fence	
151	8	F= M=PV:YB	15-Jun	Hatch	16-Jul	3	3 (1)	3 unbanded	Seasonal Exclosure	On 23 July, one of the three 7-day-old chicks lying immobile and not responding to adult. Brood subsequently seen with two chicks.
152	BY	F= M=	na	Abandoned pre-term	(16-Jun)	1	0 (0)		Seasonal Exclosure	

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
153	NOF	F=U M=U	4-Jun	Hatch	6-Jul	3	3 (2)	3 unbanded	Symbolic fence	
154	6	F=BB:YW M=U	1-Jun	Hatch (Split)	5-Jul	3	3 (3)	3 unbanded	Seasonal Exclosure	
155	NOF	F=U M=U	13-Jun	Hatch	15-Jul	3	1 (1)	1 unbanded	Symbolic fence	Two eggs abandoned post-term.
156	6	F=U M=U	3-Jun	Hatch (Split)	5-Jul	3	3 (2)	3 unbanded	Symbolic fence	
157	6	F=PG:YB M=BB:VY	11-Jun	Hatch	13-Jul	3	2 (0)	2 unbanded	Symbolic fence	One egg abandoned post-term.
158	SOF	F=U M=U	15-Jun	Hatch	17-Jul	3	2 (1)	2 VG:RW	Circular excl. with top Symbolic fence	On 18 June, symbolic fence moved west to decrease possible pedestrian disturbance. One egg (without cracks) abandoned post-term.
159	BY	F=PG:PB M=RR:OR	12-Jun	Hatch	14-Jul	3	1 (1)	1 unbanded	Seasonal Exclosure	Two eggs unknown fate.
160	8	F=U M=BB:OB	2-Jun	Hatch (Split)	4-Jul	3	2 (2)	2 VG:RB	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
161	6	F=U M=U	16-Jun	Hatch	18-Jul	3	1 (0)	1 VG:RY	Seasonal Exclosure	Two eggs (without cracks) abandoned post-term. Chick raised on northern 6 exclosure shoreline near the open riding area. On 5 occasions between 28 July - 6 August the chick was observed to enter the open riding area. On 7 August, chick depredated by California gull (see report Notes section).
162	6	F=banded M=	na	Abandoned, unknown if pre- or post-term	5-Jul	3	0 (0)		Symbolic fence	Nest not walked to while active to reduce disturbance to nearby plover broods. On 23 August, one intact egg and one partial egg with developed chick inside found near remnants of a third egg. All 3 eggs within 6 inches of each other. Two eggs had approximately 2.5-week-old embryos when contents examined.
163	8	F=U M=U	15-Jun	Hatch	17-Jul	3	3 (0)	3 unbanded	Symbolic fence	One 10-day-old chick adopted by GG:OR male with SP174 brood beginning 27 July, chick last seen 4 August and not known to fledge.
164	6	F=GA:RY M=	na	Abandoned post-term	12-Aug	2	0 (0)		Symbolic fence	Nest incubated for a minimum of 56 days from 17 June - 11 August. Nest not walked to while active to reduce disturbance to nearby plover broods. On 24 August, 2 eggs found abandoned post-term.

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
165	8	F=GA:PR M=PV:YG	16-Jun	Hatch	18-Jul	3	3 (1)	3 unbanded	Symbolic fence	
166	6	F=U M=VG:AG	22-Jun	Hatch	25-Jul	3	3 (0)	3 VG:PR	Symbolic fence	On 23 June, incubating female observed brooding 32-day-old SP66 fledgling. SP166 is a subsequent nest of the banded male associated with SP66.
167	NOF	F=U M=U	15-Jun	Hatch	17-Jul	3	3 (1)	3 VG:AR	Seasonal Exclosure	On 23 and 25 August, fledgling (37 and 39 days old) seen with a left leg injury (see report Notes section).
168	7	F=GA:O- M=	na	Abandoned, unknown if pre- or post-term	26-Jul	3	0 (0)		Symbolic fence	Nest observed active from 21 June to 24 July. On 25 July, 3 eggs found in nest bowl with tracks to eggs. No bird seen on nest after 24 July. Three eggs had approximately 3.5-week-old embryos when contents examined.
169	7	F=U M=U	5-Jun	Hatch	7-Jul	3	2 (1)	2 unbanded	Symbolic fence	One egg unknown fate. On 12 July, one chick observed immobile for an extended period of time and assumed dead. Both chicks seen 11 July at 4 days old (see report Notes section).
170	NOF	F= M=	na	Abandoned, unknown if pre- or post-term	26-Jun	3	0 (0)		Symbolic fence	Nest observed incubating from 22-25 June. Nest not walked to while active to reduce disturbance to nearby plover broods. On 24 August, 3 eggs found partially buried at nest. No sign of fertilization when egg contents examined.
171	SOF	F=U M=U	na	Depredated, coyote	3-Jul	≥1	0 (0)		Symbolic fence	Nest observed incubating from 22 June - 2 July. Nest not walked to while active to reduce disturbance to nearby plover broods. On 3 July, nest bowl walked to and coyote tracks lead to nest and eggshell fragments present.
172	7	F=U M=U	16-Jun	Hatch	18-Jul	3	3 (0)	3 unbanded	Symbolic fence	
173	8	F=GA:OR M=	12-Jun	Hatch	14-Jul	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg abandoned post-term.
174	8	F=RR:PW M=GG:OR	19-Jun	Hatch	21-Jul	3	3 (2)	1 VV:RR 2 unbanded	Symbolic fence	On 2 July, BB:VG fledgling from SP64 was found dead at edge of nest bowl. SP174 is a subsequent nest of the banded male with SP64 (see Notes section). On 27 July, the male adopted a 10-day-old unbanded chick from SP163. This chick was last seen on 4 August at 18 days old.

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
175	SOF	F=VG:GW M=GA:WW	17-Jun	Hatch (Split)	19-Jul	3	3 (3)	3 unbanded	Circular excl. with top Symbolic fence	
176	SOF	F=U M=	16-Jun	Depredated, gull	2-Jul	3	0 (0)		Symbolic fence	
177	6	F= M=U	5-Jun	Hatch	7-Jul	3	1 (1)	1 unbanded	Symbolic fence	Two eggs abandoned post-term.
178	6	F=U M=GG:OR	20-Jun	Hatch	22-Jul	3	3 (0)	3 unbanded	Symbolic fence	
179	8	F=U M=U	20-Jun	Hatch (Split)	22-Jul	3	3 (0)	3 unbanded	Symbolic fence	
180	8	F=banded M=U	17-Jun	Hatch	19-Jul	3	3 (0)	3 unbanded	Seasonal Exclosure	From 2-4 July, incubating female observed brooding SP63 BB:BB 42-day-old fledgling at nest.
181	NOF	F=U M=BB:VR	24-Jun	Hatch	26-Jul	3	3 (0)	3 unbanded	Symbolic fence	
182	7	F=GA:RG M=U	14-Jun	Hatch	16-Jul	≥2	2 (0)	2 unbanded	Seasonal Exclosure	Nest location known by multiple observations of incubating adult. To avoid disturbing young snowy plover and least tern broods, nest not walked to and total egg number unknown.
183	6	F=U M=U	17-Jun	Hatch	19-Jul	3	2 (0)	2 PG:OY	Seasonal Exclosure	One egg (without cracks) abandoned post-term.
184	6	F=PG:PG M=U	23-Jun	Hatch	25-Jul	3	3 (0)	3 unbanded	Symbolic fence	
185	6	F=BB:VG M=AG:GA	20-Jun	Hatch (Split)	22-Jul	3	3 (0)	2 PV:YR 1 unbanded	Seasonal Exclosure	Three chicks last seen on 27 July and none known to fledge. Band combination reused on one chick from UNA6 on 29 July.
186	7	F=PV:YY M=U	na	Unknown	26-Jul	≥2	0 (0)		Symbolic fence	To avoid disturbing young snowy plover and least tern broods, nest not walked to while active and total egg number unknown. Two eggs abandoned post-term. No sign of fertilization when egg contents examined.
187	6	F= M=GA:AR	21-Jun	Hatch	23-Jul	3	3 (0)	3 unbanded	Symbolic fence	On 7 August, the single remaining 15-day-old chick observed depredated by California gull (see Appendix H).
188	SOF	F=U M=GA:OR	na	Depredated, coyote	19-Jul	3	0 (0)		Symbolic fence	
189	8	F=U M=	na	Unknown	22-Jul	≥1	0 (0)		Symbolic fence	To avoid disturbing young snowy plover and least tern broods, nest not walked to while active and total egg number unknown. One egg abandoned post-term. No sign of fertilization when egg contents examined.

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
190	SOF	F=U M=-:YG	17-Jun	Hatch (Split)	19-Jul	3	3 (2)	3 VG:RG	Circular excl. with top Symbolic fence	
191	BY	F=U M=GG:PR	22-Jun	Hatch	24-Jul	3	1 (0)	1 PG:PY	Seasonal Exclosure	Two eggs (without cracks) abandoned post-term.
192	8	F= M=U	na	Abandoned, unknown if pre- or post-term	3-Jul	≥1	0 (0)		Symbolic fence	On 1 July, male observed on nest. Nest walked to 2 July and 1 egg present in nest bowl with tracks. Nest not incubated subsequently.
193	8	F= M=	na	Unknown	na	≥2	0 (0)		Seasonal Exclosure	On July 2, nest found as 2 eggs that were abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined.
194	SOF	F=U M=U	30-Jun	Hatch	30-Jul	3	3 (0)	3 PV:GR	Circular excl. with top Symbolic fence	
195	7	F=U M=	26-Jun	Hatch	28-Jul	3	3 (0)	3 unbanded	Symbolic fence	
196	6	F=BB:PW M=U	17-Jun	Hatch	19-Jul	3	3 (0)	2 PV:RG 1 unbanded	Seasonal Exclosure	
197	8	F=U M=Y-:GO	18-Jun	Hatch	20-Jul	3	3 (0)	2 VG:OR 1 unbanded	Symbolic fence	
198	7	F=U M=U	10-Jul	Hatch (Split)	11-Aug	3	3 (0)	2 VG:WG 1 unbanded	Symbolic fence	
199	7	F=U M=U	11-Jun	Hatch	13-Jul	≥2	1 (0)	1 unbanded	Symbolic fence	To avoid disturbing young snowy plover and least tern broods, nest not walked to while active and total egg number unknown. One egg abandoned post-term.
200	7	F= M=PG:OW	2-Jul	Hatch (Split)	3-Aug	3	3 (1)	1 PV:PR 1 GG:RY 1 unbanded	Seasonal Exclosure	When 4 days old the PV:PR chick adopted by adult with SP220 brood beginning 7 August, and chick fledged. On 7 August, a second chick hatched and banded GG:RY at nest. Chick not known to fledge. On 14 August, the desiccated carcass of an unbanded chick (newly hatched size) found 5 feet from nest bowl (see report Notes section).
201	7	F= M=U	7-Jul	Hatch	8-Aug	3	3 (2)	2 PG:RG 1 PA:RG	Symbolic fence	On 17 August, one PG:RG chick observed immobile and unattended for an extended period of time. Chick placed in warmed brooder and transported to Santa Barbara Zoo on 18 August. Chick banded PA:RG (see report Notes section). The remaining 2 PG:RG chicks fledged.
202	8	F=U? M=VV:WR	20-Jun	Hatch	22-Jul	3	2 (0)	2 unbanded	Seasonal Exclosure	One egg abandoned post-term.
203	8	F= M=	na	Unknown	na	≥2	0 (0)		Seasonal Exclosure	On 22 August, nest found with 2 eggs abandoned, unknown if pre- or post-term.

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
204	7	F= M=	na	Abandoned, unknown if pre- or post-term	na	3	0 (0)		Symbolic fence	On 30 August, nest found with 3 eggs abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined.
205	NOF	F= M=	na	Abandoned, unknown if pre- or post-term	na	3	0 (0)		Symbolic fence	On 11 September, nest found with 3 eggs abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined.
206	7	F= M=	na	Unknown	na	≥2	0 (0)		Seasonal Exclosure	On 10 September, nest found with 2 eggs abandoned, unknown if pre- or post-term. No sign of fertilization when egg contents examined.
207	Unknown	F= M=U	na	Hatch	(23-May)	≥2	2 (2)	2 VG:VG		On 25 May, found as brood of 2 small chicks on North Oso Flaco shoreline.
208	Unknown	F= M=PV:YG	na	Hatch	(24-May)	≥2	2 (0)	2 unbanded		On 29 May, found as brood of 2 small chicks on 8 exclosure shoreline.
209	Unknown	F=VG:AW M=U	na	Hatch	(27-May)	≥2	2 (0)	2 GG:YB		On 28 May, found as brood of 2 small chicks on South Oso Flaco shoreline.
210	Unknown	F=U M=U	na	Hatch	(28-May)	≥2	2 (2)	2 unbanded		On 29 May, found as brood of 2 small chicks on 8 exclosure shoreline.
211	Unknown	F= M=PG:VB	na	Hatch	(2-Jun)	≥2	2 (2)	2 unbanded		On 5 June, found as brood of 2 small chicks on 7 exclosure shoreline.
212	Unknown	F= M=U	na	Hatch	(3-Jun)	≥2	2 (2)	2 unbanded		On 4 June, found as brood of 2 small chicks on 8 exclosure shoreline.
213	Unknown	F= M=U	na	Hatch	(7-Jun)	≥2	2 (2)	2 unbanded		On 12 June, found as brood of 2 small chicks on North Oso Flaco shoreline.
214	Unknown	F= M=U	na	Hatch	(9-Jun)	3	3 (2)	3 unbanded		On 12 June, found as brood of 3 small chicks on South Oso Flaco shoreline.
215	Unknown	F= M=BB:OR	na	Hatch	(15-Jun)	3	3 (2)	3 GG:OY		On 16 June, found as brood of 3 small chicks on South Oso Flaco shoreline. Band combination also used on 2 chicks fledging from SP2.
216	Unknown	F=U M=U	na	Hatch	(23-Jun)	3	3 (0)	3 unbanded		On 27 June, found as brood of 3 small chicks on 7 exclosure shoreline.
217	Unknown	F=U M=NY:WG	na	Hatch	(23-Jun)	3	3 (0)	3 unbanded		On 24 June, found as brood of 3 small chicks on 7 exclosure shoreline.
218	Unknown	F=U M=U	na	Hatch	(28-Jun)	≥2	2 (0)	2 unbanded		On 29 June, found as brood of 2 small chicks on 6 exclosure shoreline.
219	Unknown	F=O-:AG M=	na	Hatch	(23-Jul)	3	3 (0)	3 unbanded		On 27 July, found as brood of 3 small chicks on 6 exclosure shoreline.

Appendix B. Snowy plover nests at ODSVRA in 2018 (continued).

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
220	Unknown	F= M=U	na	Hatch	(28-Jul)	3	3 (1)	3 unbanded		On 31 July, found as brood of 3 small chicks on North Oso Flaco shoreline. On 7 August, male adopted a 4-day-old PV:PR chick from SP200. This chick and one unbanded SP220 chick fledged.
221	Unknown	F= M=U	na	Hatch	(7-Aug)	≥2	2 (2)	2 unbanded		On 17 August, found as brood of 2 chicks on South Oso Flaco shoreline.

Insufficient information available to assign the following broods to a specific nest. Most to all of these broods were likely from nests with an assigned number, known to hatch, and with chicks not banded at nest. The majority of chicks could not be banded to avoid disturbing nearby young snowy plover broods.
UNA = unassigned nest

Nest	Location	Adult pair	Est. initiation date	Nest fate	Fate date (est.)	No. eggs	No. chicks (No. fledged)	No. chicks banded and combination	Nest protection type	Notes
UNA1	Unknown	F= M=U	na	Hatch	(7-Jun)	-	1 (1)	1 unbanded	-	
UNA2	Unknown	F=PV:AW M=U	na	Hatch	(24-Jun)	-	2 (2)	2 unbanded	-	
UNA3	Unknown	F=U M=	na	Hatch	(29-Jun)	-	3 (0)	3 unbanded	-	
UNA4	Unknown	F=U M=U	na	Hatch	(4-Jul)	-	1 (0)	1 unbanded	-	
UNA5	Unknown	F= M=U	na	Hatch	(22-Jul)	-	3 (1)	3 unbanded	-	
UNA6	Unknown	F= M=PG:PW	na	Hatch	(24-Jul)	-	1 (1)	1 PV:YR	-	Chick band combination reused from SP185 (no chicks fledging).
UNA7	Unknown	F= M=U	na	Hatch	(26-Jul)	-	1 (0)	1 unbanded	-	On 27 July, an unbanded small chick not associated with an obvious brood found injured from an aggressive attack by an unbanded male. Chick collected and taken to Pacific Wildlife Care (see report Notes section).
UNA8	Unknown	F=U M=U	na	Hatch	(26-Jul)	-	1 (0)	1 PG:PR	-	
UNA9	Unknown	F= M=GA:OW	na	Hatch	(1-Aug)	-	2 (2)	2 unbanded	-	
UNA10	Unknown	F= M=U	na	Hatch	(9-Aug)	-	3 (2)	3 unbanded	-	On 14 August, found as brood of three chicks south of south boundary and moved north onto ODSVRA property on 16 August. Two chicks subsequently fledged from ODSVRA's southern shoreline.

APPENDIX C. MAPS OF ALL CALIFORNIA LEAST TERN AND SNOWY PLOVER NEST LOCATIONS AT ODSVRA IN 2018.

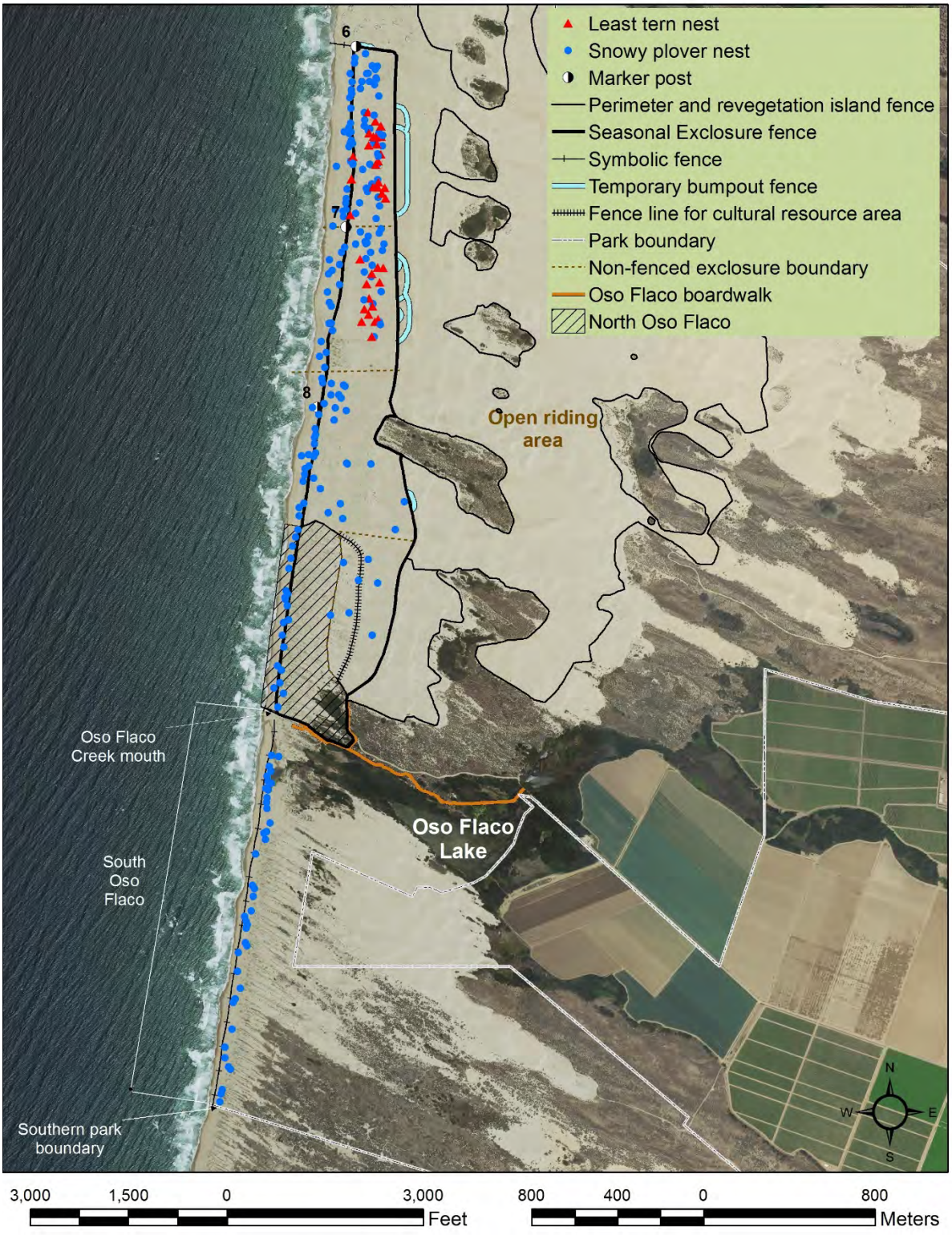


Figure C.1. California least tern and snowy plover nest locations at ODSVRA in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

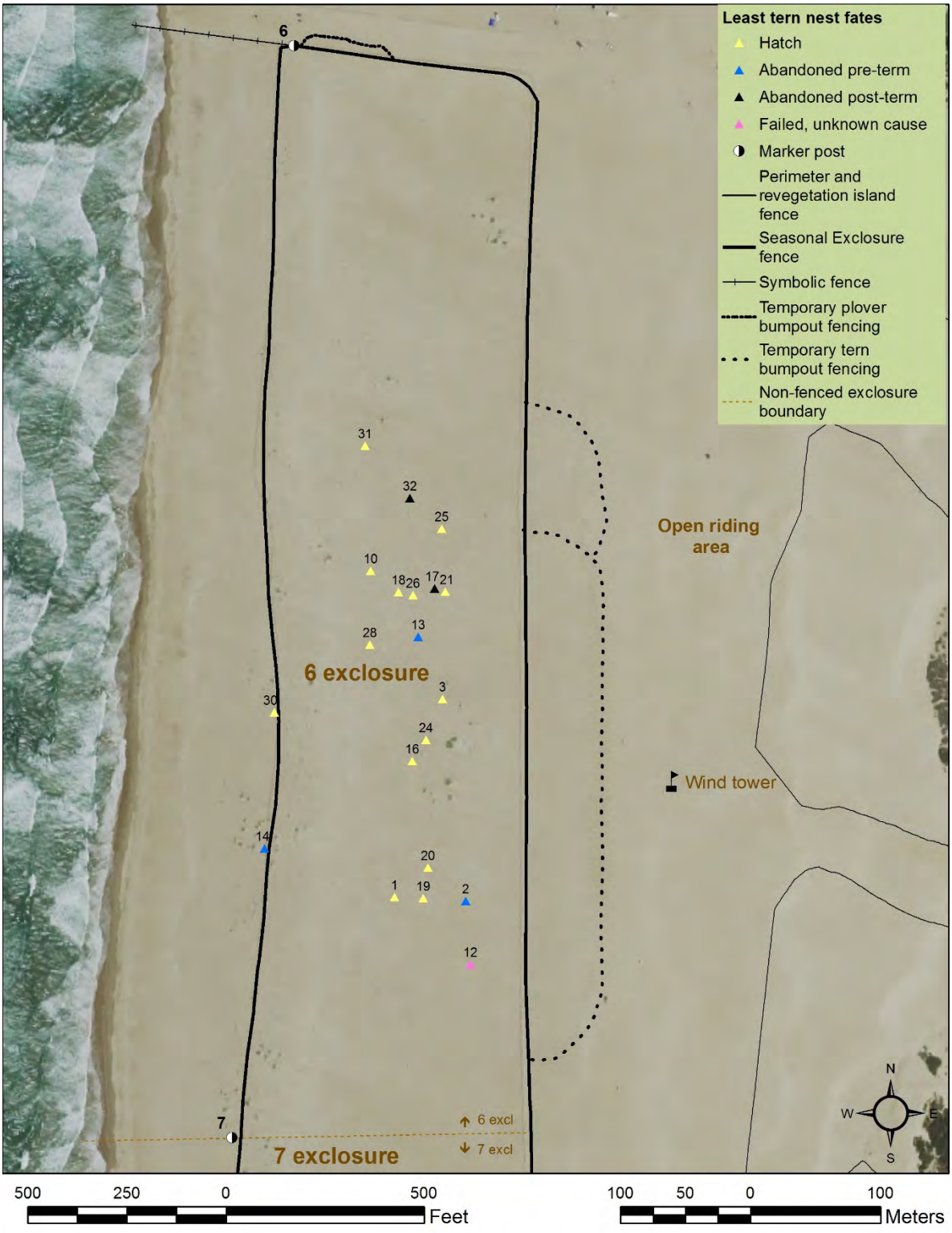


Figure C.2. California least tern nest locations at ODSVRA 6 exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

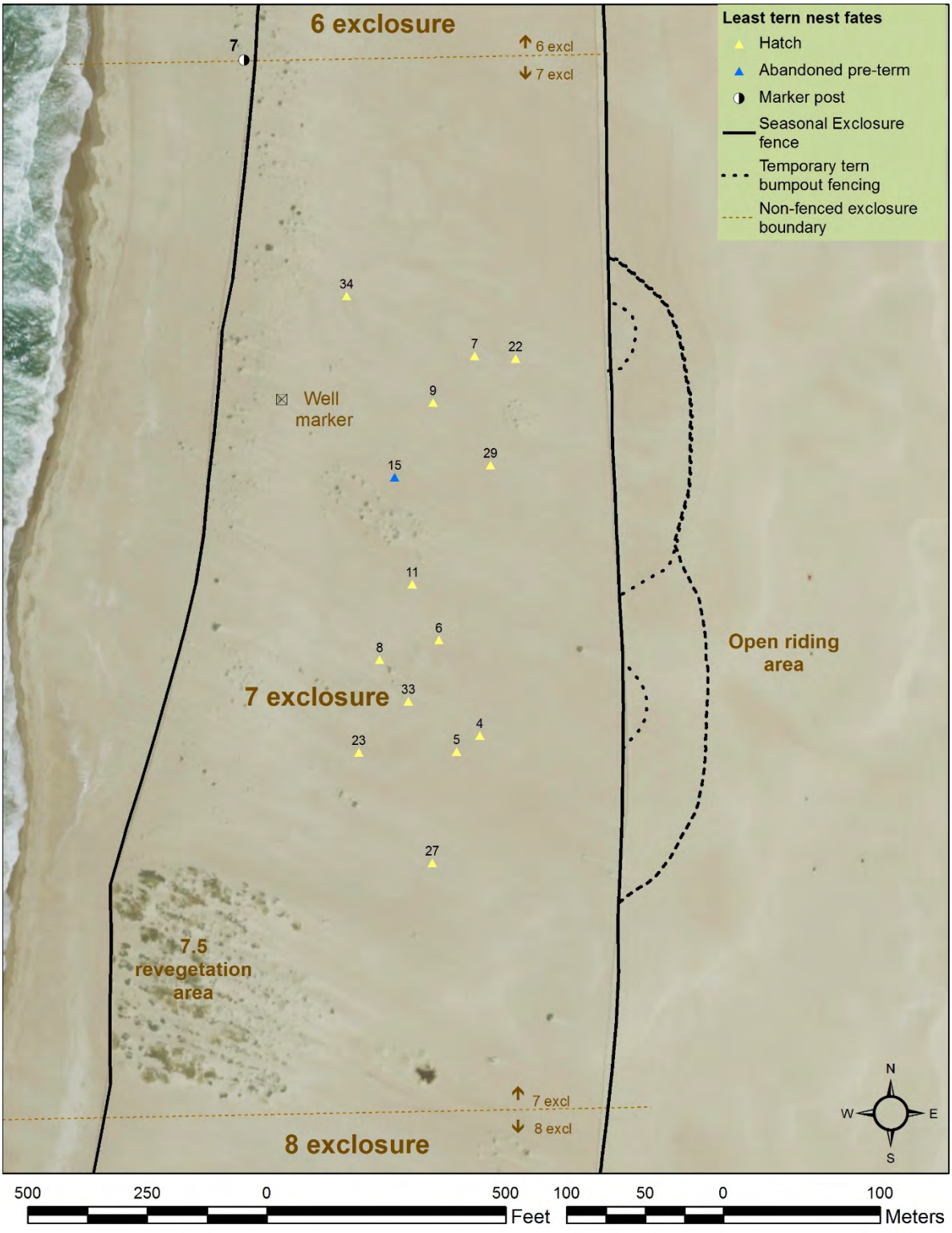


Figure C.3. California least tern nest locations at ODSVRA 7 exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

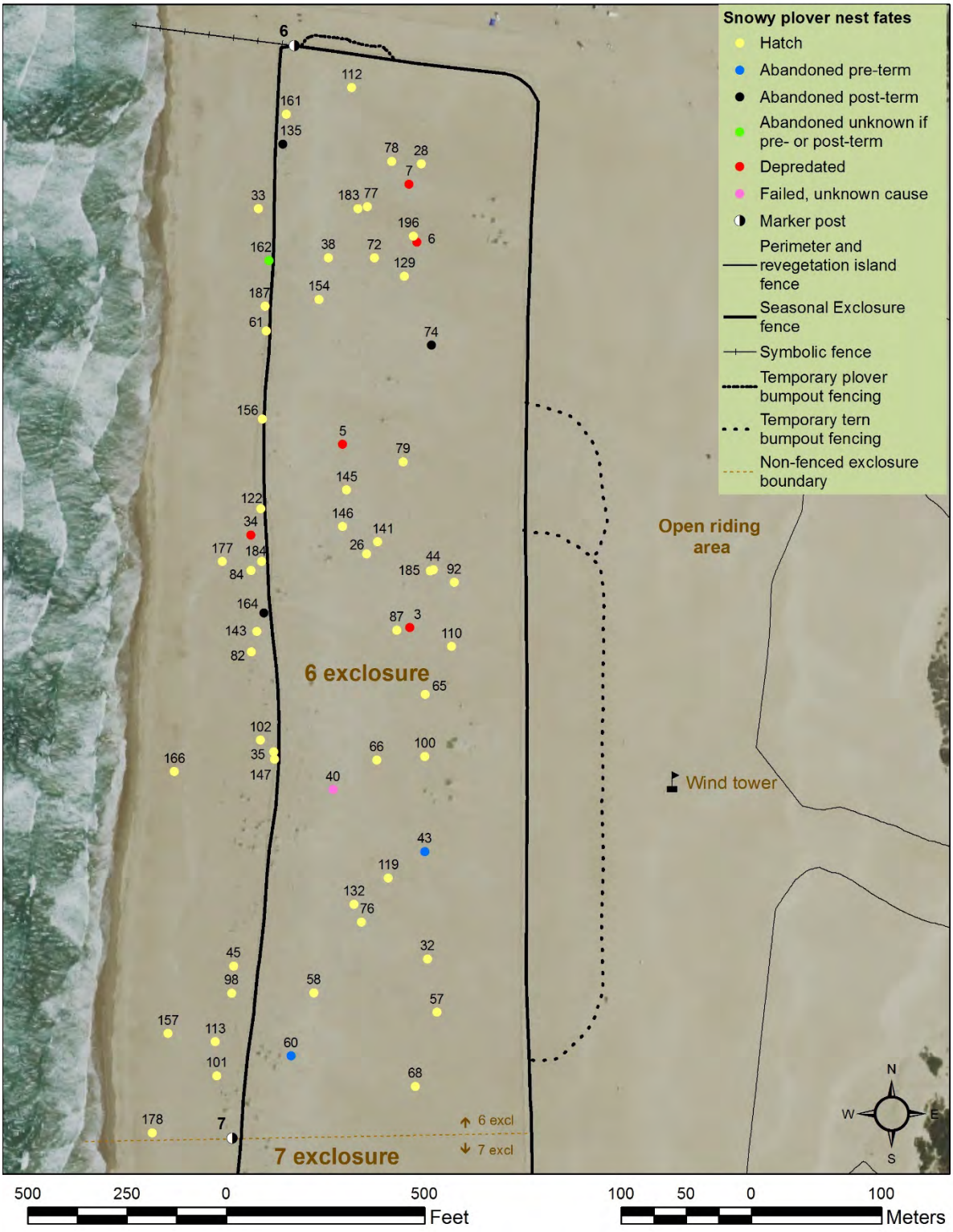


Figure C.4. Snowy plover nest locations at ODSVRA 6 exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

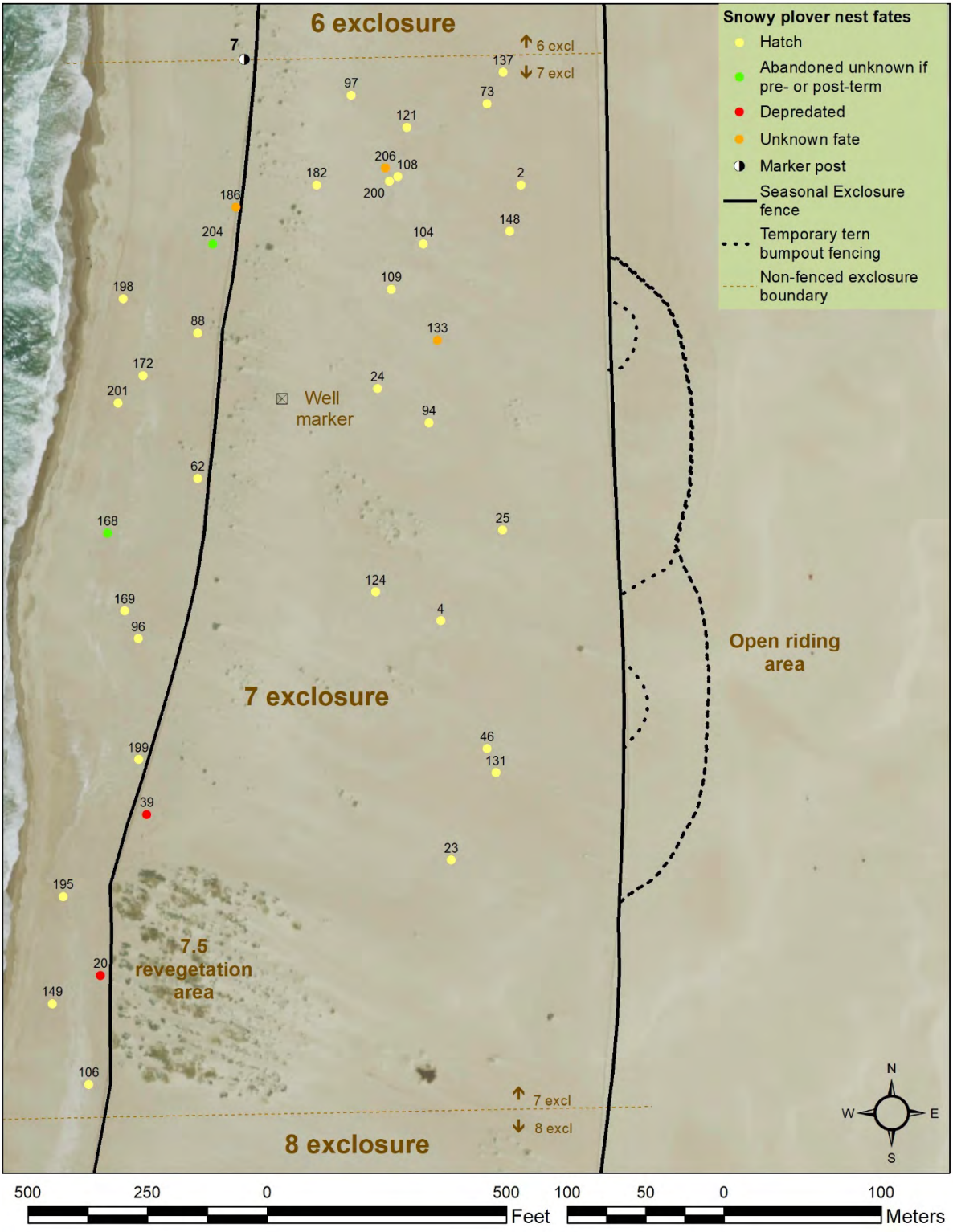


Figure C.5. Snowy plover nest locations at ODSVRA 7 exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

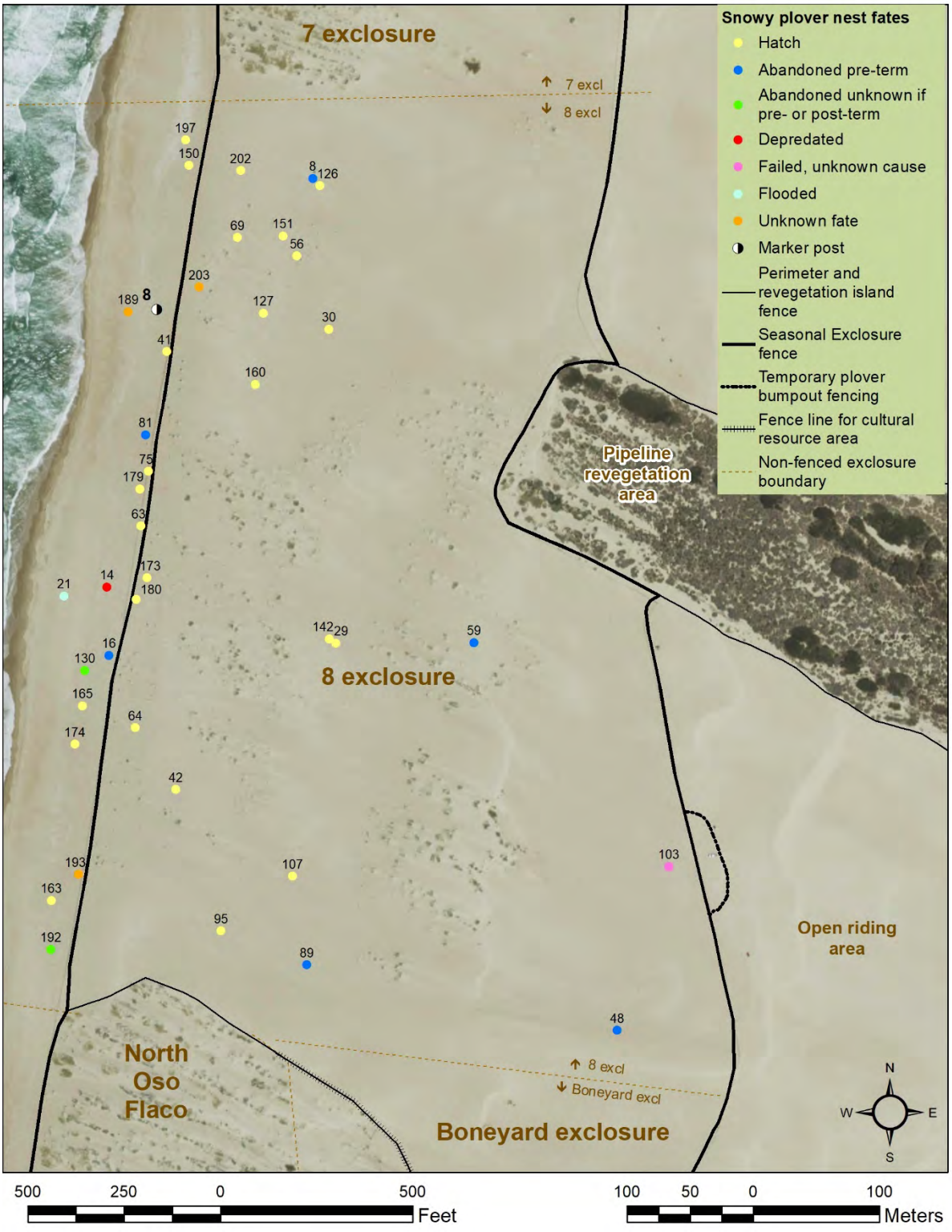


Figure C.6. Snowy plover nest locations at ODSVRA 8 exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

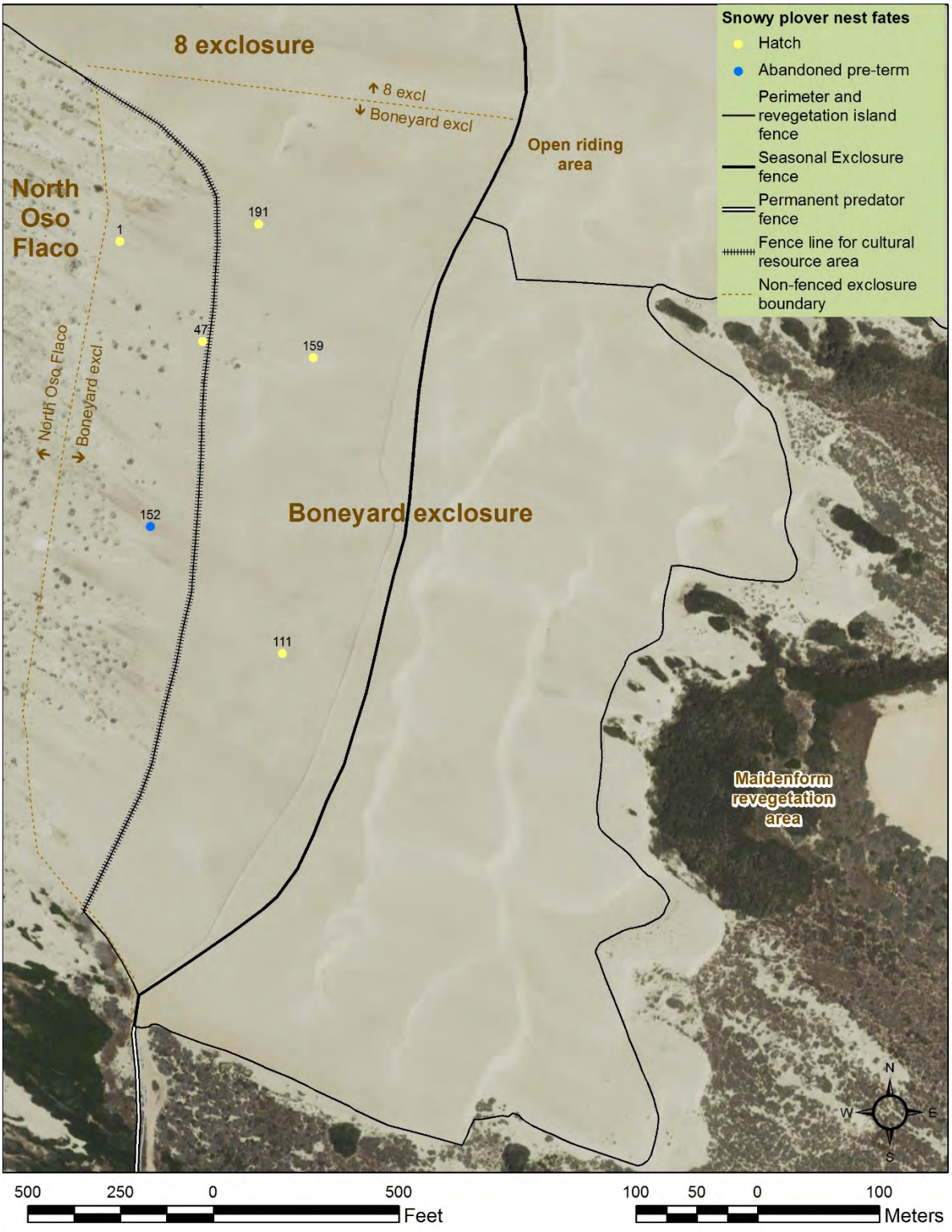


Figure C.7. Snowy plover nest locations at ODSVRA Boneyard exclosure in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

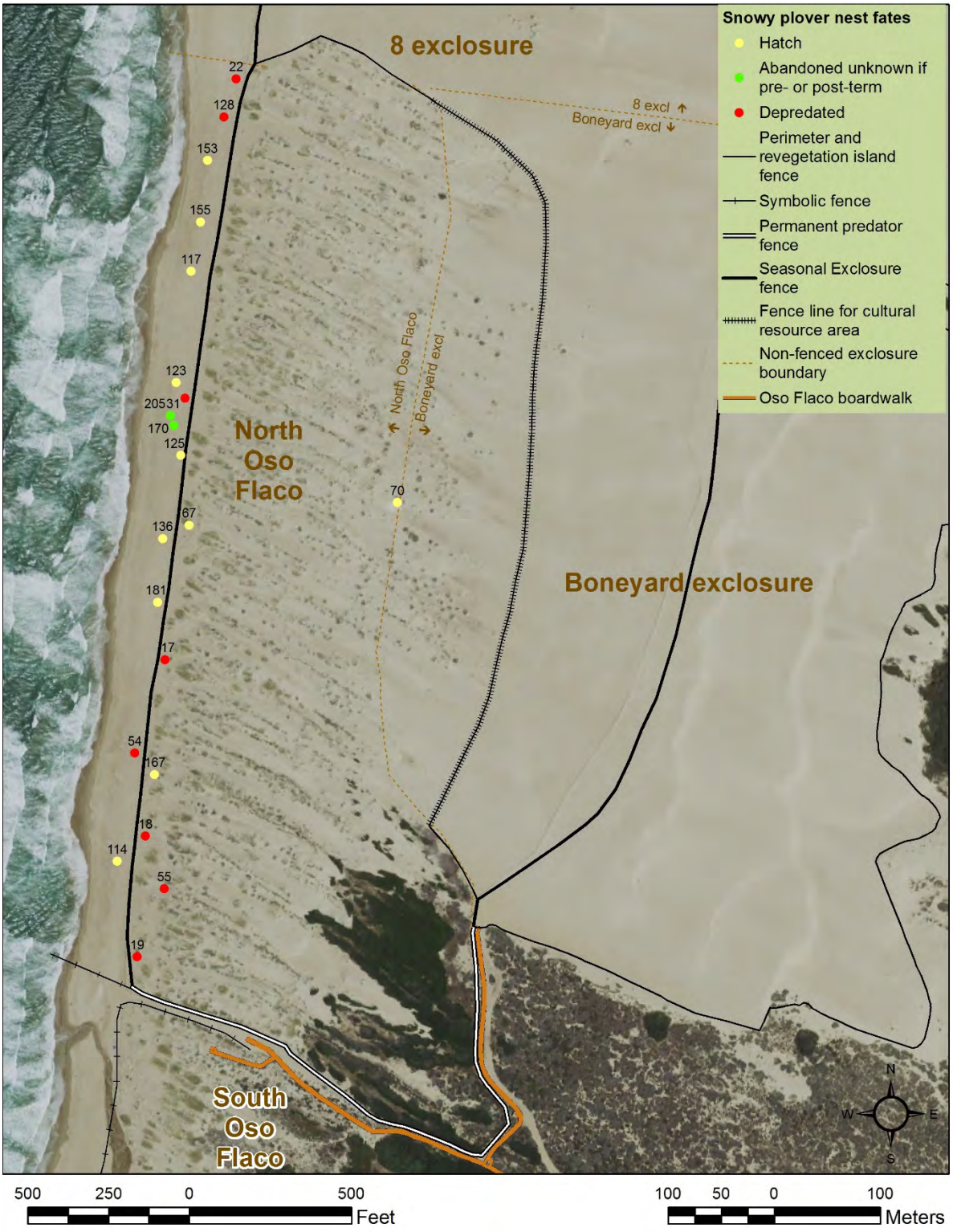


Figure C.8. Snowy plover nest locations at ODSVRA North Oso Flaco in 2018.

Appendix C. Maps of all California least tern and snowy plover nest locations at ODSVRA in 2018 (continued).

Figure C.9. Snowy plover nest locations at ODSVRA South Oso Flaco in 2018.

APPENDIX D. BANDED LEAST TERNS AND SNOWY PLOVERS.

Table D.1. Banded least terns recorded at ODSVRA in 2018.

Juveniles fledged from ODSVRA in 2018 are not included. All birds from ODSVRA were banded as chicks. Additional color-banded birds were recorded but combinations not confirmed. A number of birds had a band on only one leg. These birds may have been banded on only one leg or have lost a band. All possible band combinations of birds known fledging from ODSVRA are listed for incomplete band combinations or for band combinations that were used multiple years. Sex is included if copulation was observed and bands could be determined at that time. (For a description of color band letter codes see Appendix B.)

Band	Dates Seen	Origin and Year Banded	Notes
-:A/B	8/13, 8/15, 8/16, 8/17, 8/18, 8/20	ODSVRA unknown year	Multiple birds banded at ODSVRA with A/B on the right leg. **LT25 breeding adult.**
-:A/W	7/29, 8/24	ODSVRA unknown year	Multiple birds banded at ODSVRA with A/W on the right leg.
-:A/W/A	5/22	ODSVRA 2008 or 2016	G/Y:A/W/A in 2008, Y/G:A/W/A in 2016.
-:G/O	7/12	ODSVRA 2008 or 2011	G/Y:G/O in 2008 or B/W:G/O in 2011.
-:S	5/20, 7/1	Unknown	Multiple sites may band with only the federal band. Also may be any ODSVRA fledgling from 2004 when all banded G/Y:S, or any ODSVRA fledgling that lost the left band and tape on a metal band.
-:W/A	8/16	ODSVRA 2006, 2008, 2010, or 2011	
-:W/A/W	8/9, 8/13, 8/15, 8/16, 8/17, 8/18	ODSVRA 2008	G/W:W/A/W in 2008. **LT22 breeding adult.**
-:W/B	8/13	ODSVRA 2006, 2009, or 2013	Multiple birds banded at ODSVRA with W/B on the right leg.
-:W/R/W	7/8	ODSVRA 2008	G/Y:W/R/W in 2008
-:Y	5/20	ODSVRA unknown year	Multiple birds banded at ODSVRA with Y on the right leg.
A/Y:B/W	5/20, 6/23, 7/14	ODSVRA 2012	
A:G/Y	8/6	ODSVRA 2007 or 2014	
B/A:G/Y	8/16, 8/22, 8/24, 8/25, 8/27	ODSVRA 2014	**Breeding adult** associated with unbanded juvenile.
B/O:-	8/20, 8/22, 8/24, 8/27	ODSVRA unknown year	Multiple birds banded at ODSVRA with B/O on the left leg.
B/R:Y/G	6/13, 8/1, 8/6, 8/13	ODSVRA 2015	
B/W:G/W	8/4	ODSVRA 2011	
B/W:G/Y	8/20	ODSVRA 2007, 2011, or 2014	
B/W:O/Y	8/1	ODSVRA 2011	
B/W:W/R	8/6	ODSVRA 2011	
B/Y:Y/G	6/18	ODSVRA 2015	
B:W/B	7/1	ODSVRA 2009 or 2013	
G/B:Y/G	7/18, 8/10, 8/11	ODSVRA 2015	
G/W:G/Y	5/20	ODSVRA 2007 or 2014	
G:B/W	6/22	ODSVRA 2012	
O/G:B/W	8/15, 8/16, 8/17, 8/18, 8/21, 8/24, 8/25, 8/27	ODSVRA 2012	
O/Y:B/W	5/20	ODSVRA 2012	
O:B/W	5/20, 7/30	ODSVRA 2012	
R/W:W/B	5/20, 7/12, 8/16, 8/17, 8/18	ODSVRA 2009 or 2013	**LT35 breeding adult.**
S:-	5/20	Unknown	Multiple sites may band with only the federal band. Also may be any ODSVRA fledgling from 2003 when all banded S:G/Y, or any ODSVRA fledgling that lost the right band and tape on a metal band.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.1. Banded least terns recorded at ODSVRA in 2018 (continued).

Band	Dates Seen	Origin and Year Banded	Notes
S:B	8/16, 8/17, 8/18	VAFB 2018	Juvenile.
W/B:B/Y	8/3	ODSVRA 2010	
W/B:R/Y	5/20, 7/10, 7/29, 8/9, 8/10, 8/13, 8/14, 8/15, 8/16, 8/17, 8/18	ODSVRA 2010	**LT24 breeding adult.**
W/B:W	6/18, 6/22	ODSVRA 2010	**LT3 breeding adult.**
W/R:B/W	8/9, 8/10, 8/13	ODSVRA 2012	
W/B:W/Y	6/18	ODSVRA 2010	**LT4 breeding adult.**
W/Y:W/B	5/20, 5/21	ODSVRA 2009 or 2013	
Y/G:-	6/20	ODSVRA 2006	
Y/G:B/W	7/1, 7/11, 7/25, 7/28, 8/1, 8/8, 8/9, 8/13, 8/21	ODSVRA 2006, 2012, or 2016	**LT10 breeding adult.**
Y/G:G/A	7/1	ODSVRA 2016	
Y/G:R/B	5/20, 6/28, 7/28, 7/29, 7/30, 8/15, 8/16, 8/18, 8/24	ODSVRA 2016	
Y/G:R/W	8/11, 8/20	ODSVRA 2006 or 2016	
Y/G:W/B	8/9	ODSVRA 2006, 2013, or 2016	
Y/G:W/R	8/8	ODSVRA 2006 or 2016	
Y/G:W/R/W	8/1, 8/8, 8/9, 8/10, 8/13, 8/14, 8/15, 8/16, 8/17, 8/18, 8/20, 8/21, 8/22, 8/24, 8/25	ODSVRA 2016	**LT22 breeding adult.**
Y/G:W/Y	8/1	ODSVRA 2006 or 2016	
Y/G:Y/A	7/1	ODSVRA 2016	
Y/O:W/B	5/21, 7/27, 8/1	ODSVRA 2009	**LT7 breeding adult.**
Y/R:W/B	7/17	ODSVRA 2009 or 2013	**LT26 breeding adult.**

Appendix D. Banded least terns and snowy plovers (continued).

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018.

All birds were banded as chicks unless otherwise noted. Chicks banded outside of San Luis Obispo County are noted in order from north to south. Some sites band to brood and can have more than one bird with the same combination. At ODSVRA, the same combination may be on birds hatched in different years. (For a description of color band letter codes see Appendix B.)

ODSVRA = Oceano Dunes SVRA, SLO = San Luis Obispo, VAFB = Vandenberg Air Force Base, NWR = National Wildlife Refuge

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
R/G:K	Coos Bay 2017	Coos, OR	10/4, 10/7, 10/12, 10/14, 10/16, 10/22	
AG:AV	Salinas River NWR 2017	Monterey, CA	10/1, 10/7, 10/8, 10/10, 10/11, 10/14, 10/16, 10/17, 10/20, 10/22, 10/23, 10/25, 11/3, 11/7, 11/9, 11/12, 11/15, 11/18, 11/19, 11/20, 11/26, 12/6, 12/12, 12/13, 12/14, 12/16, 12/17, 12/31, 1/3, 1/10, 1/17, 1/23, 2/28	
OL:GP	Salinas River NWR 2009	Monterey	11/15, 11/18, 11/29, 11/30, 12/22, 1/23	
YP:OL	Salinas River NWR 2008	Monterey	10/1, 10/7, 10/9, 10/12, 10/13, 10/29, 11/1, 11/3, 11/4, 11/5, 11/6, 11/8, 11/11, 11/21, 11/22, 12/2, 12/9, 12/11, 12/12, 12/15, 12/21, 12/22, 12/23, 12/26, 12/29, 1/10, 2/21, 2/25	
YG:WL	Reservation Road 2016	Monterey	10/13, 10/16, 10/18, 10/21, 10/22, 10/23, 10/25, 10/26, 10/28, 11/3, 11/21, 11/24, 11/26, 12/1, 12/5, 12/12, 12/14, 12/22, 12/29, 1/10, 1/23, 1/31, 2/6, 2/19	
OW:GL	Elkhorn Slough 2016	Monterey	10/4, 10/6, 10/16, 10/19, 10/21, 10/22, 10/24, 10/25, 10/26, 10/28, 10/29, 10/31, 11/5, 11/10, 11/14, 11/18, 11/19, 11/22, 12/2, 12/11, 12/14, 12/23, 12/28, 12/30, 1/3, 1/17, 1/31, 2/6	
AG:GA	Moss Landing Salt Ponds 2014	Monterey	10/4, 10/9, 10/11, 10/16, 10/21, 10/22, 10/23, 10/24	
YR:AV	Fort Ord 2017	Monterey	10/13	
AY:GV	Fort Ord 2017	Monterey	1/23, 1/31, 2/6	
BB:BR	ODSVRA 2017	SLO, CA	10/11	
BB:BY	ODSVRA 2010 or 2013	SLO	10/1, 10/4, 10/7, 10/8, 10/9, 10/11, 10/12, 10/13, 10/14, 10/16, 10/20, 10/21, 10/22	
BB:GR	ODSVRA 2012 or 2015	SLO	2/21, 2/25	
BB:GY	ODSVRA 2006	SLO	10/4, 10/8, 10/13, 10/23, 11/4, 11/17, 12/10	
BB:RR	ODSVRA 2016 or 2017	SLO	10/20, 10/29, 11/15	
BB:VG	ODSVRA 2017	SLO	10/4, 10/9, 10/18, 10/22	
BB:VR	ODSVRA 2011, 2013, or 2014	SLO	10/10, 10/20, 11/1, 11/6, 11/8, 11/9, 11/10, 11/11, 11/19, 11/28, 12/4, 12/17, 1/3, 1/17, 1/23, 2/19	
BB:VY	ODSVRA 2016 or 2017	SLO	10/11, 10/13, 10/14, 10/16, 10/17, 10/19, 10/23, 10/25, 10/26, 10/28, 10/29, 11/1, 11/4, 11/6, 11/7, 11/8, 11/9, 11/10, 11/11, 11/18, 11/20, 11/21, 11/23, 11/26, 12/9, 12/16, 12/17, 12/21, 12/26, 12/29, 1/17, 1/23, 1/31, 2/6	
BB:WY	ODSVRA 2013	SLO	10/6	
BB:YB	ODSVRA 2011, 2013 or 2015	SLO	10/13	
BB:YG	ODSVRA 2011 or 2015	SLO	10/31	
BB:YR	ODSVRA 2015 or 2016	SLO	10/4	
BB:YW	ODSVRA 2013	SLO	10/1, 10/7, 10/9, 10/11, 10/14, 10/15, 10/18, 10/20, 10/22, 10/25, 10/26, 11/1, 11/3, 11/4, 11/7, 11/8, 11/9, 11/10, 11/18, 11/20, 11/21, 11/24, 11/29, 12/8, 12/9, 12/10, 12/14, 12/15, 12/22, 12/29, 1/17, 1/31, 2/21, 2/28	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
BB:YY	ODSVRA 2010	SLO	2/21	
GA:OY	ODSVRA 2014 or 2015	SLO	10/4, 10/14, 10/15, 10/17, 10/19, 10/22, 10/23, 10/25, 10/26, 11/3, 11/4, 11/5, 11/6, 11/8, 11/9, 11/10, 11/11, 11/14, 11/15, 11/17, 11/26, 12/8, 12/9, 12/13, 12/17, 12/28, 12/29, 1/10, 1/17, 1/23, 1/31, 2/25	
GA:PG	ODSVRA 2015 or 2017	SLO	10/9, 10/11, 10/23, 11/7, 11/17, 11/19, 11/21, 11/27, 12/1, 12/2, 12/5, 12/17, 12/21, 12/22, 12/24, 12/29, 1/10, 1/31	
GA:PR	ODSVRA 2016 or 2017	SLO	11/8, 11/9, 11/10, 11/11, 12/2, 12/5, 12/9, 12/21, 1/10, 1/17, 1/31, 2/6	
GA:WW	ODSVRA 2016 or 2017	SLO	10/4, 10/6, 10/11, 10/12, 11/8, 11/15, 11/19, 11/24, 12/13, 12/17, 1/10, 1/23, 1/31, 2/6, 2/14, 2/28	
GA:YY	ODSVRA 2017	SLO	10/6, 10/11, 10/12, 10/13, 10/16, 10/17, 10/20, 10/21, 10/22, 10/23, 10/24, 10/25, 10/26, 10/29, 11/6, 11/7, 11/8, 11/9, 11/15, 11/21, 11/22, 11/30, 12/12, 12/14, 12/16, 12/19, 12/25, 12/29, 12/30, 1/10, 1/23, 2/6, 2/14, 2/18, 2/25	
GG:GG	ODSVRA 2011 or 2013	SLO	10/1, 10/4, 10/7, 10/8, 10/9, 10/11, 10/12, 10/14, 10/16, 10/17, 10/22, 10/23, 10/26, 11/3, 11/4, 11/5, 11/7, 11/10, 11/18, 11/19, 11/20, 11/21, 11/22, 11/26, 12/1, 12/12, 12/14, 12/17, 12/21, 12/26, 12/29, 1/17, 2/6, 2/19	On 28 February 2018, carcass found at ODSVRA (see Appendix H).
GG:OR	ODSVRA 2014 or 2015	SLO	10/4, 10/6, 10/7, 10/11, 10/12, 10/13, 10/14, 10/15, 10/16, 10/17, 10/18, 10/20, 10/21, 10/22, 10/23, 10/24, 10/25, 10/26, 10/28, 10/29, 10/31, 11/3, 11/4, 11/6, 11/7, 11/9, 11/12, 11/14, 11/17, 11/18, 11/20, 11/29, 12/11, 12/12, 12/13, 12/15, 12/16, 12/1	
GG:PW	ODSVRA 2013 or 2014	SLO	10/4, 10/6, 10/7, 10/11, 10/12, 10/15, 10/16, 10/19, 10/22, 10/28, 10/29, 10/30, 10/31, 11/1, 11/6, 11/7, 11/8, 11/9, 11/10, 11/11, 11/12, 11/14, 11/15, 11/20, 11/21, 11/26, 11/29, 12/6, 12/11, 12/12, 12/13, 12/15, 12/16, 12/17, 12/30, 1/3, 1/10, 1/17, 1/23, 1/31	
GG:PY	ODSVRA 2017	SLO	11/4	
GG:RW	ODSVRA 2014 or 2015	SLO	10/11, 10/13, 10/18, 10/22, 10/23, 10/26	
PG:-	ODSVRA unknown	SLO	10/4, 10/23, 11/8	
PG:BG	ODSVRA 2015 or 2016	SLO	11/17	
PG:BY	ODSVRA 2017	SLO	10/12, 12/2, 12/13, 1/3, 1/10, 1/31	
PG:OG	ODSVRA 2015	SLO	10/4, 10/6, 10/11, 10/12, 10/13, 10/14, 10/15, 10/17, 10/20, 10/23, 10/29, 11/3, 11/4, 11/5, 11/6, 11/7, 11/8, 11/9, 11/10, 11/17, 11/19, 11/20, 11/21, 11/26, 12/1, 12/8, 12/12, 12/13, 12/15, 12/17, 12/21, 1/2, 1/3, 1/10, 1/23	
PG:OR	ODSVRA 2017	SLO	10/4, 10/5, 10/8, 10/12, 10/13, 10/18, 10/23, 10/29, 11/6, 11/7, 11/8, 11/10, 11/15, 11/17, 11/19, 11/20, 11/21, 11/24, 11/27, 11/29, 11/30, 12/2, 12/11, 12/13, 12/17	
PG:OW	ODSVRA 2015 or 2016	SLO	10/4, 10/12, 10/18, 10/22, 10/23, 11/8, 11/15, 11/17, 11/19, 11/29, 12/1, 12/4, 12/13, 12/17, 12/22, 1/3, 1/10, 1/17, 1/23, 1/31, 2/6, 2/23, 2/28	
PG:OY	ODSVRA 2017	SLO	10/11, 10/16, 10/17, 10/19, 10/23, 10/24, 10/25, 10/26, 10/28, 10/29, 11/3, 11/4, 11/8, 11/11, 11/18, 11/21, 11/26, 12/6, 12/8, 12/9, 12/14, 12/15	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
PG:PB	ODSVRA 2014 or 2015	SLO	1/10	
PG:PG	ODSVRA 2014 or 2015	SLO	10/7, 10/14, 10/16, 10/21, 10/22, 10/26, 11/1, 11/3, 11/6, 11/8, 11/9, 11/10, 11/11, 11/15, 11/17, 11/20, 11/22, 11/28, 11/29, 12/2, 12/5, 12/9, 12/12, 12/13, 12/17, 12/26, 1/10	
PG:PW	ODSVRA 2012 or 2014	SLO	10/4, 10/18, 10/23, 10/30, 11/8, 11/15, 11/19, 12/13, 12/31, 1/3, 1/10, 1/17, 1/23, 1/31, 2/6, 2/19, 2/28	
PG:RY	ODSVRA 2014	SLO	10/25, 11/21	
PG:VG	ODSVRA 2014 or 2015	SLO	10/1, 10/7, 10/8, 10/10, 10/11, 10/13, 10/14, 10/15, 10/17, 10/22, 10/23, 10/29, 11/7, 11/10, 11/12, 11/18, 11/20, 11/26, 11/29, 12/6, 12/9, 12/11, 12/12, 12/14, 12/15, 12/21, 1/10, 1/23, 1/31	
PG:YG	ODSVRA 2014 or 2016	SLO	11/10	
PG:YR	ODSVRA 2017	SLO	12/12	
PG:YY	ODSVRA 2015	SLO	10/12, 10/18, 11/17, 12/5, 1/3	
PV:-	ODSVRA unknown	SLO	10/1, 10/8, 10/11, 10/12, 10/13, 10/15, 10/20, 10/25, 10/26, 11/3, 11/5, 11/6, 11/15, 11/17, 11/20, 11/21, 11/29, 12/2, 12/7, 12/9, 12/15, 12/16, 12/22, 2/19	
PV:AW	ODSVRA 2016 or 2017	SLO	2/6	
PV:BB	ODSVRA 2014 or 2015	SLO	10/4	
PV:GW	ODSVRA 2015 or 2017	SLO	10/4, 10/12	
PV:OB	ODSVRA 2015 or 2017	SLO	10/4, 10/18, 10/29, 11/15, 12/13, 1/3, 1/10, 1/23, 1/31	
PV:OR	ODSVRA 2015 or 2017	SLO	10/4, 10/8, 10/9, 10/10, 10/12, 10/16, 10/17, 10/18, 10/19, 10/20, 10/23, 11/1, 11/3, 11/5, 11/8, 11/9, 11/12, 11/14, 12/3	
PV:OY	ODSVRA 2016 or 2017	SLO	10/4, 10/7, 10/12, 10/14, 10/15, 10/18, 10/19, 10/21, 10/22, 11/11, 11/14, 11/17, 11/18, 11/20, 11/22, 11/25, 11/26, 11/27, 12/1, 12/8, 12/9, 12/12, 12/13, 12/15, 12/17, 12/21	
PV:PR	ODSVRA 2017	SLO	10/4, 10/5, 10/6, 10/7, 10/30	
PV:VB	ODSVRA 2017	SLO	10/5, 10/8, 10/9, 10/11, 10/12, 10/14, 10/15, 10/18, 10/22, 10/23	
PV:VY	ODSVRA 2009	SLO	10/1, 10/4	
PV:WB	ODSVRA 2010	SLO	10/6	
PV:YB	ODSVRA 2012	SLO	10/4, 2/19, 2/23	
PV:YG	ODSVRA 2015	SLO	10/1, 10/4, 10/9, 10/12, 10/13, 10/14, 10/17, 10/19, 10/22, 10/30, 11/3, 11/4, 11/5, 11/6, 11/8, 11/11, 11/12, 11/18, 12/12, 12/15, 12/16, 12/22, 1/23, 2/18	
PV:YR	ODSVRA 2017	SLO	11/5	
RR:AB	ODSVRA 2016 or 2017	SLO	10/1, 10/5, 10/10, 10/11, 10/12, 10/13, 10/14, 10/16, 12/29	
RR:AG	ODSVRA 2017	SLO	10/4, 10/11, 10/12, 10/18, 10/23, 11/1, 11/18, 11/29, 12/13, 12/17	
RR:BB	ODSVRA 2016 or 2017	SLO	10/9, 10/10, 10/11, 10/13, 10/15, 10/16, 10/17, 10/22, 11/1, 11/4, 11/5, 11/6, 11/8, 11/9, 11/12, 11/19, 12/6, 12/9, 12/14, 12/21, 12/22, 12/28, 12/31, 1/17, 1/31, 2/6, 2/21, 2/25, 2/28	
RR:BG	ODSVRA 2016	SLO	10/4, 10/10, 10/18, 11/8, 11/15, 11/19	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
RR:BW	ODSVRA 2016 or 2017	SLO	10/5, 10/9, 10/10, 10/14, 10/15, 10/17, 10/18, 10/20, 10/23, 10/24, 10/28, 10/29, 11/1, 11/3, 11/8, 11/9, 11/11, 11/18, 11/19, 11/22, 11/25, 11/30, 12/2, 12/10, 12/12, 12/13, 12/16, 12/26, 12/28, 1/3, 1/10, 1/23, 1/31, 2/20, 2/25	
RR:BY	ODSVRA 2010	SLO	10/13	
RR:WY	ODSVRA 2017	SLO	10/11, 10/12, 10/13, 10/14, 10/15, 10/22, 10/29, 11/3, 11/4, 11/6, 11/7, 11/8, 11/11, 11/14	
VG:AG	ODSVRA 2017	SLO	10/9, 10/11, 10/12, 10/14, 10/15, 10/17, 10/29, 11/3, 11/5, 11/6, 11/8, 11/9, 11/14, 12/8, 12/12, 12/29, 12/30, 1/10, 1/17, 1/23, 1/31, 2/6, 2/14, 2/25	
VG:BW	ODSVRA 2016 or 2017	SLO	10/6, 10/13, 10/14, 10/15, 10/18, 10/21, 10/23, 10/25, 10/26, 10/30, 10/31, 11/1, 11/3, 11/5, 11/9, 11/10, 11/11, 11/19, 11/20, 11/21, 11/27, 11/29, 12/1, 12/4, 12/8, 12/12, 12/17, 12/21, 1/10, 1/17, 1/31, 2/6, 2/19, 2/20	
VG:BY	ODSVRA 2012 or 2013	SLO	10/11	
VG:GB	ODSVRA 2017	SLO	10/9, 10/10, 10/12, 11/1, 11/3, 11/10, 11/11, 11/15, 11/17, 11/18, 11/19, 11/20, 11/22	
VG:GW	ODSVRA 2011 or 2013	SLO	10/4, 10/12, 1/10, 1/23, 2/19, 2/28	
VG:OW	ODSVRA 2016 or 2017	SLO	10/4, 10/6, 10/13, 10/14, 10/15, 10/21, 10/24, 10/26, 10/28, 10/29, 11/4, 11/7	
VG:OY	ODSVRA 2015 or 2016	SLO	10/11, 10/23	
VG:RG	ODSVRA 2017	SLO	10/5, 10/9, 10/12, 10/18, 10/23, 10/31, 11/1, 11/3, 11/5, 11/7, 11/10, 11/12, 11/15, 11/20, 11/22, 12/1, 12/4, 12/5, 12/13, 12/16	
VG:VW	ODSVRA 2011 or 2013	SLO	12/9	
VO:BW	ODSVRA 2014 or 2015	SLO	10/23	
VV:AA	ODSVRA 2011	SLO	10/1, 10/4, 10/7, 10/8, 10/11, 10/14, 10/15, 10/20, 10/21, 10/22, 10/28, 11/4, 11/5, 11/6, 11/9, 11/12, 11/14, 11/17, 11/18, 11/19, 12/6, 12/8, 12/9, 12/11, 12/30, 12/31, 1/17, 1/23, 1/31, 2/20, 2/25	
VV:BG	ODSVRA 2013	SLO	10/1, 10/4, 10/7, 10/11, 10/12, 10/13, 10/20, 10/21, 10/22, 10/25, 10/26, 11/8, 11/15, 11/17, 11/21, 11/29, 11/30, 12/2, 12/4, 12/5, 12/8, 12/9, 12/11, 12/14, 12/15, 12/16, 12/21, 12/22, 1/3, 1/31, 2/6, 2/25	
VV:GR	ODSVRA 2012 or 2013	SLO	10/11, 10/12, 10/13, 10/14, 10/15, 10/25, 11/6, 11/8, 11/9, 11/20, 12/16, 12/28, 1/17	
VV:GW	ODSVRA 2015 or 2017	SLO	2/28	
VV:GY	ODSVRA 2014	SLO	2/6	
VV:OR	ODSVRA 2015 or 2016	SLO	11/10	
VV:OY	ODSVRA 2015 or 2016	SLO	10/21	
VV:RG	ODSVRA 2015 or 2017	SLO	10/12, 10/14, 10/17, 10/20, 10/22, 10/25, 10/26, 10/29, 10/31, 11/4, 11/5, 11/10, 11/15, 11/18, 11/30, 12/6, 12/8, 12/9, 12/12, 12/21, 12/30, 1/10, 1/23, 2/6, 2/19, 2/21	
VV:RY	ODSVRA 2015 or 2016	SLO	10/1, 10/4, 10/8, 10/9, 10/11, 10/12, 10/13, 10/15, 10/22, 10/25, 11/3, 11/5, 11/6, 11/8, 11/9, 11/15, 11/18, 11/19, 11/20, 11/21, 11/26, 11/30, 12/21, 12/22, 12/29, 2/19, 2/20, 2/21, 2/25	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
VV:VB	ODSVRA 2011 or 2013	SLO	10/7, 10/10, 10/23, 11/19, 12/13, 12/17, 1/3, 1/10, 1/31, 2/14, 2/19, 2/23	
VV:WY	ODSVRA 2012 or 2013	SLO	10/4, 10/6, 10/10, 10/11, 10/12, 11/1, 11/5, 11/6, 11/8, 11/9, 11/11, 11/14, 11/19, 12/5, 12/13, 12/23, 1/17, 1/23, 2/19	
VV:YB	ODSVRA 2017	SLO	10/4, 10/5, 10/13, 10/14, 10/16, 10/18, 10/22, 10/23, 10/25, 10/28, 10/29, 11/6, 11/9, 11/10, 11/12, 11/19, 11/20, 11/25, 11/26, 11/29, 11/30, 12/6, 12/8, 12/9, 12/21, 12/22, 1/10, 1/17, 1/31	
VV:YG	ODSVRA 2013 or 2015	Santa Barbara, CA	11/14	
A:G/O/G	VAFB 2017	Santa Barbara	10/4, 10/12, 1/3, 1/17, 1/23, 2/6	
B:G/Y	VAFB 2017	Santa Barbara	10/7, 10/12, 10/13, 10/14, 10/15, 10/17, 10/19, 10/20, 10/22, 10/26, 10/28, 10/29, 11/5, 11/6, 11/8, 11/9, 11/10, 11/12, 11/15, 11/18, 11/21, 12/2, 12/11, 12/12, 12/14, 1/23, 2/6, 2/14	
B:Y/G	VAFB 2013	Santa Barbara	10/9, 11/9, 11/11, 11/15, 11/18, 11/20, 11/30	
GN:RR	VAFB 2017	Santa Barbara	10/12, 11/3, 11/15, 11/17, 11/18, 11/21, 11/22, 12/8, 12/9, 12/10, 12/11	
L:Y/G	VAFB 2016	Santa Barbara	10/4, 10/18, 11/19, 12/13, 12/17, 12/22, 12/30, 12/31, 1/10, 1/31, 2/23	On federal service band on right leg there is exposed metal above yellow tape.
NB:G-	VAFB unknown	Santa Barbara	10/10, 11/8, 1/3	On federal service band on left leg there is exposed metal above blue tape. Brown plastic band on left leg is missing tape and fading.
NO:OR	VAFB 2016	Santa Barbara	12/1	
NO:RG	VAFB 2017	Santa Barbara	10/4, 10/6, 10/7, 10/8, 10/9	
NO:YG	VAFB 2015	Santa Barbara	10/11	
NR:AY	VAFB 2017	Santa Barbara	10/11, 10/13, 10/15, 10/18, 10/23, 10/24, 10/25, 10/26, 10/29, 11/1, 11/3, 11/6, 11/8, 12/8, 12/11, 12/12, 12/15, 12/21, 12/26, 12/29	On federal service band on left leg there is exposed metal below red tape.
NR:BY	VAFB 2017	Santa Barbara	10/24	
NR:YG	VAFB 2017	Santa Barbara	10/4, 10/6, 10/9, 10/12, 10/13, 10/14, 10/21, 10/22, 10/23, 10/26, 11/1, 11/6, 11/7, 11/8, 11/9, 11/10, 11/14, 11/15, 11/17, 11/18, 11/20, 11/22, 11/29, 11/30, 12/10, 12/16, 12/21, 12/29, 12/30, 1/23, 1/31, 2/14, 2/25	On federal service band on left leg there is exposed metal above red tape.
NS:WB	VAFB Unknown	Santa Barbara	10/26, 10/28	
NW:YG	VAFB 2017	Santa Barbara	10/8	
NY:WB	VAFB 2016	Santa Barbara	10/7, 10/12, 10/13, 10/14, 10/16, 10/25, 10/29, 11/3, 11/5, 11/25, 11/26, 11/28, 12/21, 12/22	On federal service band on left leg the yellow band has peeled to expose most of the metal band.
NY:WG	VAFB 2017	Santa Barbara	10/4, 10/6, 10/7, 10/11, 10/12, 10/14, 10/15, 10/23	
O-:AG	VAFB 2013	Santa Barbara	10/1, 10/22, 10/23, 10/26, 10/29, 11/1, 11/3, 11/9, 12/16, 12/21, 12/25, 12/29	Originally banded NO:AG, top brown band missing and now banded O-:AG. On federal service band on left leg there is exposed metal above orange tape.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.2. Banded snowy plovers recorded at ODSVRA 1 October 2017 to 28 February 2018 (continued).

Band Combination	Origin and Year Banded	County Banded	Dates Seen	Notes
O-:PB	VAFB 2014	Santa Barbara	2/23, 2/28	Originally banded NO:PB, top brown band missing and now banded O-:PB. On federal service band on left leg there is exposed metal below orange tape.
O-:WG	VAFB Unknown	Santa Barbara	10/21, 10/23, 11/11, 12/6, 2/6, 2/14, 2/20	Originally banded NO:WG, top brown band missing and now banded O-:WG. On federal service band on left leg there is exposed metal above orange tape.
O-:WY	VAFB 2013	Santa Barbara	10/4, 10/12	Originally banded NO:WY, top brown band missing and now banded O-:WY. On federal service band on left leg there is exposed metal below orange tape and in other worn areas.
-:AY	Unknown	Unknown	10/1, 10/12, 10/13, 10/16, 10/18, 10/19, 10/21, 10/26, 10/30, 11/4, 11/5, 11/6, 11/8, 11/9, 11/10, 11/11, 11/20, 11/26, 11/29, 12/9, 12/12, 12/16	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018.

Juveniles fledged from ODSVRA in 2018 are not included. All birds were banded as chicks unless otherwise noted. Chicks banded outside of San Luis Obispo County are noted in order north to south. Some sites band to brood and can have more than one bird with the same combination. (For a description of color band letter codes see Appendix B.)

ODSVRA = Oceano Dunes SVRA, SLO = San Luis Obispo, VAFB = Vandenberg Air Force Base, NWR = National Wildlife Refuge

F = Female, M = Male

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
OW:GL		Elkhorn Slough 2016	Monterey, CA	3/1, 3/4, 3/12, 3/14	
AG:GA	M	Moss Landing Salt Ponds 2014	Monterey	3/19, 4/11, 4/12, 4/14, 5/11, 5/14, 5/22, 5/25, 5/27, 5/29, 5/31, 6/2, 6/3, 6/12, 6/17, 6/28, 6/30, 7/2, 7/3, 7/4, 7/7, 7/9, 7/16, 7/17, 7/28, 7/30, 8/7, 8/12, 8/13, 8/21, 8/25, 8/27, 9/22	ODSVRA breeding male.
AG:AV		Salinas River NWR 2017	Monterey	3/5, 3/7, 3/17, 8/4, 8/16, 8/17, 8/19, 9/10, 9/13	
YG:WL		Reservation Road 2016	Monterey	3/3, 6/15	
AY:GV		Fort Ord 2017	Monterey	3/11, 3/16	
BB:AR	M	ODSVRA 2017	SLO, CA	4/26, 5/5, 5/22, 6/2, 6/10, 6/23, 6/24, 7/1, 7/9, 7/11, 7/12, 7/13, 7/15, 7/16, 7/17, 7/21, 7/24, 7/30, 8/4, 8/12, 8/18	ODSVRA breeding male.
BB:BG	M	ODSVRA 2015 or 2016	SLO	5/8, 5/15, 5/17, 5/21, 5/22, 5/26, 5/27, 6/3, 6/21, 6/26	ODSVRA breeding male.
BB:BY		ODSVRA 2010 or 2013	SLO	3/13, 4/25, 9/20	
BB:GR	F	ODSVRA 2012 or 2015	SLO	5/22, 6/21, 6/23, 6/26, 6/29, 7/1, 7/4, 7/5, 7/7	ODSVRA breeding female.
BB:OB	M (2)	ODSVRA 2014 or 2016	SLO	4/1, 4/7, 5/24, 6/6, 6/29, 6/30, 7/2, 7/6, 7/11, 7/16, 7/28, 7/29, 8/8, 8/15, 8/16, 8/21, 8/24, 9/9	ODSVRA breeding males (2).
BB:OR	M	ODSVRA 2016 or 2017	SLO	5/3, 5/25, 5/26, 6/14, 6/15, 6/16, 6/17, 6/19, 6/20, 6/22, 7/1, 7/5, 7/21	ODSVRA breeding male.
BB:OW	F	ODSVRA 2015 or 2016	SLO	6/14, 6/15, 6/17, 6/19, 6/21, 6/23	ODSVRA breeding female.
BB:PW	F	ODSVRA 2014 or 2016	SLO	6/24, 7/19, 8/4	ODSVRA breeding female.
BB:PY	M	ODSVRA 2017	SLO	4/7, 5/9, 5/12, 5/17, 5/22, 5/25, 6/2, 6/3, 6/15, 6/17, 6/22, 6/30, 7/3, 8/10, 8/12, 8/14, 8/19, 8/24, 8/26	ODSVRA breeding male.
BB:RB	M	ODSVRA 2015	SLO	4/7, 4/12, 4/18, 4/20, 4/26, 4/29, 5/11, 5/12, 5/18, 5/28, 5/29, 5/30, 5/31, 6/2, 6/3, 6/6, 6/12, 6/16, 6/21, 6/22, 6/29	ODSVRA breeding male.
BB:RR	M	ODSVRA 2016 or 2017	SLO	4/14, 4/16, 4/19, 4/20, 4/26, 5/14, 5/20, 5/25, 5/27, 5/29, 5/30, 6/1, 6/4, 6/8, 6/12, 6/15, 6/16, 6/17, 6/22, 6/29, 7/1, 7/3, 7/4, 7/6, 7/9, 7/11, 7/12, 7/16, 7/18, 9/12, 9/17	ODSVRA breeding male.
BB:RW		ODSVRA 2014 or 2015	SLO	5/11	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
BB:VG	F	ODSVRA 2017	SLO	5/8, 5/11, 6/12, 6/14, 6/17, 6/25, 7/4, 9/1, 9/8, 9/10, 9/13, 9/16	ODSVRA breeding female.
BB:VR	M	ODSVRA 2011, 2013, or 2014	SLO	5/22, 6/1, 6/2, 6/3, 6/12, 6/14, 6/29, 7/3, 7/11, 7/26, 7/31, 8/2, 8/4, 8/6, 8/11, 8/16, 8/17, 9/15	ODSVRA breeding male.
BB:VY	M	ODSVRA 2016 or 2017	SLO	3/5, 3/11, 4/7, 4/11, 5/8, 5/9, 6/27, 7/5, 7/13, 7/16, 7/22, 7/26, 7/31, 8/1, 8/2, 8/4, 8/12, 8/21, 8/27, 8/29, 8/30, 9/3, 9/16, 9/17, 9/24	ODSVRA breeding male.
BB:WB	M	ODSVRA 2013	SLO	4/9, 5/22, 5/29, 5/31, 6/6, 6/17, 6/21	ODSVRA breeding male.
BB:WY		ODSVRA 2013	SLO	3/4, 4/1, 4/4	
BB:YB		ODSVRA 2011, 2013 or 2015	SLO	4/26, 4/28, 5/3, 5/11, 5/12, 5/14, 5/22, 5/25, 5/26, 6/1, 6/9, 6/12, 6/13, 6/18, 6/19, 7/2, 7/6	
BB:YW	F	ODSVRA 2013	SLO	3/1, 3/27, 4/17, 4/19, 4/20, 5/11, 5/14, 5/22, 5/25, 5/26, 5/30, 6/2, 6/4, 7/6, 7/9, 7/10, 7/11, 7/12, 7/16, 7/24, 7/26, 7/30, 8/22, 8/27, 8/29, 9/2, 9/12, 9/16, 9/17, 9/20, 9/23, 9/24, 9/27	ODSVRA breeding female.
BB:YY		ODSVRA 2010	SLO	3/15	
GA:AB		ODSVRA 2013 or 2015	SLO	5/29, 6/3, 7/16	
GA:AR	M	ODSVRA 2015	SLO	4/11, 5/3, 5/4, 5/9, 5/11, 5/14, 5/23, 5/25, 5/30, 6/2, 6/22, 6/25, 6/29, 7/4, 7/10, 7/12, 7/23, 7/24, 7/26, 7/27, 7/31, 8/2, 8/5, 8/6, 8/9	ODSVRA breeding male.
GA:BB		ODSVRA 2017	SLO	7/12, 8/5, 9/24	
GA:GR		ODSVRA 2015 or 2016	SLO	5/18, 7/4, 8/24	
GA:O-	F	ODSVRA Unknown	SLO	5/4, 5/8, 6/16, 6/21, 7/4	ODSVRA breeding female. Bird missing right foot.
GA:OG		ODSVRA 2014 or 2015	SLO	5/28	
GA:OR	M and F	ODSVRA 2016 or 2017	SLO	3/31, 4/16, 5/2, 5/4, 5/10, 5/18, 5/31, 6/3, 6/4, 6/15, 6/20, 6/22, 6/23, 6/28, 6/30, 7/3, 7/4, 7/12, 7/14, 7/16, 9/8	ODSVRA breeding male and female.
GA:OW	M	ODSVRA 2013 or 2014	SLO	3/28, 4/17, 5/4, 5/14, 5/20, 5/28, 5/30, 6/6, 6/13, 6/15, 7/2, 8/8, 8/9, 8/11, 8/14, 8/16, 8/18, 8/19, 8/21, 8/24, 8/28	ODSVRA breeding male.
GA:OY		ODSVRA 2014 or 2015	SLO	4/1, 8/24, 9/12, 9/13, 9/18, 9/24, 9/27	
GA:PG		ODSVRA 2015 or 2017	SLO	4/1	
GA:PR	M and F	ODSVRA 2016 or 2017	SLO	4/7, 4/26, 5/3, 5/13, 5/29, 6/11, 6/13, 6/16, 6/20, 6/29, 7/2, 7/16, 7/19, 7/20, 7/21, 7/28, 8/10, 8/16, 8/17, 8/25, 8/26, 9/4, 9/16	ODSVRA breeding male and female.
GA:RG	F	ODSVRA 2015 or 2016	SLO	4/1, 4/5, 4/15, 4/27, 7/7, 7/19, 7/20, 8/16, 8/19, 8/20, 9/8	ODSVRA breeding female.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
GA:RY	M and F (2)	ODSVRA 2017	SLO	3/13, 4/1, 5/5, 5/22, 5/27, 5/28, 6/4, 6/12, 6/14, 6/17, 6/20, 7/7, 7/11, 7/16, 7/29, 7/31, 8/2, 8/6, 8/9, 8/10, 8/13, 8/14, 8/15, 8/16, 8/18, 8/19, 8/27, 9/4, 9/12, 9/15, 9/16, 9/17	ODSVRA breeding male and females (2).
GA:WG	M	ODSVRA 2016 or 2017	SLO	5/11, 5/20, 6/28, 7/5, 7/10, 8/16, 8/18, 8/19, 8/28	ODSVRA breeding male.
GA:WR	M	ODSVRA 2015 or 2016	SLO	5/6, 5/14, 5/16, 5/19, 5/22, 5/23, 6/11, 6/12, 6/14, 6/18, 6/21, 7/1, 7/6	ODSVRA breeding male.
GA:WW	M (2)	ODSVRA 2016 or 2017	SLO	3/31, 4/25, 4/29, 5/4, 5/14, 5/18, 5/20, 5/22, 5/26, 5/27, 6/6, 6/7, 6/12, 6/13, 6/20, 6/22, 6/24, 6/27, 6/29, 7/1, 7/2, 7/3, 7/4, 7/8, 7/9, 7/10, 7/13, 7/15, 7/16, 7/17, 7/24, 7/29, 7/30, 7/31, 8/6, 8/11, 8/16, 8/17, 8/18, 8/20	ODSVRA breeding males (2).
GA:Y-	M	ODSVRA unknown	SLO	6/27, 7/1, 7/3, 7/11, 7/12, 7/17, 7/28	ODSVRA breeding male.
GA:YB	M	ODSVRA 2017	SLO	5/11, 5/18, 5/22, 6/18, 6/27, 6/28, 7/1, 7/2, 7/3, 7/17, 7/18, 7/22, 7/29, 7/30, 8/3, 8/9, 8/13, 8/15, 8/16, 8/20	ODSVRA breeding male.
GA:YR		ODSVRA 2014	SLO	4/8, 5/6, 6/6, 7/2, 7/31, 8/14	
GA:YY	F	ODSVRA 2017	SLO	3/16, 4/27, 5/22, 7/2, 8/25, 8/27	ODSVRA breeding female.
GG:AB	F	ODSVRA 2015 or 2016	SLO	3/21, 4/6, 4/14, 4/28, 6/27, 6/29, 6/30, 7/2, 7/11	ODSVRA breeding female.
GG:AY	M	ODSVRA 2012 or 2013	SLO	5/23, 5/30, 6/21, 6/27, 6/28, 7/1, 7/4, 7/10	ODSVRA breeding male.
GG:BW		ODSVRA 2012	SLO	7/12, 9/5	
GG:GR	F	ODSVRA 2011 or 2013	SLO	5/11, 5/16, 5/22, 7/4, 7/8, 7/9, 7/16, 7/18, 7/27, 7/31, 8/2, 8/4, 8/6	ODSVRA breeding female.
GG:OR	M (2)	ODSVRA 2014 or 2015	SLO	3/5, 3/17, 4/7, 4/10, 4/11, 4/13, 4/14, 4/21, 5/11, 5/17, 5/18, 5/28, 5/30, 5/31, 6/2, 6/3, 6/14, 6/16, 6/21, 7/19, 7/20, 7/22, 7/24, 7/27, 7/28, 7/30, 7/31, 8/6, 8/11, 8/12, 8/13, 8/14, 8/16, 8/17, 8/18, 8/19, 8/21, 8/22, 8/26, 9/3, 9/4, 9/7, 9/13, 9/14	ODSVRA breeding males (2).
GG:OW		ODSVRA 2014 or 2015	SLO	3/3	
GG:PR	M	ODSVRA 2017	SLO	5/14, 6/3, 6/4, 7/2, 7/12, 7/18	ODSVRA breeding male.
GG:PW	M	ODSVRA 2013 or 2014	SLO	3/4, 4/24, 5/2, 5/16, 5/18, 5/22, 5/25, 5/29, 6/21, 6/26, 6/27, 6/29, 7/3, 7/4, 7/6, 7/9, 7/31, 8/18, 9/15	ODSVRA breeding male.
GG:WB	M	ODSVRA 2011 or 2013	SLO	4/3, 4/7, 4/16, 4/17, 4/26, 4/29, 4/30, 5/1, 5/3, 5/29, 5/30, 6/2, 6/3, 6/4, 6/17, 6/20, 6/27, 7/4	ODSVRA breeding male.
GG:WR		ODSVRA 2014 or 2016	SLO	5/7	
GG:YR		ODSVRA 2017	SLO	8/28	
PG:-	F	ODSVRA unknown	SLO	4/7, 5/11, 5/13, 5/22, 5/29, 6/6, 6/12, 6/21, 8/26, 9/6	ODSVRA breeding female.
PG:BG		ODSVRA 2015 or 2016	SLO	9/2	
PG:OB		ODSVRA 2012 or 2014	SLO	8/16	
PG:OG		ODSVRA 2015	SLO	3/5, 6/12, 7/22, 8/13, 8/18, 8/25, 9/13	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
PG:OW	M and F	ODSVRA 2015 or 2016	SLO	4/7, 4/15, 4/28, 5/7, 5/13, 5/14, 5/15, 5/22, 6/6, 6/11, 6/12, 6/14, 6/20, 6/30, 7/1, 7/4, 7/7, 7/11, 7/15, 7/28, 7/29, 8/6, 8/9, 8/19, 8/21	ODSVRA breeding male and female.
PG:PB	F	ODSVRA 2014 or 2015	SLO	3/31, 4/5, 4/9, 6/8, 6/28, 7/6, 8/18, 9/4, 9/12	ODSVRA breeding female.
PG:PG	F	ODSVRA 2014 or 2015	SLO	5/2, 6/16, 7/7, 7/26, 7/28, 7/29, 8/3, 8/19, 8/28, 9/13	ODSVRA breeding female.
PG:PW	M	ODSVRA 2012 or 2014	SLO	3/15, 3/28, 4/27, 4/28, 4/29, 4/30, 5/1, 5/3, 5/8, 5/14, 5/22, 5/23, 5/31, 6/2, 6/3, 6/6, 6/10, 6/12, 6/25, 6/29, 7/28, 7/29, 7/30, 8/6, 8/10, 8/11, 8/12, 8/19, 8/24, 8/29, 9/1, 9/12, 9/14, 9/15, 9/16	ODSVRA breeding male.
PG:VB	M	ODSVRA 2015 or 2016	SLO	6/8, 6/15, 6/17, 6/19, 6/30, 7/1, 7/3, 7/4	ODSVRA breeding male.
PG:VG	M	ODSVRA 2014 or 2015	SLO	3/3, 3/28, 3/31, 4/1, 5/22, 5/26, 5/27, 5/28, 5/30, 7/1, 8/12, 8/13, 8/20, 8/21, 9/14, 9/16, 9/18, 9/21, 9/24	ODSVRA breeding male.
PG:VY		ODSVRA 2015	SLO	9/14	
PG:YB	F	ODSVRA 2015 or 2017	SLO	4/11, 5/22, 6/18, 7/4, 7/13, 8/24, 9/7	ODSVRA breeding female.
PG:YG		ODSVRA 2014 or 2016	SLO	7/9	
PG:YY		ODSVRA 2015	SLO	8/1, 9/15, 9/16, 9/17	
PV:-	F	ODSVRA unknown	SLO	3/7, 5/23, 5/26, 5/27, 5/29, 7/30, 8/1, 8/21, 8/23, 9/1, 9/4, 9/14, 9/17	ODSVRA breeding female.
PV:AW	F	ODSVRA 2016 or 2017	SLO	4/14, 5/18, 5/22, 6/27, 7/7, 7/14, 7/18, 7/19, 7/22, 7/28, 8/1, 8/2, 8/3, 8/5, 8/6, 8/7, 8/13, 8/14, 8/19	ODSVRA breeding female.
PV:BW		ODSVRA 2012 or 2014	SLO	7/31	
PV:BY	F	ODSVRA 2015	SLO	6/12, 6/30, 7/1, 7/3, 7/6, 7/8, 7/10, 7/11, 7/12, 7/16, 7/27, 7/28, 7/31, 8/2, 8/6, 8/13, 8/16	ODSVRA breeding female.
PV:GW		ODSVRA 2015 or 2017	SLO	7/19, 8/16, 9/7, 9/8, 9/9	
PV:OB		ODSVRA 2015 or 2017	SLO	3/20, 7/11, 7/13, 8/17, 8/18, 8/21	
PV:OW		ODSVRA 2015	SLO	6/2	
PV:PG	F	ODSVRA 2015 or 2017	SLO	4/18, 5/20, 5/22, 5/25, 6/22, 8/18	ODSVRA breeding female.
PV:PR	F	ODSVRA 2017	SLO	3/31, 4/7, 5/12, 5/14, 5/29, 6/2, 6/4	ODSVRA breeding female.
PV:RB		ODSVRA 2016	SLO	8/6, 8/14, 8/21, 8/29	
PV:RY		ODSVRA 2015	SLO	7/16	
PV:VW	F	ODSVRA 2014 or 2015	SLO	5/10, 5/11, 6/18, 6/21, 6/24, 7/3, 7/16, 7/28, 8/3, 8/8, 8/12, 8/13, 8/14, 8/26	ODSVRA breeding female.
PV:VY	F	ODSVRA 2009	SLO	6/12, 6/27, 6/29, 7/1, 8/10, 8/12, 8/17, 8/22, 8/27, 8/29, 9/4, 9/14, 9/16	ODSVRA breeding female.
PV:WB		ODSVRA 2010	SLO	8/8	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
PV:WY	M	ODSVRA 2014 or 2015	SLO	5/7, 5/13, 5/14, 5/15, 5/16, 5/20, 5/22, 5/23, 5/25, 6/2, 6/3, 6/17, 6/27, 7/2, 7/4, 7/16, 8/28, 9/9	ODSVRA breeding male.
PV:YB	M	ODSVRA 2012	SLO	5/18, 5/20, 5/22, 5/26, 5/28, 6/13, 7/11, 7/17, 7/19, 7/20, 7/22, 7/23, 7/29, 7/30, 7/31, 8/3, 8/6, 8/8, 8/9, 8/11, 8/17	ODSVRA breeding male.
PV:YG	M	ODSVRA 2015	SLO	4/1, 5/29, 6/6, 6/8, 6/23, 6/29, 7/2, 7/19, 7/21, 8/8, 8/16, 8/21	ODSVRA breeding male.
PV:YW		ODSVRA 2015 or 2017	SLO	4/9, 4/18	
PV:YY	F	ODSVRA 2015 or 2017	SLO	5/5, 5/16, 6/27, 6/30, 7/26, 7/27, 8/19, 9/8	ODSVRA breeding female.
RR:AB	M	ODSVRA 2016 or 2017	SLO	4/16, 4/18, 4/19, 4/20, 5/11, 5/15, 5/22, 5/23, 6/6, 6/14, 6/17, 6/22	ODSVRA breeding male.
RR:AW	M	ODSVRA 2017	SLO	5/11, 5/14, 5/17, 6/12, 6/26, 7/1, 7/2, 7/9, 7/15, 7/16, 7/17, 7/23, 7/25, 7/29, 7/30, 7/31, 8/6, 8/8, 8/12, 8/13, 8/16	ODSVRA breeding male.
RR:BB	F	ODSVRA 2016 or 2017	SLO	3/3, 3/11, 3/12, 3/16, 5/18, 5/19, 5/22, 5/27, 5/28, 7/7, 7/10, 7/11, 7/16, 7/18, 7/22, 8/11, 8/14, 8/18, 9/10, 9/14, 9/15	ODSVRA breeding female.
RR:BG		ODSVRA 2016	SLO	9/1	On 1 September, carcass found at ODSVRA (see Appendix H). Two birds banded with the same combination in 2016.
RR:BW	M and F	ODSVRA 2016 or 2017	SLO	3/3, 3/7, 4/23, 5/9, 5/18, 5/23, 6/5, 6/15, 7/1, 7/3, 7/4, 8/6, 8/18, 8/22, 8/28, 8/31, 9/1, 9/10, 9/12, 9/24	ODSVRA breeding male and female.
RR:OR	M	ODSVRA 2010	SLO	5/7, 5/16, 5/20, 5/31, 6/2, 6/8, 6/12, 6/15, 6/16, 6/20, 7/4, 7/24, 7/27, 7/28, 7/30, 8/1, 8/4, 8/6, 8/10, 8/12	ODSVRA breeding male.
RR:PW	F	ODSVRA 2014	SLO	4/22, 5/5, 6/1, 6/4, 6/14, 6/16, 7/23, 7/26, 7/27, 7/31, 8/10, 8/11, 8/12, 8/13, 8/14, 8/16, 8/18, 8/21, 8/22, 8/23, 8/24	ODSVRA breeding female.
RR:WB		ODSVRA 2017	SLO	5/12	
RR:WG		ODSVRA 2012	SLO	8/19	
VG:AG	M	ODSVRA 2017	SLO	3/4, 5/3, 5/15, 5/28, 5/30, 6/1, 6/6, 6/18, 6/23, 6/26, 7/5, 7/8, 7/24, 7/27, 8/2, 8/8, 8/22, 9/1, 9/4, 9/7, 9/10, 9/15, 9/16, 9/18	ODSVRA breeding male.
VG:AW	F	ODSVRA 2011 or 2013	SLO	4/24, 5/28, 6/1, 6/15	ODSVRA breeding female.
VG:BW	F	ODSVRA 2016 or 2017	SLO	3/3, 3/20, 5/8, 6/2, 6/11, 6/22, 7/4, 7/11, 8/24, 8/27, 9/2, 9/9, 9/24	ODSVRA breeding female.
VG:GR	F	ODSVRA 2017	SLO	6/29, 7/1	ODSVRA breeding female.
VG:GW	F	ODSVRA 2011 or 2013	SLO	4/15, 6/2, 6/15, 6/17, 6/20, 7/27, 7/28, 8/10, 8/14, 8/18, 8/28	ODSVRA breeding female.
VG:OW		ODSVRA 2016 or 2017	SLO	4/10	
VG:PB		ODSVRA 2015 or 2017	SLO	8/17, 8/19	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
VG:VB		ODSVRA 2015 or 2016	SLO	4/16	
VG:VY	M	ODSVRA 2015 or 2016	SLO	5/20, 5/22, 6/8, 6/13, 6/16, 6/27, 7/12, 7/14, 7/30, 8/7, 8/8, 8/9	ODSVRA breeding male.
VO:BW	F	ODSVRA 2014 or 2015	SLO	4/1, 7/4, 7/28, 7/31, 8/1, 8/8, 8/13	ODSVRA breeding female.
VV:AA	F	ODSVRA 2011	SLO	3/3, 3/16, 3/21, 4/3, 4/11, 4/16, 5/29, 6/30, 7/2, 8/7, 8/13, 8/20, 8/21, 8/27, 8/28, 8/29, 9/1, 9/7, 9/12, 9/14, 9/16, 9/18, 9/24	ODSVRA breeding female.
VV:BG	F	ODSVRA 2013	SLO	3/15, 5/24, 8/3, 8/13, 8/16, 8/21, 8/27, 9/1, 9/10, 9/14, 9/15, 9/16, 9/24	ODSVRA breeding female.
VV:BW	M	ODSVRA 2014 or 2015	SLO	6/19, 6/20, 6/21, 6/25, 7/1, 7/2, 7/17	ODSVRA breeding male.
VV:GR	F	ODSVRA 2012 or 2013	SLO	3/5, 4/25	ODSVRA breeding female.
VV:GW	F	ODSVRA 2015 or 2017	SLO	4/8, 4/10, 4/29, 5/14, 6/17, 7/3, 7/6, 7/7, 7/11, 7/13	ODSVRA breeding female.
VV:OW	M	ODSVRA 2017	SLO	6/18	ODSVRA breeding male.
VV:RG		ODSVRA 2015 or 2017	SLO	3/3, 3/4	
VV:RY	F	ODSVRA 2015 or 2016	SLO	3/19, 4/10, 4/11, 4/12, 4/14, 4/15, 4/24, 5/4	ODSVRA breeding female.
VV:VB	M	ODSVRA 2011 or 2013	SLO	5/22, 5/25, 6/8, 6/15, 6/20, 6/27, 7/1, 7/4	ODSVRA breeding male.
VV:WR	M	ODSVRA 2015 or 2016	SLO	5/17, 5/19, 6/6, 6/19, 7/28, 7/29, 7/30, 7/31, 8/3, 8/8	ODSVRA breeding male.
VV:WY	F	ODSVRA 2012 or 2013	SLO	5/30, 6/20, 6/22	ODSVRA breeding female.
VV:YG	M	ODSVRA 2013 or 2015	SLO	5/14, 5/22, 5/30, 6/2, 6/4, 6/6, 6/17, 6/24, 6/25, 6/26, 7/4, 7/16, 8/6	ODSVRA breeding male.
AN:BW		VAFB 2018	Santa Barbara, CA	9/5	Juvenile.
GN:RR	M	VAFB 2017	Santa Barbara	5/30, 6/2, 6/12, 6/13, 6/27, 7/1, 7/4, 7/8, 7/9, 7/11, 7/13, 7/15, 7/23, 8/7, 8/16, 8/17, 8/19, 8/20, 9/8	ODSVRA breeding male. On federal service band on left leg there is exposed metal above brown tape.
GN:YY		VAFB 2018	Santa Barbara	8/23	Juvenile.
NB:BW	M	VAFB 2016	Santa Barbara	5/22, 5/27, 6/8, 6/16, 6/21, 6/23, 6/26, 6/27, 7/1, 7/4, 7/12, 7/13, 7/16, 7/19, 7/31, 8/8, 8/9, 8/13, 8/17, 8/19	ODSVRA breeding male. On federal service band on left leg there is exposed metal above blue tape.
NB:OY	M	VAFB 2016	Santa Barbara	5/8, 5/18, 5/19, 5/22, 6/5, 6/12, 7/10, 7/11, 7/16, 7/22	ODSVRA breeding male. On federal service band on left leg there is exposed metal below blue tape.
NR:BR	F	VAFB 2016	Santa Barbara	4/16, 4/18, 4/19, 6/15, 6/17, 6/22, 7/18, 7/22	ODSVRA breeding female. On federal service band on left leg there is exposed metal below red tape.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.3. Banded snowy plovers with known origins recorded at ODSVRA 1 March to 30 September 2018 (continued).

Band Combination	Sex (#)	Origin and Year Banded	County Banded	Dates Seen	Notes
NR:NB		VAFB 2017	Santa Barbara	8/19, 9/8	On federal service band on left leg there is exposed metal below red tape.
NR:WB	M	VAFB 2016	Santa Barbara	4/26, 5/11, 5/13, 5/17, 5/22, 6/12, 6/15, 7/1, 7/15, 8/6, 8/19	ODSVRA breeding male.
NR:YG	F	VAFB 2017	Santa Barbara	3/4, 3/7, 3/20, 6/29, 8/9, 8/13, 8/17, 8/20, 8/21, 8/27, 9/16, 9/18	ODSVRA breeding female. On federal service band on left leg there is exposed metal above red tape.
NW:RR		VAFB 2018	Santa Barbara	7/12	
NY:WG	M	VAFB 2017	Santa Barbara	6/14, 6/28, 7/13, 7/16, 7/17	ODSVRA breeding male.
O-:AG	F	VAFB 2013	Santa Barbara	3/3, 7/29, 7/31, 8/2, 8/3, 8/16, 8/21, 8/27, 9/1, 9/24	ODSVRA breeding female. Originally banded NO:AG, top brown band missing and now banded O-:AG. On federal service band on left leg there is exposed metal above orange tape.
O-:PB	M	VAFB 2014	Santa Barbara	4/14, 4/26, 6/2, 6/5, 6/22, 6/26, 7/3, 7/4, 7/10, 7/12, 7/16	ODSVRA breeding male. Originally banded NO:PB, top brown band missing and now banded O-:PB. On federal service band on left leg there is exposed metal below orange tape.
O-:WG		VAFB 2012	Santa Barbara	8/17, 8/29	Originally banded NO:WG top brown band missing and now banded O-:WG. On federal service band on left leg there is exposed metal above orange tape.
-:YG	M	Unknown	Unknown	6/22, 7/5, 8/10, 8/14, 8/16, 8/17, 8/18, 8/20, 9/15, 9/24	ODSVRA breeding male.
B-:G-	F	Unknown	Unknown	5/24, 7/4, 7/6, 7/8, 7/9, 7/11, 7/13, 9/12	ODSVRA breeding female.
Y-:GO	M	Unknown	Unknown	5/18, 5/25, 6/2, 6/4, 6/6, 6/16, 7/20, 7/23, 7/29, 7/31, 8/7, 8/8	ODSVRA breeding male.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.4. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2017 to 28 February 2018.

This is a partial list based on information received from a coordinated effort throughout the range of monitors and managers to share band sightings. ODSVRA bands chicks to brood and some bands have been used multiple years and it is possible to have more than one bird with the same combination. (For a description of color band letter codes see Appendix B.)

VAFB = Vandenberg Air Force Base, SLO = San Luis Obispo, Guadalupe NWR = Guadalupe-Nipomo Dunes National Wildlife Refuge, SB = State Beach, SP = State Park

Band Combination	Year Banded	Location Seen	County	Dates Seen
RR:PW	2014	Manchester Beach	Mendocino, CA	10/4, 11/2, 11/12, 1/22
GA:PB	2016 or 2017	San Carpoforo	SLO, CA	10/17, 10/31, 11/7, 1/16, 1/24
GA:RY	2017	San Carpoforo	SLO	10/17
GG:PB	2012 or 2013	Arroyo Laguna	SLO	10/17
GG:PR	2017	Arroyo Laguna	SLO	10/24, 11/7, 11/15
PV:AW	2016 or 2017	Arroyo Laguna	SLO	10/17, 1/3
VV:GW	2015 or 2017	Arroyo Laguna	SLO	10/17, 11/15
BB:GR	2012 or 2015	San Simeon SP	SLO	1/23
BB:RR	2016 or 2017	San Simeon SP	SLO	12/19, 12/25
BB:VG	2017	San Simeon SP	SLO	1/30
GA:RY	2017	San Simeon SP	SLO	1/23, 1/30
GG:PB	2012 or 2013	San Simeon SP	SLO	11/7, 1/16, 1/30
GG:PR	2017	San Simeon SP	SLO	1/23
PG:OR	2017	San Simeon SP	SLO	10/17, 10/24
PV:AW	2016 or 2017	San Simeon SP	SLO	10/11, 11/21, 1/23
PV:GW	2015 or 2017	San Simeon SP	SLO	11/7
PV:YR	2017	San Simeon SP	SLO	10/17
RR:VY	2016 or 2017	San Simeon SP	SLO	11/21, 1/16
VV:GW	2015 or 2017	San Simeon SP	SLO	11/7, 12/19, 1/23, 1/30
BB:VG	2017	Villa Creek	SLO	11/23
RR:AG	2017	Villa Creek	SLO	10/10, 10/24
BB:GB	2014 or 2015	Morro Strand SB	SLO	10/3
BB:OB	2014 or 2016	Morro Strand SB	SLO	10/3
BB:OR	2016 or 2017	Morro Strand SB	SLO	10/31
BB:VG	2017	Morro Strand SB	SLO	12/12, 1/16
GA:GR	2015 or 2016	Morro Strand SB	SLO	10/10, 11/7, 12/12
GA:RG	2015 or 2016	Morro Strand SB	SLO	12/5
GA:RY	2017	Morro Strand SB	SLO	2/14
GG:PB	2012 or 2013	Morro Strand SB	SLO	11/14, 2/22
PG:OB	2012 or 2014	Morro Strand SB	SLO	10/3
PG:OR	2017	Morro Strand SB	SLO	1/16
PV:AW	2016 or 2017	Morro Strand SB	SLO	11/19, 12/9, 2/14
PV:BB	2014 or 2015	Morro Strand SB	SLO	12/5
PV:PR	2017	Morro Strand SB	SLO	10/3
PV:VB	2017	Morro Strand SB	SLO	11/7, 12/21, 1/30, 2/1
PV:YR	2017	Morro Strand SB	SLO	10/10, 10/31
RR:AG	2017	Morro Strand SB	SLO	10/31, 11/7, 12/12, 12/21, 2/1
RR:VY	2016 or 2017	Morro Strand SB	SLO	11/14
V-:W-	2008	Morro Strand SB	SLO	12/12, 12/21, 1/16, 1/23
VV:GW	2015 or 2017	Morro Strand SB	SLO	2/14

Appendix D. Banded least terns and snowy plovers (continued).

Table D.4. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2017 to 28 February 2018 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen
BB:GB	2014 or 2015	Morro Bay Sandspit	SLO	10/10, 10/17, 10/24, 10/31, 11/7, 12/16, 1/18, 1/30
BB:OB	2014 or 2016	Morro Bay Sandspit	SLO	10/10, 10/17, 10/24, 10/31, 11/14, 1/2, 1/9, 2/14, 2/20
GG:OG	2013 or 2014	Morro Bay Sandspit	SLO	10/10, 10/17, 10/24, 10/31, 11/7, 11/14, 12/9, 12/16, 1/9, 1/20, 1/23
GG:WB	2011 or 2013	Morro Bay Sandspit	SLO	10/10, 10/17, 11/7, 12/5
PG:OB	2012 or 2014	Morro Bay Sandspit	SLO	10/10, 10/17, 10/24, 1/2, 1/9, 1/30, 2/14
PG:OR	2017	Morro Bay Sandspit	SLO	1/18, 1/30
PV:VB	2017	Morro Bay Sandspit	SLO	10/24
PV:YR	2017	Morro Bay Sandspit	SLO	10/17, 10/24, 2/14
RR:AG	2017	Morro Bay Sandspit	SLO	11/3
RR:WW	2010	Morro Bay Sandspit	SLO	10/17, 10/31, 11/14, 12/5, 1/22, 1/30, 2/27
GA:GY	2012 or 2013	Guadalupe NWR	SLO	10/4
GG:AW	2017	Guadalupe NWR	SLO	10/4
PG:OR	2017	Guadalupe NWR	SLO	10/4
PG:PG	2014 or 2015	Guadalupe NWR	SLO	10/4
PG:YY	2015	Guadalupe NWR	SLO	10/4
PV:GW	2015 or 2017	Guadalupe NWR	SLO	10/4
PV:PR	2017	Guadalupe NWR	SLO	10/4
RR:AW	2017	Guadalupe NWR	SLO	10/4
RR:GB	2017	Guadalupe NWR	SLO	10/4
RR:OB	2017	Guadalupe NWR	SLO	10/4
RR:VG	2016 or 2017	Guadalupe NWR	SLO	10/4
RR:WY	2017	Guadalupe NWR	SLO	10/4
VG:RG	2017	Guadalupe NWR	SLO	10/4
BB:RR	2016 or 2017	VAFB	Santa Barbara, CA	10/12, 1/23, 2/20
GA:GR	2015 or 2016	VAFB	Santa Barbara	11/13, 12/18, 1/2, 1/23, 2/20
GA:PR	2016 or 2017	VAFB	Santa Barbara	10/12
GA:RB	2010	VAFB	Santa Barbara	10/12
GA:RG	2015 or 2016	VAFB	Santa Barbara	10/12
PV:GW	2015 or 2017	VAFB	Santa Barbara	11/13, 2/20
RR:AW	2017	VAFB	Santa Barbara	11/13, 12/18
RR:BW	2016 or 2017	VAFB	Santa Barbara	10/12, 11/13, 12/18
RR:LY	2010	VAFB	Santa Barbara	10/13, 11/13, 12/18, 1/23, 2/20
VG:AG	2017	VAFB	Santa Barbara	11/13
VG:PB	2015 or 2017	VAFB	Santa Barbara	11/13, 12/18, 1/2, 2/20
VG:RG	2017	VAFB	Santa Barbara	10/17, 11/13, 12/18
VV:WB	2013 or 2014	VAFB	Santa Barbara	10/12, 12/18, 1/23
PV:AW	2016 or 2017	Hollywood Beach	Ventura, CA	11/12

Appendix D. Banded least terns and snowy plovers (continued).

Table D.4. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 October 2017 to 28 February 2018 (continued).

Band Combination	Year Banded	Location Seen	County	Dates Seen
RR:OR	2010	Hollywood Beach	Ventura	11/12
VG:AW	2011 or 2013	Hollywood Beach	Ventura	11/12
VG:PR	2017	Hollywood Beach	Ventura	10/19
PV:RB	2016	Salt Creek Beach	Orange, CA	11/23, 12/13
VG:WY	2017	San Clemente SB	Orange	1/22
BB:VB	2011, 2013 or 2014	Camp Pendleton	San Diego, CA	11/9, 11/15, 11/22, 11/30, 12/7, 12/14, 12/21, 12/29, 1/4, 1/13, 1/18, 1/25, 2/1, 2/8, 2/20
VV:GW	2015 or 2017	Camp Pendleton	San Diego	10/5, 10/19
BB:BG	2015 or 2016	Tijuana River Mouth	San Diego	10/3, 10/13, 11/20, 12/17, 1/23, 1/26, 2/21, 2/22
BB:OR	2016 or 2017	La Bocana	Baja California, Mexico	1/19

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018.

This is a partial list based on information received from a coordinated effort throughout the range of monitors and managers to share band sightings.
ODSVRA is banding chicks to brood and some bands have been used multiple years so it is possible to have more than one bird with the same combination.
SLO = San Luis Obispo, Guadalupe NWR = Guadalupe-Nipomo Dunes National Wildlife Refuge, NWR = National Wildlife Refuge, SB = State Beach,
VAFB = Vandenberg Air Force Base, Bolsa Chica = Bolsa Chica Ecological Reserve
M = male, F = female.

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
VG:RY	2017		South Spit, Humboldt	Humboldt, CA	5/9, 7/29	
PV:YB	2012		Eden Landing	Alameda, CA	9/10	
PG:BG	2015 or 2016		Pajaro Spit	Santa Cruz, CA	4/24, 4/26	
BB:GR	2012 or 2015		Zmudowski SB	Monterey, CA	4/2, 4/3, 4/5, 4/17, 4/20, 5/9, 5/18, 6/19	
PV:AG	2015 or 2016		Moss Landing Salt Ponds	Monterey	4/25	
PV:AG	2015 or 2016	M	Moss Landing SB	Monterey	4/11, 4/12, 4/20, 5/29, 6/12, 6/14, 6/20, 6/29	Moss Landing SB breeding male.
GG:GW	2014 or 2015		Salinas River NWR	Monterey	3/6, 5/22	
PG:BG	2015 or 2016		Salinas River SB	Monterey	6/6	
VG:BG	2011 or 2013	M	Salinas River SB	Monterey	3/8, 3/12, 3/19, 3/23, 3/26, 3/29, 4/3, 4/9, 4/13, 4/17, 4/23, 4/26, 5/3, 5/15, 5/18, 5/22, 5/29, 6/13, 6/19, 6/21, 6/27, 7/6, 8/16, 8/20	Salinas River SB breeding male.
GG:GW	2014 or 2015		Marina Beach SB	Monterey	3/12, 3/15, 4/4, 5/21, 5/23, 7/13, 7/16, 7/20, 7/23, 8/16	
VG:VR	2018		Marina Beach SB	Monterey	8/24, 8/28	Juvenile.
GG:GW	2014 or 2015		Reservation Road	Monterey	5/20	
GA:PB	2016 or 2017		San Carpoforo	SLO, CA	3/5, 3/7, 3/19	
PV:AW	2016 or 2017		San Carpoforo	SLO	5/15	
GA:RY	2017		Arroyo Laguna	SLO	3/19, 3/27, 4/10, 4/11, 4/12, 5/15	
GG:PB	2012 or 2013		Arroyo Laguna	SLO	9/18	
GG:PR	2017		Arroyo Laguna	SLO	3/19	
PG:WB	2018		Arroyo Laguna	SLO	9/18	Juvenile.
PV:AW	2016 or 2017		Arroyo Laguna	SLO	3/19, 3/27, 4/10, 4/11, 4/12, 5/17, 5/22	
BB:AR	2017 or 2018		Villa Creek	SLO	8/24, 8/29, 9/4, 9/11, 9/14, 9/18	
BB:GW	2018		Villa Creek	SLO	8/8	Juvenile.
GA:AW	2018		Villa Creek	SLO	8/21	Juvenile.
PG:WB	2018		Villa Creek	SLO	9/11	Juvenile.
RR:VY	2016 or 2017		Villa Creek	SLO	6/13, 6/19, 6/29, 7/3, 7/4, 7/6, 7/10, 7/12, 7/16, 7/19, 7/20, 7/23, 7/25, 7/26, 7/27, 7/30, 8/1, 8/3, 8/6, 8/7, 8/8, 8/10, 8/13, 8/14, 8/15, 8/16, 8/17, 8/20, 8/21, 8/22, 8/24, 8/27, 8/29, 9/4, 9/11, 9/14, 9/18	
V-:W-	2008		Villa Creek	SLO	5/13, 5/14, 5/15, 5/16, 5/17, 5/18, 5/30	Originally banded PV:PW, top pink bands missing from both legs and now banded V-:W-.
BB:AR	2017 or 2018		Morro Strand SB	SLO	8/21	
BB:OB	2014 or 2016		Morro Strand SB	SLO	3/5	
BB:RG	2018		Morro Strand SB	SLO	9/5	Juvenile.
BB:VG	2017 or 2018		Morro Strand SB	SLO	3/22, 3/27, 9/18	
GA:WY	2018		Morro Strand SB	SLO	8/27	Juvenile.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
GG:PB	2012 or 2013		Morro Strand SB	SLO	4/10	
GG:PG	2018		Morro Strand SB	SLO	8/10, 8/12	Juvenile.
GG:PR	2017		Morro Strand SB	SLO	6/3	
PG:GY	2016 or 2018		Morro Strand SB	SLO	9/11, 9/18, 9/20	
PV:PB	2015		Morro Strand SB	SLO	3/5	
PV:VB	2017		Morro Strand SB	SLO	3/19, 3/20, 3/27, 4/10, 4/11, 4/12, 4/18, 4/19	
RR:AG	2017		Morro Strand SB	SLO	3/5, 3/19, 3/20, 7/15, 7/17, 7/22, 7/25, 7/29, 8/3, 8/12, 9/11, 9/14, 9/18	
RR:WY	2017 or 2018		Morro Strand SB	SLO	7/8, 7/10, 7/11, 7/12, 7/13, 7/15, 7/17, 7/24, 7/27, 7/28	
V-:W-	2008	M	Morro Strand SB	SLO	3/6, 3/7, 3/29, 4/10, 4/12, 4/20, 4/24, 4/27, 5/1, 5/2, 5/29, 6/1, 6/3, 6/6, 6/8, 6/13, 6/14, 6/15, 6/20, 6/21, 6/22, 6/24, 6/29, 6/30, 7/3, 7/6, 7/7, 7/9, 7/10, 7/11, 7/12, 7/13, 7/16, 7/17, 7/18, 7/19, 7/22, 7/24, 7/25, 7/27, 8/10, 8/18, 9/14, 9/18	Morro Strand breeding male. Originally banded PV:PW, top pink bands missing from both legs and now banded V-:W-.
VG:VR	2018		Morro Strand SB	SLO	8/17	Juvenile.
VG:YG	2018		Morro Strand SB	SLO	8/18	Juvenile.
VG:YR	2015		Morro Strand SB	SLO	8/29	
VG:YW	2017 or 2018		Morro Strand SB	SLO	8/10, 8/18, 8/21, 9/14	
VV:GW	2015 or 2017		Morro Strand SB	SLO	8/31, 9/14	
VV:OR	2015 or 2016	M	Morro Strand SB	SLO	3/20, 3/28, 3/29, 3/30, 4/10, 4/12, 4/13, 4/17, 4/18, 4/19, 4/20, 4/26, 4/27, 5/1, 5/4, 5/9, 5/18, 5/22, 5/24, 5/25, 5/29, 5/31, 6/3, 6/5, 6/6, 6/7, 6/8, 6/13, 6/14, 6/15, 6/21, 6/22, 6/23, 6/24, 6/27, 6/28, 6/29, 6/30, 7/3, 7/4, 7/5, 7/7, 7/10, 7/11, 7/1	Morro Strand breeding male.
BB:OB	2014 or 2016		Morro Bay Sandspit	SLO	3/26, 3/27	
GA:AW	2018		Morro Bay Sandspit	SLO	9/18	Juvenile.
GG:OG	2013 or 2014	M	Morro Bay Sandspit	SLO	3/5, 3/6, 3/9, 3/26, 3/27, 4/12, 4/17, 4/24, 4/25, 4/27, 4/28, 5/1, 5/2, 5/3, 5/4, 5/8, 5/9, 5/10, 5/14, 5/15, 5/16, 5/17, 5/18, 5/21, 5/23, 5/24, 5/31, 6/1, 6/6, 6/7, 6/8, 6/12, 6/13, 6/14, 6/15, 6/19, 6/20, 6/21, 6/22, 6/23, 6/25, 6/27, 6/28, 7/5, 7/6,	Morro Bay Sandspit breeding male.
GG:PB	2012 or 2013	F	Morro Bay Sandspit	SLO	3/7, 3/26, 4/25, 4/26, 4/30, 5/1, 5/3, 5/4, 5/7, 5/8, 5/14, 5/15, 5/17, 5/18, 5/21, 5/22, 5/23, 5/29, 6/8, 6/11, 6/13, 6/14, 6/18, 6/27, 6/29, 7/3, 7/16, 7/17, 7/18, 7/19, 7/25, 8/2, 8/12, 8/15, 8/16, 8/20, 8/21	Morro Bay Sandspit breeding female.
GG:PG	2018		Morro Bay Sandspit	SLO	8/9	Juvenile.
GG:YG	2011 or 2013		Morro Bay Sandspit	SLO	8/16	
PG:RB	2016 or 2018		Morro Bay Sandspit	SLO	9/11, 9/14, 9/18	
PV:GY	2018		Morro Bay Sandspit	SLO	8/21, 9/20	Juvenile.
PV:YR	2017		Morro Bay Sandspit	SLO	3/5	
RR:VY	2016 or 2017		Morro Bay Sandspit	SLO	6/28	
RR:WW	2010		Morro Bay Sandspit	SLO	3/5, 3/19, 3/20	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
VG:RY	2017		Morro Bay Sandspit	SLO	4/24, 4/25, 4/26	
VG:YG	2018		Morro Bay Sandspit	SLO	8/21	Juvenile.
VV:AB	2017 or 2018		Morro Bay Sandspit	SLO	7/24	
VV:OR	2015 or 2016		Morro Bay Sandspit	SLO	4/25, 5/15, 6/18	
GA:AW	2018		Guadalupe NWR	SLO	8/2, 8/15	Juvenile.
GA:AY	2018		Guadalupe NWR	SLO	8/2	Juvenile.
GA:OG	2014 or 2015		Guadalupe NWR	SLO	3/8, 3/15, 3/29, 4/19, 7/11	
GA:PR	2016 or 2017		Guadalupe NWR	SLO	8/30	
GA:PW	2014 or 2015		Guadalupe NWR	SLO	7/11	
GA:RB	2010		Guadalupe NWR	SLO	8/15, 8/22	
GA:RY	2017		Guadalupe NWR	SLO	8/30, 9/8, 9/27	
GA:WY	2018		Guadalupe NWR	SLO	8/8, 8/15	Juvenile.
GG:BB	2018		Guadalupe NWR	SLO	7/11	Juvenile.
GG:OY	2018		Guadalupe NWR	SLO	8/30	Juvenile.
GG:YW	2013 or 2015		Guadalupe NWR	SLO	8/2	
GG:YY	2018		Guadalupe NWR	SLO	8/22	Juvenile.
PG:-	unknown		Guadalupe NWR	SLO	9/20	
PG:BY	2017		Guadalupe NWR	SLO	3/15, 3/29, 4/19, 4/26, 5/16, 7/11, 8/2, 8/15, 9/27	
PG:OG	2015		Guadalupe NWR	SLO	9/27	
PG:OR	2017		Guadalupe NWR	SLO	8/30	
PG:PW	2012 or 2014		Guadalupe NWR	SLO	9/27	
PG:VR	2018		Guadalupe NWR	SLO	8/22	Juvenile.
PG:YB	2015 or 2017		Guadalupe NWR	SLO	4/26, 5/3, 6/5, 9/12	
PG:YY	2015		Guadalupe NWR	SLO	3/20, 5/10, 6/5, 7/25, 8/15, 8/22	
PV:OB	2015 or 2017		Guadalupe NWR	SLO	3/15, 5/16, 5/30, 6/5, 8/2, 8/8	
PV:PR	2017 or 2018		Guadalupe NWR	SLO	8/30	
PV:YB	2012		Guadalupe NWR	SLO	7/11	
PV:YY	2015 or 2017		Guadalupe NWR	SLO	8/22	
RR:AW	2017		Guadalupe NWR	SLO	9/20, 9/27	
RR:BB	2016 or 2017		Guadalupe NWR	SLO	8/22, 9/20	
RR:PW	2014		Guadalupe NWR	SLO	6/5	
RR:VY	2016 or 2017		Guadalupe NWR	SLO	9/8	
VG:AY	2018		Guadalupe NWR	SLO	8/15	Juvenile.
VG:GB	2017 or 2018		Guadalupe NWR	SLO	9/27	
VG:RG	2017 or 2018		Guadalupe NWR	SLO	9/27	
VG:RY	2017		Guadalupe NWR	SLO	9/27	
VV:BB	2011 or 2013		Guadalupe NWR	SLO	3/29	
BB:BB	2018		Guadalupe Restoration Project	SLO	7/20, 9/14	Juvenile.
GA:AR	2015		Guadalupe Restoration Project	SLO	8/3	
GA:GR	2015 or 2016		Guadalupe Restoration Project	SLO	4/16, 4/27, 5/2, 5/8, 5/11, 5/22, 6/4, 7/13, 7/26, 7/30	
GA:OG	2014 or 2015		Guadalupe Restoration Project	SLO	5/25	

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
GA:PW	2014 or 2015		Guadalupe Restoration Project	SLO	4/20, 4/27, 5/8, 5/11, 5/29, 6/22, 7/18	
GA:YB	2017 or 2018		Guadalupe Restoration Project	SLO	4/27, 5/11, 5/22, 6/14, 6/28, 7/13, 7/18	
GG:AW	2017 or 2018		Guadalupe Restoration Project	SLO	7/20	
GG:GB	2016 or 2018		Guadalupe Restoration Project	SLO	7/16, 7/20	
GG:GR	2011 or 2013		Guadalupe Restoration Project	SLO	4/23	
GG:PG	2018		Guadalupe Restoration Project	SLO	7/30	Juvenile.
GG:YG	2011 or 2013		Guadalupe Restoration Project	SLO	6/4	
PG:YB	2015 or 2017		Guadalupe Restoration Project	SLO	5/9	
PG:YR	2017		Guadalupe Restoration Project	SLO	6/14	
PV:BY	2015		Guadalupe Restoration Project	SLO	4/20	
PV:YR	2017		Guadalupe Restoration Project	SLO	5/22, 5/25, 5/29, 6/1, 6/4	
PV:YY	2015 or 2017		Guadalupe Restoration Project	SLO	4/16, 9/14	
RR:BY	2010		Guadalupe Restoration Project	SLO	5/2	
RR:WB	2017		Guadalupe Restoration Project	SLO	5/8, 6/28	
RR:WG	2012		Guadalupe Restoration Project	SLO	3/13, 4/16, 4/18, 4/20, 5/2, 5/22, 5/29, 6/1, 7/16, 7/26, 7/30	
VG:VG	2018		Guadalupe Restoration Project	SLO	7/20	Juvenile.
VV:AY	2018		Guadalupe Restoration Project	SLO	8/21	Juvenile.
VV:OW	2017		Guadalupe Restoration Project	SLO	4/20, 5/18, 5/22	
VV:RW	2015 or 2017		Guadalupe Restoration Project	SLO	5/14	
VV:WW	2018		Guadalupe Restoration Project	SLO	7/27	Juvenile.
BB:AR	2018		VAFB	Santa Barbara, CA	7/26	Juvenile.
BB:BW	2018		VAFB	Santa Barbara	7/20	Juvenile.
BB:GW	2018		VAFB	Santa Barbara	7/23	Juvenile.
BB:OR	2016 or 2017	F	VAFB	Santa Barbara	6/1, 6/15, 6/18, 6/20, 6/26, 6/28, 7/9, 7/11, 7/13, 7/23, 7/26, 7/30, 9/10	VAFB breeding female.
BB:RG	2018		VAFB	Santa Barbara	9/26	Juvenile.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
BB:RR	2016 or 2017		VAFB	Santa Barbara	3/15, 3/23, 4/10, 4/17, 4/19, 4/25, 4/26, 5/3, 5/8, 5/31, 6/12, 6/25, 7/5	
BB:VG	2018		VAFB	Santa Barbara	7/25	Juvenile.
GA:GR	2015 or 2016		VAFB	Santa Barbara	3/5	
GA:OR	2016 or 2017		VAFB	Santa Barbara	3/29, 7/19, 8/16, 8/24	
GA:PB	2016 or 2017	M	VAFB	Santa Barbara	5/14, 5/29, 6/14, 6/19, 6/25, 6/29, 7/3	VAFB breeding male.
GA:PG	2015 or 2017		VAFB	Santa Barbara	3/23	
GA:WY	2018		VAFB	Santa Barbara	8/24	Juvenile.
GA:YG	2018		VAFB	Santa Barbara	9/5, 9/19	Juvenile.
GA:YY	2017		VAFB	Santa Barbara	5/29, 5/31, 6/19, 6/21, 6/27	
GG:GB	2018		VAFB	Santa Barbara	7/20, 7/26, 7/30	Juvenile.
GG:OY	2018		VAFB	Santa Barbara	7/20, 7/25, 8/23	Juvenile.
GG:PB	2012 or 2013		VAFB	Santa Barbara	4/5, 8/9	
GG:PG	2018		VAFB	Santa Barbara	8/3	Juvenile.
GG:PR	2017	F	VAFB	Santa Barbara	3/15, 3/28, 4/3, 4/5, 4/26, 5/8, 5/14, 5/22, 5/29, 6/21, 6/25, 7/3, 7/5, 7/9, 7/12, 7/16, 7/25, 7/30, 8/3, 8/16, 8/17, 8/30, 9/19	VAFB breeding female.
GG:RB	2018		VAFB	Santa Barbara	8/8, 8/14, 8/24, 8/30	Juvenile.
GG:WB	2011 or 2013	M	VAFB	Santa Barbara	3/23, 3/29, 4/4, 4/9, 4/18, 4/20, 4/23, 4/25, 4/27, 5/2, 5/10, 5/14, 5/28, 5/30, 6/1, 6/6	VAFB breeding male.
GG:WW	2018		VAFB	Santa Barbara	7/23	Juvenile.
GG:YR	2018		VAFB	Santa Barbara	9/10	Juvenile.
PV:BY	2015		VAFB	Santa Barbara	8/28	
PV:GW	2015 or 2017	M	VAFB	Santa Barbara	3/20, 3/23, 3/28, 4/5, 5/3, 5/11, 5/16, 5/22, 6/5, 6/12, 6/19, 7/25	VAFB breeding male.
PV:PG	2015 or 2017		VAFB	Santa Barbara	6/27, 7/11, 7/13, 7/17	
PV:RB	2016		VAFB	Santa Barbara	9/10	
PV:WG	2016 or 2018		VAFB	Santa Barbara	7/30, 8/8	
RR:AW	2017		VAFB	Santa Barbara	3/15, 3/23, 4/10, 4/24, 4/26, 5/8, 9/6, 9/10, 9/14, 9/16	
RR:LY	2010	M	VAFB	Santa Barbara	3/8, 3/19, 3/27, 3/29, 4/4, 4/9, 4/16, 4/18, 4/20, 4/25, 4/27, 5/2, 5/14, 5/19, 5/30, 6/6, 6/13, 6/15, 6/18, 6/22, 6/25, 6/27, 7/4, 7/11, 7/13, 7/17, 7/19, 7/23, 7/31, 8/24, 9/5, 9/19	VAFB breeding male.
VG:BB	2011, 2013, or 2014		VAFB	Santa Barbara	7/20	
VG:GB	2018		VAFB	Santa Barbara	6/25, 7/5	Juvenile.
VG:PB	2015 or 2017		VAFB	Santa Barbara	9/6, 9/10	
VG:RY	2017		VAFB	Santa Barbara	4/20	
VG:VG	2018		VAFB	Santa Barbara	8/13, 8/15	Juvenile.
VG:YG	2018		VAFB	Santa Barbara	7/16, 7/25, 9/20	Juvenile.
VG:YW	2018		VAFB	Santa Barbara	7/26, 7/30, 8/14, 9/16	Juvenile.
VV:AB	2017 or 2018		VAFB	Santa Barbara	7/16, 7/20	
VV:AG	2018		VAFB	Santa Barbara	7/11	Juvenile.
VV:VY	2018		VAFB	Santa Barbara	7/13, 7/16, 8/30	Juvenile.

Appendix D. Banded least terns and snowy plovers (continued).

Table D.5. Snowy plovers banded as chicks at ODSVRA seen at other sites from 1 March to 30 September 2018 (continued).

Band Combination	Year Banded	Sex	Location Seen	County	Dates Seen	Notes
VW:BB	2015	M	VAFB	Santa Barbara	3/15, 3/20, 3/23, 3/28, 4/10, 5/8, 5/22, 6/4, 6/13, 6/25, 7/5	VAFB breeding male.
GA:AW	2018		Jalama Beach	Santa Barbara	9/20	Juvenile.
PG:RB	2016 or 2018		Jalama Beach	Santa Barbara	9/20	
PV:RG	2017		Coal Oil Point Reserve	Santa Barbara	4/18	
VV:AY	2018		Ormond Beach	Ventura, CA	9/3	Juvenile.
GG:PG	2018		Malibu Lagoon	Los Angeles, CA	9/14, 9/21	Juvenile.
BB:AY	2014 or 2016		Bolsa Chica	Orange, CA	3/9, 4/11, 4/15, 4/16, 4/18	Bolsa Chica breeding female.
GG:AY	2012 or 2013		Bolsa Chica	Orange	4/11	
GG:GB	2016 or 2018		Bolsa Chica	Orange	8/10	
BB:VW	2018		Huntington Beach	Orange	8/1, 8/22	Juvenile.
GA:YB	2017 or 2018		Huntington Beach	Orange	5/2	
GA:BB	2017 or 2018		Huntington Beach	Orange	8/22	
VV:AB	2017 or 2018		Newport Beach	Orange	8/25	
VG:WY	2017		San Clemente SB	Orange	9/17	
BB:VB	2011, 2013 or 2014		Camp Pendleton	San Diego, CA	3/1, 3/6, 3/15	
GG:AW	2017 or 2018		Camp Pendleton	San Diego	7/30	
PG:BW	2014		Camp Pendleton	San Diego	8/2	
VG:BW	2016 or 2017		Camp Pendleton	San Diego	7/11	
VG:WY	2017		Camp Pendleton	San Diego	5/17, 5/22, 5/26, 5/29, 5/31, 6/5, 6/9, 6/14, 6/16, 6/19, 6/23, 6/26, 6/30, 7/3	Camp Pendleton breeding male.
PG:BY	2017 or 2018		San Elijo SB	San Diego	8/31	
GA:WW	2016 or 2017		Coronado	San Diego	8/3	
GG:GW	2014 or 2015		Coronado	San Diego	7/31	
GG:WW	2018		Coronado	San Diego	8/3, 8/17	Juvenile.
PG:WB	2018		Coronado	San Diego	8/31	Juvenile.
VG:BW	2016 or 2017		Coronado	San Diego	5/4	
VG:GR	2017		Coronado	San Diego	7/5	
VV:VY	2018		Coronado	San Diego	8/17	Juvenile.
GG:GB	2016 or 2018		Silver Strand SB	San Diego	8/2, 8/12, 8/17	
BB:BG	2015 or 2016		Tijuana River Mouth	San Diego	3/1, 3/8, 3/15, 3/21	
BB:VW	2018		Tijuana River Mouth	San Diego	8/9	Juvenile.
VG:AY	2018		Tijuana River Mouth	San Diego	9/12	Juvenile.

APPENDIX E. CALIFORNIA LEAST TERN REPRODUCTIVE SUCCESS FOR SAN LUIS OBISPO AND SANTA BARBARA COUNTIES FROM 2004-18.

Note that chicks are not banded at Rancho Guadalupe Dunes County Park (RGDCP) or Coal Oil Point Reserve (COPR) and other methods are used to estimate number of juveniles produced. In 2018, Vandenberg Air Force Base (VAFB) banded chicks to site and year for the first time. Sources: RGDCP (pers. comm. Tom Applegate), VAFB (pers. comm. Dan Robinette), and COPR (pers. comm. staff).

Year	Site	No. pairs	No. nests	No. nests hatching	No. chicks	No. juveniles	No. juveniles per total no. nest	No. juveniles per pair
2004	ODSVRA	47	63	44	69	25	0.40	0.53
	RGDCP	8	8	3	7	0	0.00	0.00
	VAFB[1]	1	1	0	0	0	0.00	0.00
	COPR	6	6	0	0	0	0.00	0.00
2005	ODSVRA	47-53	59	39	66	20	0.34	0.38-0.43
	RGDCP	4	4	0	0	0	0.00	0.00
	VAFB	44	44	18	32	1	0.02	0.02
	COPR	0	0	0	0	0	0.00	0.00
2006	ODSVRA	31-35	38	28	45	36	0.95	1.04-1.16
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB[2]	2	2	0	0	0	0.00	0.00
	COPR	5	5	4	7	7	1.40	1.40
2007	ODSVRA	54-60	66	51	90	70	1.06	1.17-1.3
	RGDCP	1	1	1	1	1	1.00	1.00
	VAFB	18	18	13	20	16	0.89	0.89
	COPR	4	6	2	4	0	0.00	0.00
2008	ODSVRA	55-56	56	50	99	70	1.25	1.26-1.27
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	18	18	17	32-33	19	1.06	1.06
	COPR	1	1	0	0	0	0.00	0.00
2009	ODSVRA	25-26	26	23	43	33	1.27	1.29-1.32
	RGDCP	2-3	3	2	3	3	1.00	1.00-1.50
	VAFB	30	31	28	56	37	1.19	1.23
	COPR	0	0	0	0	0	0.00	0.00
2010	ODSVRA	23	23	20	35	29	1.26	1.26
	RGDCP	1	1	1	2	2	2.00	2.00
	VAFB	33	34	29	57	29	0.85	0.88
	COPR	0	0	0	0	0	0.00	0.00
2011	ODSVRA	33-34	35	31	55	50	1.43	1.47-1.52
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	32	32	19	36	4	0.13	0.13
	COPR	1	1	0	0	0	0.00	0.00
2012	ODSVRA	41-44	46	33	52	42	0.91	0.97-1.02
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	18	18	12	21	10	0.56	0.56
	COPR	0	0	0	0	0	0.00	0.00
2013	ODSVRA	48-53	57	45	85	56	0.98	1.07-1.17
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	15	15	15	25	19	1.27	1.27
	COPR	0	0	0	0	0	0.00	0.00
2014	ODSVRA	47-48	49	42	76	58	1.18	1.21-1.23
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	17	21	15	30	20	0.95	1.18
	COPR	0	0	0	0	0	0.00	0.00

Appendix E. California Least Tern reproductive success for San Luis Obispo and Santa Barbara Counties from 2004-18 (continued).

Year	Site	No. pairs	No. nests	No. nests hatching	No. chicks	No. juveniles	No. juveniles per total no. nest	No. juveniles per pair
2015	ODSVRA	44-49	54	48	84	69	1.28	1.41-1.57
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	22	22	22	45	29	1.32	1.32
	COPR	0	0	0	0	0	0.00	0.00
2016	ODSVRA	47-48	49	46	78	59	1.20	1.23-1.26
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	25	27	21	38	18	0.67	0.72
	COPR	0	0	0	0	0	0.00	0.00
2017	ODSVRA	42-47	52	22	39	7	0.13	0.15-0.17
	RGDCP	0	0	0	0	0	0.00	0.00
	VAFB	27	28	23	41	8	0.29	0.30
	COPR	0	0	0	0	0	0.00	0.00
2018	ODSVRA	30-33	35	28	42	35	1.00	1.06-1.17
	RGDCP	10-11	11	5	10	4	0.36	0.36-0.40
	VAFB	60	83	33	57	35	0.42	0.58
	COPR	0	0	0	0	0	0.00	0.00

[1,2] Minimum counts of adult terns at the VAFB colony site were 60 and 40 in 2004 and 2006, respectively, but nesting was limited.

APPENDIX F. ADDENDUMS TO SNOWY PLOVER NESTING SUCCESS.

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-18.

Nests from unknown locations (identified only by presence of broods) are not included in table. Percent nests hatching is calculated using number of hatching nests from known location divided by number of known location and fate nests. Those chicks whose specific area where hatching could not be identified are not included in table. Beginning in 2006, an additional 0.4 miles of shoreline at the southern end of the park has been monitored by ODSVRA (a survey conducted by the Guadalupe-Nipomo Dunes NWR in 2005 determined this area was part of the ODSVRA and not the refuge, as was previously thought). Between 1998-2003, increases occurred in the size of the seasonal Southern Exclosure; size has remained consistent since 2004. Information on areas in table is provided in the report Site Description section on page 33.

Excl. = Exclosure, BY = Boneyard

Year	Area	No. known location nests	No. nests with known location and known fate	No. nests with known location hatching	% nests hatching	No. chicks from known location	No. chicks from known location and with known fate	No. chicks from known location and with known fate fledged	% chicks known fledged
	Open Riding Area	1	1	0	0	0	0	0	0
	Arroyo Grande Excl. [1]	3	3	3	100	9	9	0	0
	Southern Exclosure	25	24	21	88	56	56	2	4
	Oso Flaco	4	2	2	100	6	6	1	17
2001	**Total**	**33**	**30**	**26**	**87**	**71**	**71**	**3**	**4**
	Southern Exclosure	33	33	25	76	62	62	35	56
	Oso Flaco	2	2	0	0	0	0	0	0
2002	**Total**	**35**	**35**	**25**	**71**	**62**	**62**	**35**	**56**
	Dunes Preserve	1	1	1	100	3	3	0	0
	Open Riding Area	1	1	1	100	3	3	3	100
	Pipeline Revegetation	3	3	2	67	4	4	2	50
	East of BY Exclosure [2]	2	2	1	50	3	3	2	67
	Southern Exclosure	74	73	52	71	136	135	92	68
	Oso Flaco	13	13	5	38	11	11	7	64
2003	**Total**	**94**	**93**	**62**	**67**	**160**	**159**	**106**	**67**
	Open Riding Area	1	1	0	0	0	0	0	0
	Pipeline Revegetation	1	1	1	100	3	3	0	0
	Southern Exclosure	113	111	87	78	208	205	59	29
	Oso Flaco	27	27	17	63	40	39	7	18
2004	**Total**	**142**	**140**	**105**	**75**	**251**	**247**	**66**	**27**
	East of BY Exclosure [2]	2	2	2	100	6	6	2	33
	Southern Exclosure	79	79	60	76	142	142	57	40
	Oso Flaco	22	22	18	82	49	49	23	47
2005	**Total**	**103**	**103**	**80**	**78**	**197**	**197**	**82**	**42**
	Open Riding Area	1	1	0	0	0	0	0	0
	Southern Exclosure	87	84	65	77	173	173	8	5
	Oso Flaco	29	29	22	76	57	57	9	16
2006	**Total**	**117**	**114**	**87**	**76**	**230**	**230**	**17**	**7**
	Southern Exclosure	76	76	61	80	159	157	58	37
	Oso Flaco	15	15	9	60	20	20	4	20
2007	**Total**	**91**	**91**	**70**	**77**	**179**	**177**	**62**	**35**
	Southern Exclosure	100	100	73	73	172	172	64	37
	Oso Flaco	19	19	8	42	19	19	5	26
2008	**Total**	**119**	**119**	**81**	**68**	**191**	**191**	**69**	**36**

Table F.1. Nesting success of snowy plovers in identifiable areas at ODSVRA, 2001-18 (continued).

Year	Area	No. known location nests	No. nests with known location and known fate	No. nests with known location hatching	% nests hatching	No. chicks from known location	No. chicks from known location and with known fate	No. chicks from known location and with known fate fledged	% chicks known fledged
	Pismo Lagoon	1	1	0	0	0	0	0	0
	Southern Exclosure	125	124	86	69	221	221	79	36
	Oso Flaco	23	22	8	36	22	22	2	9
2009	**Total**	**149**	**147**	**94**	**64**	**243**	**243**	**81**	**33**
	Carpenter Creek	1	1	0	0	0	0	0	0
	Arroyo Grande Creek	3	3	0	0	0	0	0	0
	Open Riding Area	1	1	1	100	2	2	2	100
	Southern Exclosure	126	123	95	77	234	234	86	37
	Oso Flaco	22	22	13	59	33	33	15	45
2010	**Total**	**153**	**150**	**109**	**73**	**269**	**269**	**103**	**38**
	Open Riding Area	2	2	2	100	5	5	1	20
	Southern Exclosure	140	135	113	84	300	300	129	43
	Oso Flaco	23	23	16	70	40	40	18	45
2011	**Total**	**165**	**160**	**131**	**82**	**345**	**345**	**148**	**43**
	Open Riding Area	3	3	0	0	0	0	0	0
	Southern Exclosure	194	186	143	77	353	353	85	24
	Oso Flaco	14	14	9	64	21	21	4	19
2012	**Total**	**211**	**203**	**152**	**75**	**374**	**374**	**89**	**24**
	Southern Exclosure	147	144	115	80	288	288	147	51
	Oso Flaco	23	23	15	65	39	39	25	64
2013	**Total**	**170**	**167**	**130**	**78**	**327**	**327**	**172**	**53**
	Open Riding Area	1	1	0	0	0	0	0	0
	Southern Exclosure	201	194	173	89	428	428	142	33
	Oso Flaco	44	44	33	75	86	86	35	41
2014	**Total**	**246**	**239**	**206**	**86**	**514**	**514**	**177**	**34**
	Arroyo Grande Creek[3]	1	-	1	-	2	2	0	0
	Southern Exclosure	182	175	153	87	401	401	215	54
	Oso Flaco	20	20	14	70	39	39	24	62
2015	**Total**	**203**	**195**	**168**	**86**	**442**	**442**	**239**	**54**
	Arroyo Grande Creek[3]	1	-	1	-	2	2	1	50
	Southern Exclosure	169	156	136	87	326	326	91	28
	Oso Flaco	40	37	29	78	82	82	33	40
2016	**Total**	**210**	**193**	**166**	**85**	**410**	**410**	**125**	**30**
	Arroyo Grande Creek	1	1	0	0	0	0	0	0
	Southern Exclosure	195	165	107	65	252	252	105	42
	Oso Flaco	77	72	38	53	96	96	55	57
2017	**Total**	**273**	**238**	**145**	**61**	**348**	**348**	**160**	**46**
	Southern Exclosure	145	139	111	80	274	274	131	48
	Oso Flaco	61	61	33	54	84	84	43	51
2018	**Total**	**206**	**200**	**144**	**72**	**358**	**358**	**174**	**49**

[1]Arroyo Grande Excl.: A seasonal exclosure (with two-inch by four-inch wire mesh fencing and closed from the riding area) in use in 2001 and 2002, but not subsequently. This area had three nests in 2001, none in 2002.

[2]East of BY Exclosure: Area closed to vehicles year-around and open to pedestrians. There were two nests in 2003 and two nests in 2005. All nests had a single nest wire exclosure (10-foot by 10-foot exclosure).

[3]Brood with approximately one-day-old chicks found in Arroyo Grande Creek area, likely from an unknown nest nearby.

Table F.2. Attributed causes of snowy plover nest loss in Southern Exclosure and Oso Flaco at ODSVRA from 2002-18.

Flooded nests include nests overwashed by tide and nests flooded by creek and tide. The percentage of total loss for each cause is shown for the 17-year period 2002-18. Prior to 2010, nest abandonment suspected due to wind was included with nests abandoned pre-term; these causes of nest loss are shown separately for 2010-18.
So. Excl. = Southern Exclosure, Aband.=Abandoned

Year	Area	Aband. pre-term	Aband. post-term	Aband., suspected wind	Aband. unknown pre- or post-term	Failed, cause unknown	Unidentified predator	Avian predator	Gull	Corvid	Raven	Northern harrier	Peregrine falcon	Coyote	Raccoon	Skunk	Flooded	Total
	So. Excl.				6	1								1				**8**
2002	Oso Flaco				2													**2**
	So. Excl.	17	2				3				1							**23**
2003	Oso Flaco	2				1	1				4							**8**
	So. Excl.	12				7	2				2			1				**24**
2004	Oso Flaco	4				2	3										1	**10**
	So. Excl.	9	3			7												**19**
2005	Oso Flaco	2	1				1											**4**
	So. Excl.	5	4			2	1		3					4				**19**
2006	Oso Flaco				1		1		3								2	**7**
	So. Excl.	4	1			9					1							**15**
2007	Oso Flaco	2				2					1			1				**6**
	So. Excl.	10			3	2	2	5	1			2					1	**26**
2008	Oso Flaco	3			1			4	1			1					2	**12**
	So. Excl.	9	1			3	5	16	2			1					1	**38**
2009	Oso Flaco	4				2	1	5								1	1	**14**
	So. Excl.	5	2	9			4	6									2	**28**
2010	Oso Flaco	1		2				2							1	2	1	**9**
	So. Excl.	6	3	1	1	2	1	5		3								**22**
2011	Oso Flaco						2			2					1	2		**7**
	So. Excl.	11	1	6	3	3	3	5		3		5	1	1			1	**43**
2012	Oso Flaco	3	1	1														**5**
	So. Excl.	5	5	15		3	1											**29**
2013	Oso Flaco	3	2	2					1									**8**
	So. Excl.	13	1		4	2											1	**21**
2014	Oso Flaco	6		1	1		1							1			1	**11**
	So. Excl.	11	1	1	4	2		2			1						2	**24**
2015	Oso Flaco	1				1	1				3							**6**

Table F.2. Attributed causes of snowy plover nest loss in Southern Exclosure and Oso Flaco at ODSVRA from 2002-18 (continued).

Year	Area	Aband. pre-term	Aband. post-term	Aband., suspected wind	Aband. unknown pre- or post-term	Failed, cause unknown	Unidentified predator	Avian predator	Gull	Corvid	Raven	Northern harrier	Peregrine falcon	Coyote	Raccoon	Skunk	Flooded	Total
	So. Excl.	5	7	2	2	3										1		**20**
2016	Oso Flaco	4				1	1		1								1	**8**
	So. Excl.	5	3	1	3	11	9	2	2		6			1		15		**58**
2017	Oso Flaco	5		2	2	15					4			1		3	2	**34**
	So. Excl.	9	3		5	2		3			5						1	**28**
2018	Oso Flaco	2		3	2		2	10	5					4				**28**
		136	**37**	**35**	**31**	**59**	**31**	**44**	**8**	**6**	**16**	**8**	**1**	**8**	**0**	**16**	**9**	**445**
	So. Excl.	30.6%	8.3%	7.9%	7.0%	13.3%	7.0%	9.9%	1.8%	1.3%	3.6%	1.8%	0.2%	1.8%	0.0%	3.6%	2.0%	
2002-18 Total		**42**	**4**	**11**	**9**	**24**	**14**	**21**	**11**	**2**	**12**	**1**	**0**	**7**	**2**	**8**	**11**	**179**
nest loss	Oso Flaco	23.5%	2.2%	6.1%	5.0%	13.4%	7.8%	11.7%	6.1%	1.1%	6.7%	0.6%	0.0%	3.9%	1.1%	4.5%	6.1%	
2002-18 Grand Total		**178**	**41**	**46**	**40**	**83**	**45**	**65**	**19**	**8**	**28**	**9**	**1**	**15**	**2**	**24**	**20**	**624**
So. Excl. and Oso Flaco		28.5%	6.6%	7.4%	6.4%	13.3%	7.2%	10.4%	3.0%	1.3%	4.5%	1.4%	0.2%	2.4%	0.3%	3.8%	3.2%	

Appendix F. Addendums to snowy plover nesting success (continued).

Table F.3. Nest protection used at ODSVRA in 2018.

Nests with unknown location and unknown fate nests are excluded. Percent in parenthesis is percent nests hatched. Circular = single nest circular exclosure; un = unknown predator; av = avian; rav = common raven; sku = skunk; gul = gull, unknown species; coy = coyote; pre = abandoned pre-term; pos = abandoned post-term; ukp = abandoned unknown pre- or post-term; win = abandoned, suspected wind; fld = flooded; unk = failed, cause unknown.

	Seasonal Exclosure			Symbolic fencing	
Area	**No additional fencing**	**Bumpout**	**Circular**	**No additional fencing**	**Circular**
6 exclosure	**39**	**1**	**0**	**23**	**0**
Nests hatched	30 (77%)	1 (100%)		20 (87%)	
Nests depredated	4 (3 rav, 1 av)			1 (1 rav)	
Nests failed other causes	5 (1unk, 2 pre, 2 pos)			2 (1 ukp, 1 pos)	
7 exclosure	**20**	**0**	**0**	**14**	**0**
Nests hatched	19 (95%)			11 (79%)	
Nests depredated	1 (1 rav)			1 (1 av)	
Nests failed other causes				2 (2 ukp)	
8 exclosure	**20**	**1**	**0**	**15**	**0**
Nests hatched	16 (80%)			9 (60%)	
Nests depredated				1 (1 av)	
Nests failed other causes	4 (4 pre)	1 (unk)		5 (2 ukp, 2 pre, 1 ove)	
Boneyard	**6**	**0**	**0**		
Nests hatched	5 (83%)				
Nests depredated					
Nests failed other causes	1 (1 pre)				
SOUTHERN EXCLOSURE TOTALS	**85**	**2**	**0**	**52**	**0**
Nests hatched	70 (82%)	1 (50%)		40 (77%)	
Nests depredated	5 (4 rav, 1 av)			3 (2 av, 1 rav)	
Nests failed other causes	10 (7 pre, 2 pos, 1 unk)	1 (1 unk)		9 (5 ukp, 2 pre, 1 pos, 1 ove)	
North Oso Flaco	**7**	**0**	**0**	**13**	**1**
Nests hatched	3 (43%)			7 (54%)	1 (100%)
Nests depredated	4 (4 av)			4 (3 av, 1 coy)	
Nests failed other causes				2 (2 ukp)	
South Oso Flaco				**20**	**20**
Nests hatched				6 (30%)	16 (80%)
Nests depredated				13 (3 av, 3 coy, 5 gul, 2 un)	
Nests failed other causes				1 (1 win)	4 (2 pre, 2 win)
OSO FLACO TOTALS	**7**	**0**	**0**	**33**	**21**
Nests hatched	3 (43%)			13 (39%)	17 (81%)
Nests depredated	4 (4 av)			17 (6 av, 4 coy, 5 gul, 2 un)	
Nests failed other causes				3 (2 ukp, 1 win)	4 (2 pre, 2 win)
GRAND TOTAL	**92**	**2**	**0**	**85**	**21**
Nests hatched	73 (79%)	1 (50%)		53 (62%)	17 (81%)
Nests depredated	9 (5 av, 4 rav)			20 (8 av, 4 coy, 5 gul, 1 rav, 2 un)	
Nests failed other causes	10 (2 pos, 7 pre, 1 unk)	1 (1 unk)		12 (1 ove, 1 pos, 2 pre, 7 ukp, 1 win)	4 (2 pre, 2 win)

Appendix F. Addendums to snowy plover nesting success (continued).

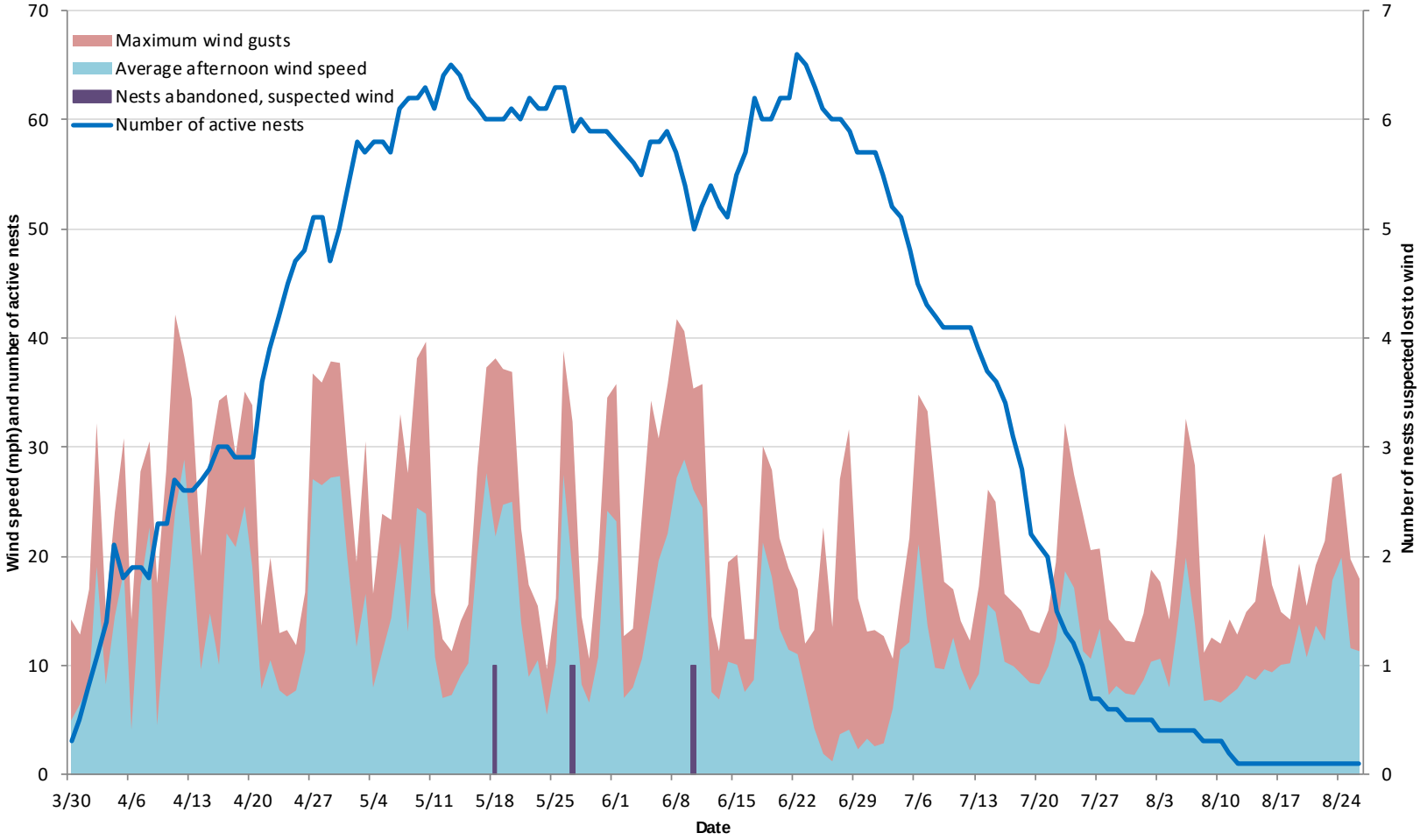


Figure F.1. Daily wind speed data (daily afternoon average and daily maximum wind gust) and snowy plover nest loss attributed to wind at ODSVRA from 30 March to 26 August 2018.

The left y-axis corresponds to wind speed in miles per hour (mph) and total number of active nests. The right y-axis corresponds to number of nests lost with fate abandoned, suspected wind. (Only nests with entire clutch lost, whether partial or complete, are included and not eggs lost from a nest that remained active.) Wind speed was collected at the S1 wind tower, located approximately 375 feet east of 6 exclosure since 2011, from an anemometer at 10 meters height. The daily afternoon average wind speed is calculated from the average of the hours 1:00 pm – 5:00 pm. The maximum wind gust represents the maximum wind speed for the entire day.

APPENDIX G. PREDATOR SUMMARY TABLES AND FIGURES.

Table G.1. Summary of predators detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

Observations from 1 March–10 September (a 194-day period). Contracted predator management specialists were essentially done and observer presence in field by park staff was reduced after the first week of September (no remaining chicks). Min no. individ. = minimum number of different individuals identified during season. This number was not determined for mammals or owls as these species are primarily nocturnal with occurrences detected by tracks.

Species	First date observed	Last date observed	No. days detected	Min. no. individ.	Notes
Mammalian					
Bobcat	25 Jun	18 Aug	8	-	Tracks of bobcat (*Lynx rufus*) encountered in Boneyard on eight days and inside 8 exclosure on two days. One bobcat caught in trap intended for skunks was released.
Coyote	7 Mar	8 Sep	101	-	Most common on South Oso Flaco shoreline. Tracks also present on the Southern Exclosure and North Oso Flaco shoreline. Four plover nests documented depredated by coyote (three in South Oso Flaco and one in North Oso Flaco). Noted inside the Seasonal Exclosure on 11 days (22 occurrences).
Opossum	13 Apr	8 Sep	23	-	Activity primarily noted in the Southern Exclosure and North Oso Flaco during July-September.
Raccoon	6 Mar	8 Sep	55	-	Activity noted inside the Southern Exclosure and shoreline. Tracks also present in North and South Oso Flaco.
Skunk	9 Mar	5 Sep	49	-	Activity primarily noted in 8 and Boneyard exclosures. Tracks also present in 6 exclosure, 7 exclosure, North and South Oso Flaco.
Avian					
American crow	1 Apr	21 Aug	7	2	Mostly seen flying over NOF foredunes and SOF. Three sightings of a single crow on separate days flying over 6, 8, and Boneyard exclosures. On 1 and 2 April, two crows seen flying together over sensitive areas south of 8 exclosure.
American kestrel	6 Mar	9 Sep	34	3	Frequent sightings in August and September. Observed perch-hunting in all areas of the Southern Exclosure and Oso Flaco. Minimum of three individuals (based on sex characteristics) observed during season: one male and two females.
Common raven	9 Apr	24 Aug	6	3	Primarily observed flying over exclosure areas in April. Three ravens seen at same time flying over 7 exclosure on 17 April. Five nests documented lost to raven (three in 6 exclosure on 5 April, and two on 6 and 7 shoreline on 17 April).
Gull spp.	Present daily throughout season				Gulls were present the length of the shoreline of the Southern Exclosure and Oso Flaco. Five plover nests documented depredated by gull in South Oso Flaco (presence of tracks at depredated nests). Gulls were documented taking a minimum of 11 plover chicks (see Table H.2 in Appendix H).
Loggerhead shrike	8 Jul	8 Sep	5	1	All observations in North Oso Flaco and Boneyard.
Merlin	4 Apr	9 May	20	2	Primarily observed hunting over North Oso Flaco and Boneyard. Minimum of two individuals (based on sex characteristics) observed during season: one male and one female.
Northern harrier	2 Mar	9 Sep	25	3	Almost all observations in flight and often hunting primarily over North and South Oso Flaco. Minimum of three individuals (based on age and sex characteristics) observed during season: one adult female, one sub-adult male, and one juvenile.
Osprey	Common throughout season				Although not documented as a predator of plovers or terns, ospreys (*Pandion haliaetus*) are included in this table due to the disturbance they can cause when perched for long periods of time in sensitive areas. Primarily observed flying over 6, 7 and 8 exclosures and occasionally perched and eating fish.

Appendix G. Predator summary tables and figures (continued).

Table G.1. Summary of predators detected in the Southern Exclosure and Oso Flaco at ODSVRA in 2018 (continued).

Species	First date observed	Last date observed	No. days detected	Min. no. individ.	Notes
Large owl spp.	7 Mar	7 Sep	32		Great horned owl and barn owl documented on-site but observations and tracks indicate great horned owl make up the majority of owl presence. Activity primarily noted in 8 exclosure, North Oso Flaco, and Boneyard exclosure. Noted inside South Oso Flaco on two days, 7 exclosure on two days, and 6 exclosure on one day.
Peregrine falcon	1 Mar	9 Sep	88	5	Observed throughout the Southern Exclosure and Oso Flaco in flight and perching, sometimes over an extended time period. Observed multiple times pursuing and/or consuming prey on the shoreline and inside exclosures. Peregrines were documented taking one juvenile or adult plover, one adult plover, and three plover chicks (see Table G.1 in Appendix H). Minimum of five individuals (based on bands and/or age and sex characteristics) observed during season: three uniquely banded birds, one unbanded adult, and one unbanded sub-adult.
Red-tailed hawk	1 Mar	9 Sep	30	4	Observed primarily perch-hunting in Oso Flaco foredunes. Minimum of four individuals (based on age characteristics) observed during season: two adults, one sub-adult, and one juvenile.

Table G.2. Mammalian and avian predators removed under predator management actions for least terns and snowy plovers at ODSVRA in 2018.

Seven coyotes, one red fox, two raccoons, one opossum, five striped skunks, three common ravens, three California gulls, and one western gull were lethally removed. Two raccoons were caught in traps intended for skunks and were euthanized. One American kestrel, two great horned owls, and two peregrine falcons were live-trapped and relocated. The relocation date is given in parenthesis. All animals trapped or removed were within ODSVRA boundaries, with the exception of three ravens off-site removed with the permission of the landowner.

Date	Species	Age/Sex	Location
Lethally removed			
4-April	coyote	adult male	North Oso Flaco
5-April	raccoon	adult female	Pipeline revegetation area
5-April	coyote	adult male	North Oso Flaco
10-April	striped skunk	adult male	between Pawprint revegetation areas
11-April	raccoon	adult female	North Eucalyptus revegetation area
17-April	coyote	adult male	North Oso Flaco
25-April	common raven	adult	Oso Flaco Lake Road (east of Oso Flaco Lake)
27-April	common raven	adult	east of Oso Flaco Lake
29-April	common raven	adult	east of Oso Flaco Lake
18-May	red fox	adult male	between Pawprint revegetation areas
19-May	coyote	adult female	between Pawprint revegetation areas
24-May	coyote	adult female	between Pawprint revegetation areas
30-May	western gull	immature	6 exclosure
6-June	striped skunk	adult female	Boneyard exclosure
13-June	striped skunk	adult male	Boneyard exclosure
17-June	California gull	immature	6 exclosure
15-July	coyote	adult male	South Oso Flaco
27-July	California gull	immature	6 exclosure
31-July	striped skunk	adult male	8 exclosure
7-August	California gull	immature	6 exclosure
13-August	opossum	adult male	8 exclosure
21-August	striped skunk	juvenile female	Boneyard exclosure
27-August	coyote	adult male	North Oso Flaco
Live-trapped and relocated			
16-May (17-May)	great horned owl	adult	Pipeline revegetation area
24-May (25-May)	great horned owl	adult	Pipeline revegetation area
8-June (8-June)	American kestrel	adult female	South Oso Flaco
10-July (13-July)	peregrine falcon	adult male	South Oso Flaco
31-August (3-Sept.)	peregrine falcon	juvenile male	South Oso Flaco

Appendix G. Predator summary tables and figures (continued).

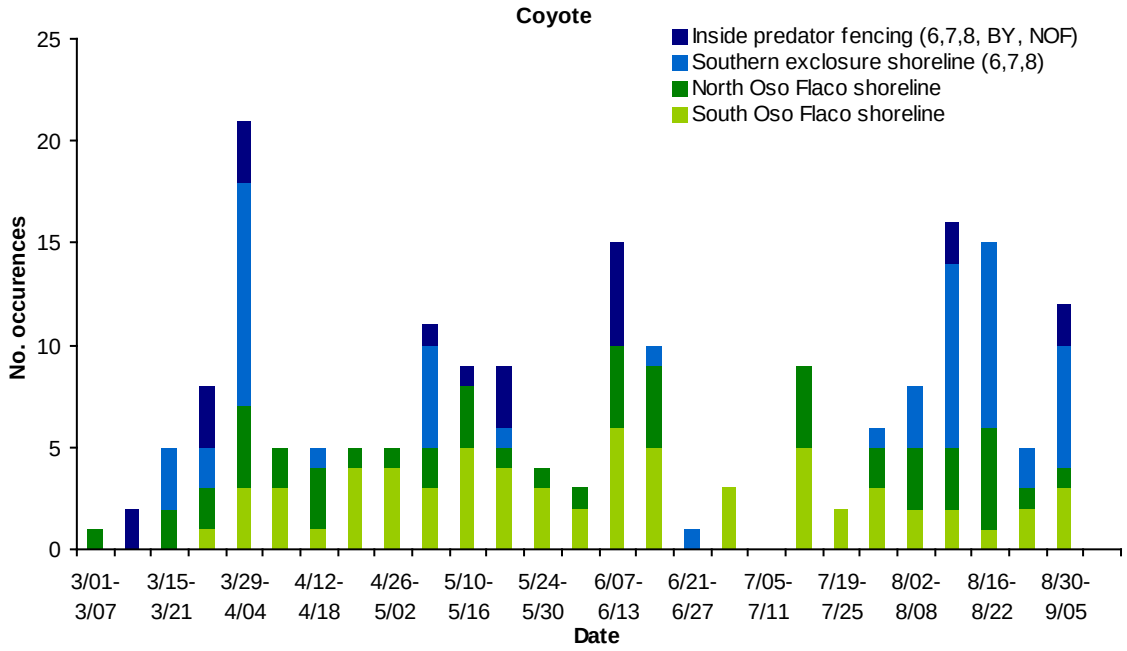


Figure G.1. Coyote occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

Observations from 1 March–10 September (a 194-day period). Coyote presence is documented for the Southern Exclosure shoreline (6, 7, and 8 exclosures), North Oso Flaco shoreline, South Oso Flaco shoreline, and inside the predator fencing of both the Southern Exclosure (6, 7, 8, Boneyard exclosures) and North Oso Flaco as separate occurrences. For the Southern Exclosure (6, 7, 8, and Boneyard exclosures) and North Oso Flaco, a distinction is made between the shoreline and inside the predator fencing of the exclosures because coyotes are typically excluded from the area protected by predator fencing.

Appendix G. Predator summary tables and figures (continued).

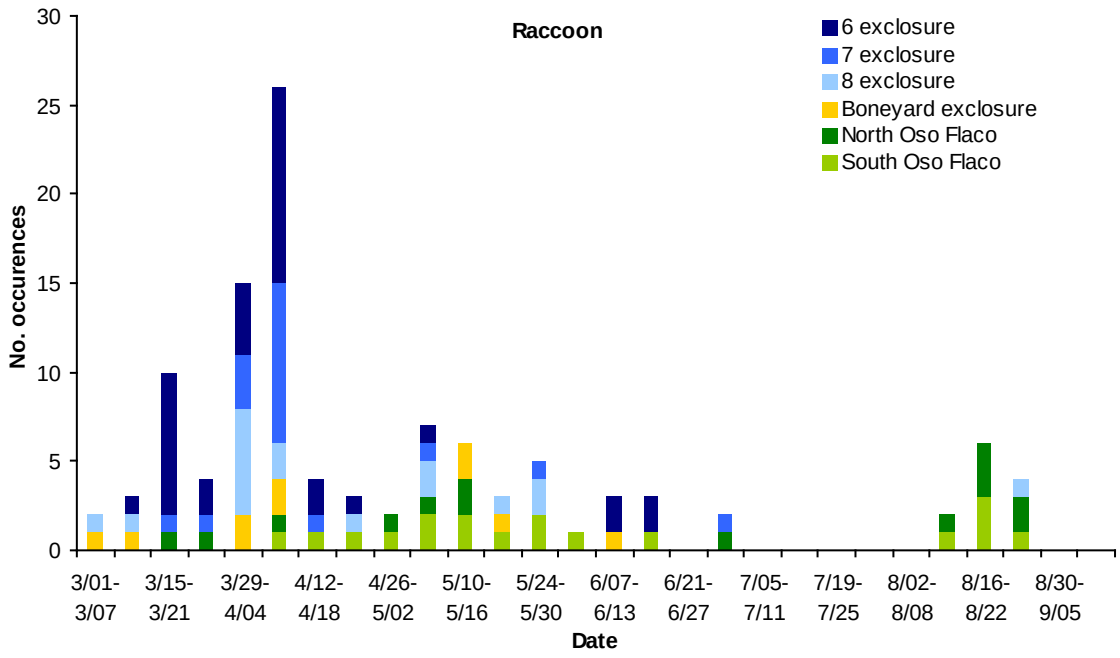


Figure G.2. Raccoon occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

Observations from 1 March–10 September (a 194-day period). Raccoon presence is documented for each of the areas of the Southern Exclosure (6, 7, 8, and Boneyard exclosures), North Oso Flaco, and South Oso Flaco as separate occurrences. No distinction is made between the shoreline and inside the predator fencing of the exclosure since raccoons are able to climb over the predator fencing.

Appendix G. Predator summary tables and figures (continued).

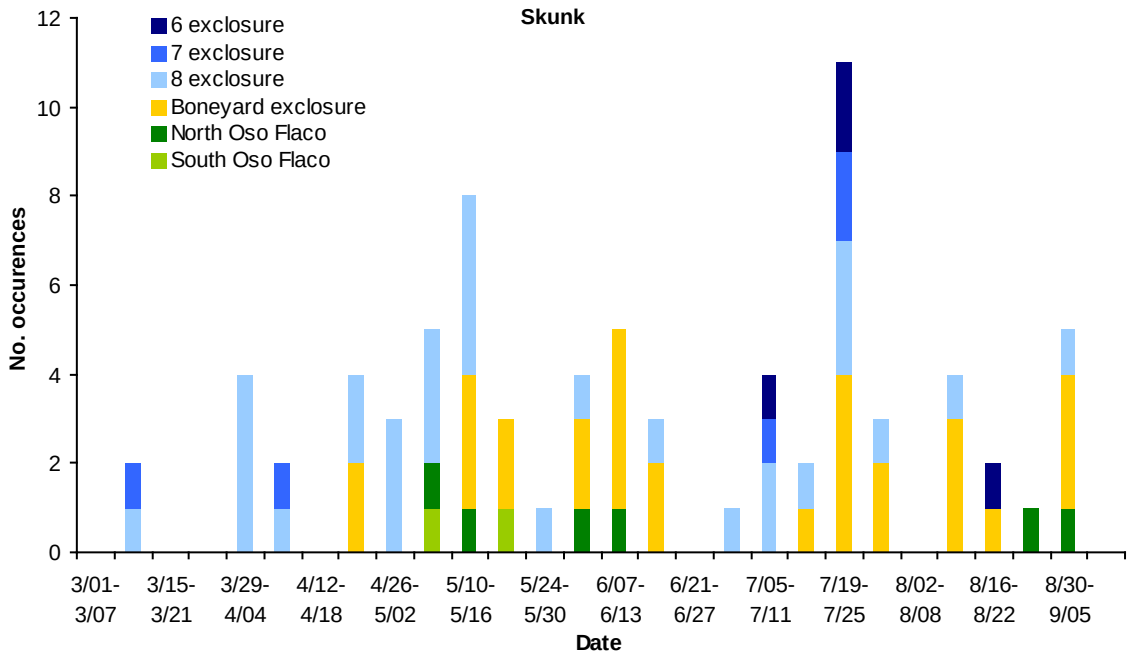
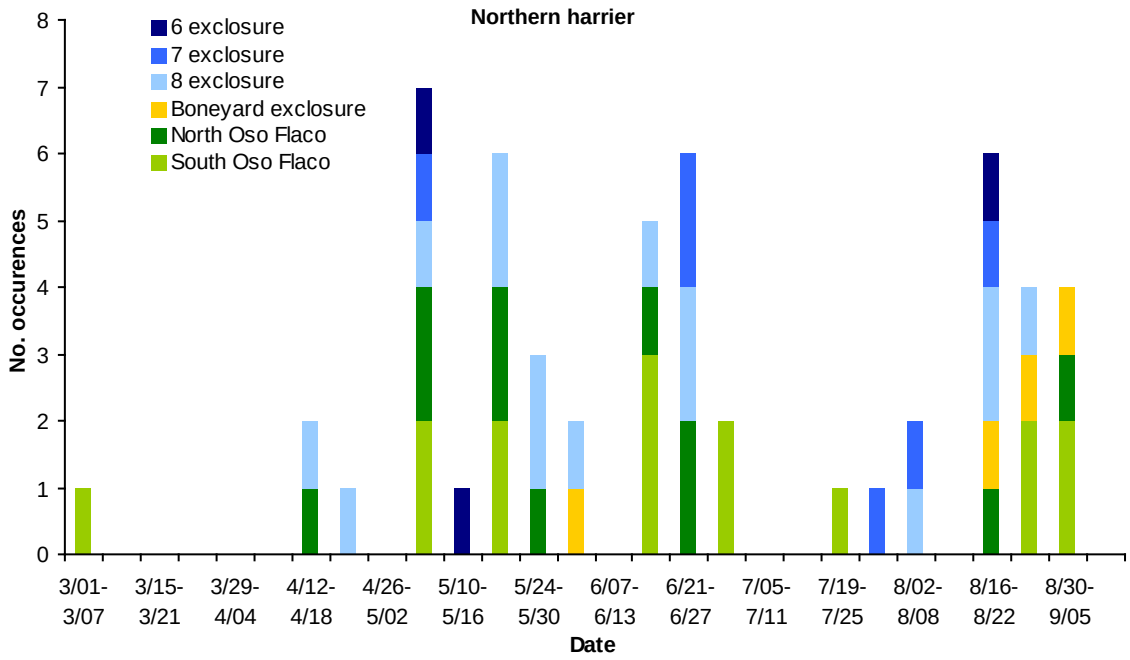


Figure G.3. Skunk occurrences documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

Observations from 1 March–10 September (a 194-day period). Skunk presence is documented for each of the areas of the Southern Exclosure (6, 7, 8, and Boneyard exclosures), North Oso Flaco, and South Oso Flaco as separate occurrences. No distinction is made between the shoreline and inside the predator fencing of the exclosure since skunks are able to pass through predator fencing.

Appendix G. Predator summary tables and figures (continued).



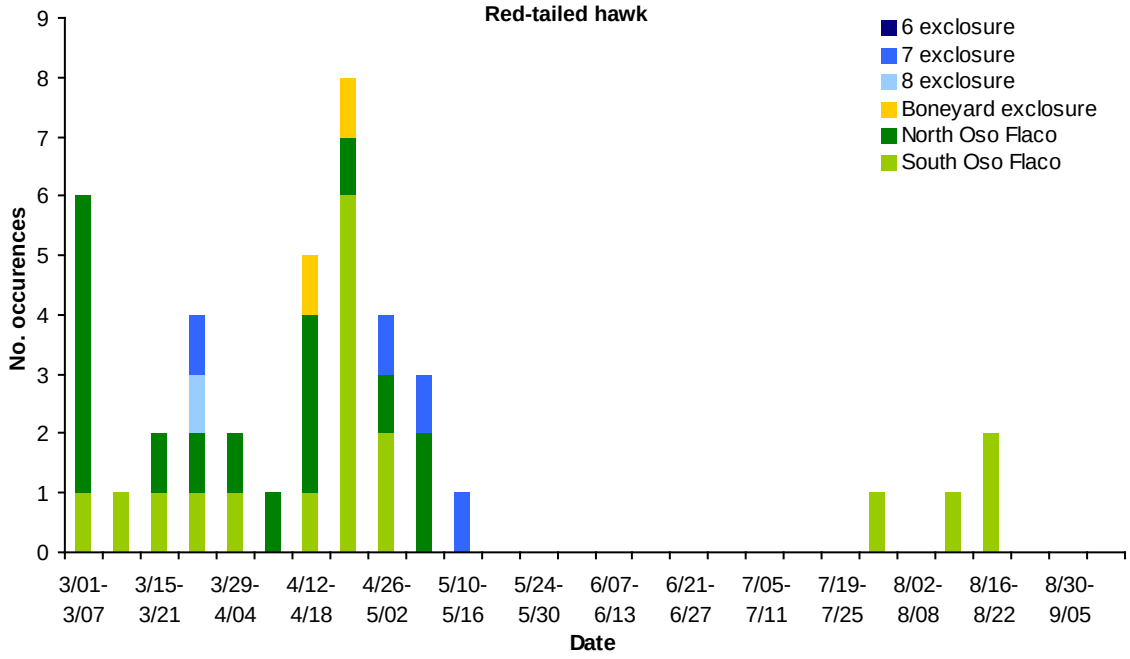
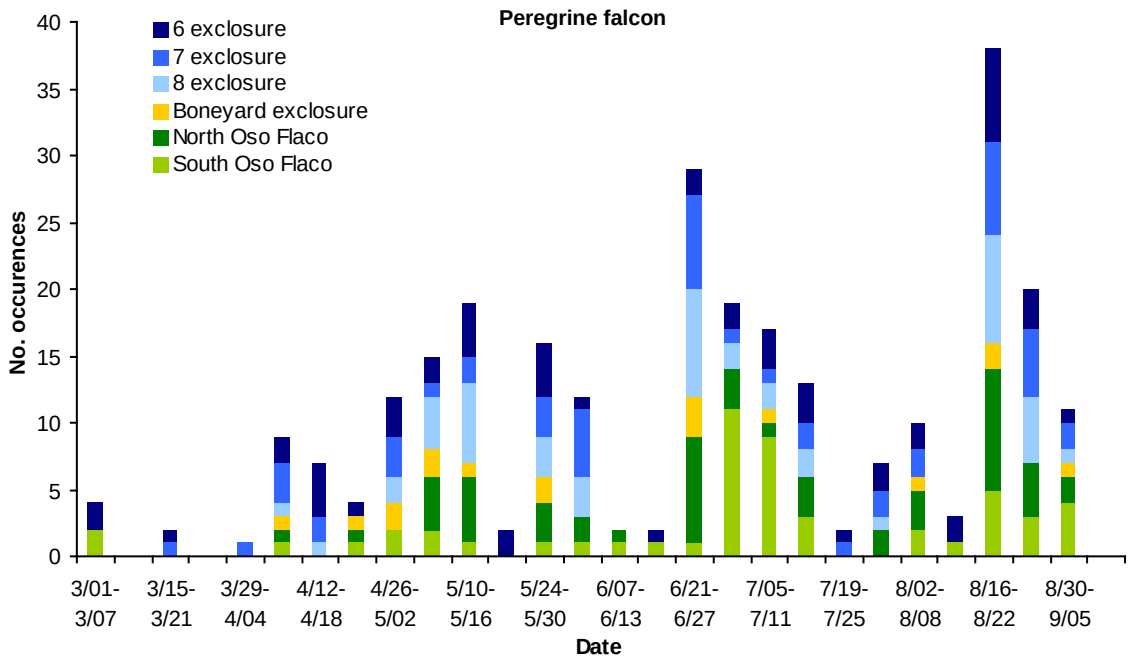


Figure G.4. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018.

Observations from 1 March–10 September (a 194-day period).

Appendix G. Predator summary tables and figures (continued).



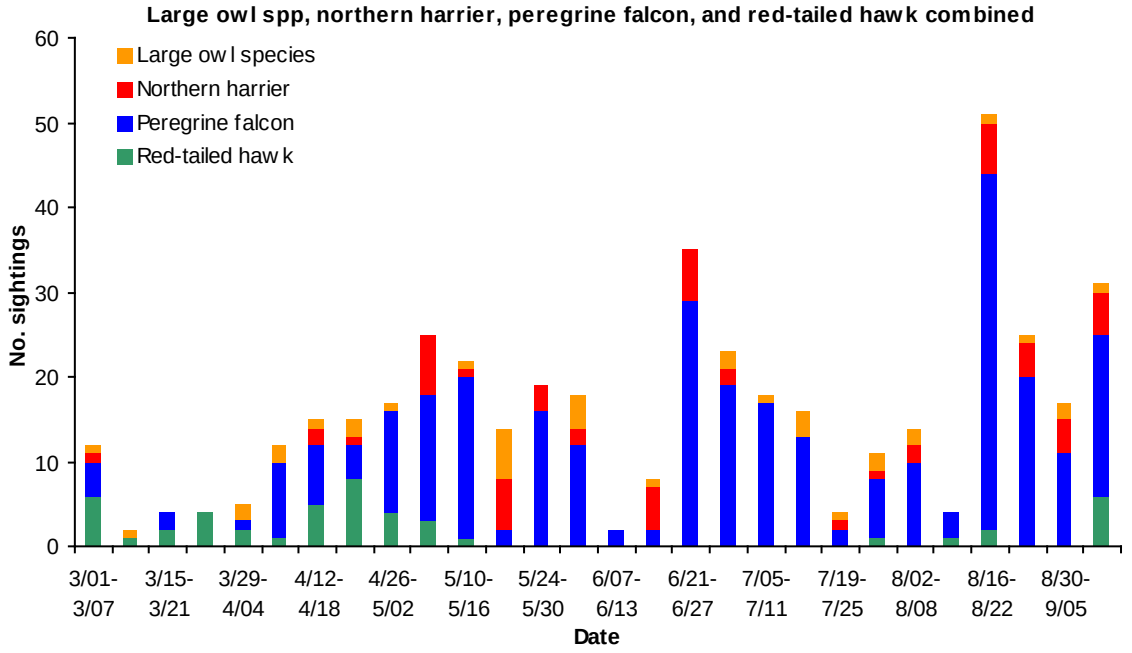


Figure G.4. Avian predator sightings documented in the Southern Exclosure and Oso Flaco at ODSVRA in 2018 (continued).
Observations from 1 March–10 September (a 194-day period).

APPENDIX H. DOCUMENTED MORTALITY OF CALIFORNIA LEAST TERN AND SNOWY PLOVER CHICKS, JUVENILES, AND ADULTS AT ODSVRA.

Table H.1. Documented predation of least terns from 1 March to 30 September 2018.

See Notes section and attached necropsy report for more detail.

No. (age)	Predator	Location	Notes
1 (juvenile)	Unknown avian	8 exclosure	On 26 August, a dead least tern fledgling, banded G/Y:B/A from the LT34 nest, was found on the 8 exclosure shoreline. The intact carcass had a wound on the back of neck with fresh blood. The necropsy report indicates the bird died from acute trauma with wounds presumably caused by attempted predation by an avian predator. The fledgling was last seen alive 25 August on the 7 exclosure shoreline at 23 days old.

Table H.2. Documented predation of snowy plovers from 1 March to 30 September 2018.

No. (age)	Predator	Location	Notes
9 (chick)	Western gull (immature)	6 exclosure	On 30 May at 8:22 am, an immature western gull was observed eating an unbanded 10-day-old chick from the SP35 nest and a second unbanded chick (likely the sibling chick from the same nest) on 6 exclosure shoreline. What is believed to be the same gull was observed later the same day eating prey on 6 exclosure shoreline and adult plovers were displaying at the gull. The gull was lethally removed by USDA Wildlife Services and the remains of nine plover chicks were found in the gut, including two three-day-old banded chicks from the SP79 nest, one six-day old banded chick from the SP72 nest, one six-day-old banded chick from the SP73 nest, one 12-day-old banded chick from the SP65 nest, and four small unbanded chicks from unknown nests.
1 (adult)	Peregrine falcon (banded adult male)	7 exclosure	On 26 June, a banded adult male peregrine falcon was observed eating an adult plover on 7 exclosure shoreline. The falcon was live-trapped on 10 July and released on 13 July at the Butte Valley Wildlife Area, Siskiyou County, California, 475 miles north of ODSVRA. On 10 August, this bird was observed back on-site.
3 (chick)	Peregrine falcon (banded adult male)	7 exclosure, North Oso Flaco	On 27 June, the same adult male peregrine falcon noted above taking an adult plover, was observed catching three prey items (evidence supports these were three plover chicks): one inside 7 exclosure, one on 7 exclosure shoreline, and one on North Oso Flaco shoreline.
2 (chick)	California gull (immature)	6 exclosure	On 7 August, an immature California gull was observed eating a 20-day-old banded chick from the SP161 nest and a 15-day-old banded chick from the SP187 nest. The gull was lethally removed by USDA Wildlife Services and no additional remains were found in the gut.
1 (juvenile or adult)	Peregrine falcon (juvenile)	7 exclosure	On 19 August, a juvenile peregrine falcon was observed catching and eating a juvenile or adult plover on 7 exclosure shoreline. The peregrine was live-trapped on 31 August and released on 3 September in the Owens Valley, Inyo County, California, 179 miles northeast of ODSVRA.

Appendix H. Documented mortality of California least tern and snowy plover chicks, juveniles, and adults at ODSVRA (continued).

Table H.3. Mortality, other than documented predation, of snowy plovers from 1 February 2018 to 12 October 2018.

See Notes section and attached necropsy or medical reports for more detail. All remains not sent for necropsy were saved as specimens for a designated depository. One injured adult that died later while receiving medical care is included in table.

No. (age)	Location	Notes
1 (adult)	Open riding area	On 1 February, the intact carcass of an adult banded VV:YB, was found north of marker post 6. The carcass appeared flattened and fresh.
1 (adult)	Open riding area	On 9 February, the carcass of an unbanded adult plover was found south of marker post 4 in fresh tire tracks and appeared flattened.
1 (adult)	Open riding area	On 28 February, the carcass of an adult female banded GG:GG was found at the base of the exclosure fence north of marker post 7. The carcass was partially buried and appeared fairly fresh. A GG:GG plover was last seen in this same general area on 19 February.
1 (adult)	Open riding area	On 1 March, the carcass of an unbanded adult plover was found east of marker post 7. The area had multiple vehicle tracks and was closed to riding later that morning. One wing of the bird appeared twisted and no predator tracks were seen.
1 (adult)	8 exclosure	On 26 April, an unbanded adult with a left leg injury was taken to Pacific Wildlife Care for medical treatment. Fine hair-like material and one necrotic toe were surgically removed, and the bird was given antibiotics and pain medication. On 30 April, the bird was found dead at Pacific Wildlife Care.
1 (chick)	8 exclosure	On 13 May, one unbanded seven-day-old chick from the SP29 nest was observed lying immobile on the 8 exclosure shoreline and unattended by an adult. The chick was placed in a brooder where it died by the following morning. The chick was last seen actively foraging on 8 May at two days old.
1 (chick)	6 exclosure	On 11 June, one eight to nine-day-old chick from the SP77 nest appeared dead and seen dragged by the associated male on the 6 exclosure shoreline. The chick was last seen alive earlier on this day. The carcass could not be recovered to avoid disturbance to young nearby plover broods.
1 (juvenile)	8 exclosure	On 2 July, the carcass of a banded juvenile plover from the SP64 nest was found on the immediate edge of the active SP174 nest bowl on the 8 exclosure shoreline. The intact carcass was in rigor and appeared fresh. The necropsy report indicates it died from pulmonary hemorrhage, but the cause of the hemorrhage was not determined. The juvenile was last seen alive on the 8 exclosure shoreline on 30 June when 38 to 39 days old.
1 (chick)	7 exclosure	On 12 July, the carcass of one unbanded chick from the SP169 brood was observed on the 7 exclosure shoreline with the sibling and associated adults nearby. Two chicks hatched from this nest and both chicks were seen 11 July at four days old. The carcass was not recovered to avoid disturbance to young nearby plover broods.
1 (chick)	6 exclosure	On 24 July, an unbanded chick carcass was observed held in the bill of a whimbrel on the 6 exclosure shoreline. The carcass was limp and likely dead prior to the whimbrel picking it up. The whimbrel flew a short distance with it and the chick carcass was not relocated.
1 (juvenile)	8 exclosure	On 9 August, the carcass of an unbanded juvenile plover was found on the 8 exclosure shoreline. The intact carcass was wet and there was a small amount of blood on the underside of the bird. Radiographs did not show any fractures and the carcass was too desiccated for additional necropsy analysis.
1 (chick)	7 exclosure	On 14 August, the desiccated carcass of an unbanded newly hatched sized chick from the SP200 brood was found five feet from the nest bowl in 7 exclosure. The chick hatched sometime after 7 August, when the egg was pipped and peeping. An adult continued attending the nest until 10 August and the unbanded chick was not observed alive.
1 (adult)	8 exclosure	On 1 September, the desiccated remains of an adult plover banded RR:BG were found on the 8 exclosure shoreline. Parts found included a decomposed skeleton and leg bones. A male with this combination was known breeding at our site in 2017 and was last seen 19 November 2017.

Appendix H. Documented mortality of California least tern and snowy plover chicks, juveniles, and adults at ODSVRA (continued).

Table H.3. Mortality, other than documented predation, of snowy plovers from 1 February 2018 to 12 October 2018 (continued).

No. (age)	Location	Notes
1 (chick)	South Oso Flaco	On 6 September, the desiccated carcass of a small chick banded VV:YB from the SP49 brood was found on the South Oso Flaco shoreline in the general area of the nest and where the brood was raised. Three chicks were last seen 28 May, two last seen on 13 June, and the remaining chick was last seen on 15 June at 19 days old.
1 (suspected adult)	South Oso Flaco	On 6 September, the desiccated partial remains of a snowy plover, suspected to be an adult, were found in South Oso Flaco. Parts found included a partial bill, leg, and feathers.
1 (adult)	Open riding area	On 22 September, the carcass of an unbanded adult plover was found north of marker post 5. The carcass appeared fresh and was found in an area with multiple vehicle tracks and adjacent to a large roosting flock of plovers.
1 (chick)	South Oso Flaco	On 23 September, desiccated partial remains of a small chick from the SP105 brood were found in South Oso Flaco near the nest location. Remains were partially buried and only two of the bands were found. Three chicks from this brood were last seen 28 June at 10 days old.
2 (adult)	Open riding area	On 30 September, two unbanded adult plover carcasses were found 10 feet apart north of marker post 5. The birds were found in an area with multiple vehicle tracks, adjacent to a large roosting flock of plovers, and appeared flattened and partially buried.
1 (adult)	Open riding area	On 12 October, the carcass of an unbanded adult plover was found between markers post 4 and 5. The carcass appeared fresh and was found in an area with multiple vehicle tracks and adjacent to a large roosting flock of plovers.

Oceano Dunes State Vehicular Recreation Area

2018 Predator Management Report

Submitted To:

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Submitted By:

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&
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San Luis District
CA Wildlife Services Program

Introduction

Prior to the 2018 California Least Tern (*Sternula antillarum browni*)(CLTE) and Western Snowy Plover (*Charadrius nivosus nivosus*)(SNPL) nesting season, USDA-APHIS-Wildlife Services entered into an agreement with Oceano Dunes State Vehicular Recreation Area (ODSVRA) to conduct predator management activities in the CLTE and SNPL nesting areas. Wildlife Specialist (WS) Alexander Schaefer was assigned to the ODSVRA project to monitor and selectively remove mammalian or avian predators for protection of nesting CLTE and SNPL.

WSS Alexander Schaefer began working the ODSVRA project on April 2, 2018 and worked through September 7, 2018. Prior to beginning, WS Schaefer underwent USDA mandatory training including the use of firearms, trapping equipment, defensive driving, civil rights, and all aspects of safety.

Methods of Predator Management

Multiple methods were used for CLTE and SNPL protection throughout the nesting season. Activities included surveying, trapping, shooting, spotlighting and hazing.

Daytime surveys were performed by either hiking or driving on the dunes and shoreline in an attempt to locate predators through track or visual identification. Wildlife Services stayed in communication with State Park resource staff in order to stay current on their observations of predator activity. Predator surveys were conducted in revegetation islands such as Heather, Acacia, Cottonwood, Eucalyptus, Table Top, Pipeline, Boy Scout Camp, and Maidenform. Predator activities also took place on the southern exclosure shoreline, North Oso Flaco and the South Oso Flaco areas (Appendix 1).

Trapping was the most common method for predator management during the 2018 nesting season. Methods included the use of Woodstream® #3 and #1-1/2 padded jaw leg-hold traps for predators such as coyotes (*Canis latrans),* red fox (*Vulpes vulpes)* common ravens (*Corvus corax*), and striped skunks (*Mephitis mephitis).* Traps were baited with commercially available lures made from different scents, glands and meat based baits as well as with hard boiled chicken eggs. Single door cage traps manufactured by Tomahawk Live Trap® were also used in an attempt to capture skunks, opossums and raccoons. Cage traps were baited with either dry or wet canned cat food. The model of firearm used to remove trapped animals was a Ruger® 10/22 chambered in .22 long rifle, while the ammunition of choice was CCI® Short Range Green that fired a 21 grain non-lead cartridge. A Browning® BPS 20 gauge shotgun was also used on site that fired Federal® brand 3 inch shells with steel #2 shot.

Euthanasia of captured animals is conducted in compliance with standards set by the American Veterinary Medical Association. Where practical, captured animals are euthanized by a single shot at close range with a .22 caliber rifle. Circumstances sometimes require the use of euthanasia drugs to remove a target predator that is trapped. When necessary, sodium pentobarbital is administered through a needle and syringe that is

fastened to a metal rod with a collar twisted in place to hold the syringe. The effects of sodium pentobarbital are rapid unconsciousness, followed by a reduction of respiration and central nervous system activity, and ending with cardiac arrest. When injected into the heart or major artery, the results are almost instantaneous. Sodium pentobarbital is a schedule II controlled substance whose use is monitored by the U.S. Drug Enforcement Administration. Use of sodium pentobarbital by WS employees is restricted to those that have received training and are certified in its use. Mammals euthanized in this fashion are given an injection of the drug and disposed of according to WS directives, and all applicable state and federal laws and regulations. Injections are placed in the intraperitoneal cavity. The typical dosage rate is 1 cc for every 10 pounds of body weight. A sliding internal rod within the larger metal rod allows the applicant to inject the drug with the use of their thumb while holding the end of the rod farthest away from the animal.

Spotlighting is a common method of predator management that is usually performed while driving a vehicle and shining a high powered light looking for the reflective eye shine of the predator. Once eye shine has been located, identification of the predator can then be made with the use of binoculars. The same method can also be performed while remaining in a stationary position along target predators' travel ways in an effort to remove them should they appear. The spotlight used to locate predators was an FLX 800® lumen unit manufactured by Barska Flashlights®. Binoculars used in identifying predators were 10 X 42mm Goldring® by Leupold Optics.

Baiting efforts to attract common ravens using hard boiled chicken eggs were employed in attempt to entice ravens to a location to feed on the hard boiled eggs. Once ravens have become habituated to feeding on the hard boiled eggs, eggs that have been injected with the corvicide DRC-1339 are then placed in the area where the pre-baiting occurred (see Appendix 2). Although attempts were made to attract common ravens to pre-bait eggs, no ravens fed on them. DRC-1339 was not utilized during the 2018 nesting season.

Results of Predator Management Methods

When predator management efforts by Wildlife Services began for the 2018 season, the SNPL nesting season had already commenced. The main predation concerns this season were by common ravens, gulls, coyotes, and striped skunks in or near SNPL and CLTE habitat. Coyote track evidence suggested that individuals were hunting and foraging primarily along the shoreline areas in South Oso Flaco in areas where SNPL nests and chicks were found. In past nesting seasons, coyotes have been documented taking SNPL eggs and chicks at ODSVRA. In 2012, four coyote scats were found to contain a total of 11 bands (representing a minimum of one plover chick, two unknown age plovers, and one unknown age tern). Coyote tracks along the shoreline or past the Oso Flaco Boardwalk was often documented and four SNPL nests were confirmed to have been predated by coyotes during the nesting season.

The 2018 nesting season saw an increase of common raven predation events on SNPL nests. Multiple sightings were observed of individual birds frequenting the exclosure areas

throughout the park with documented nest losses to ravens. Aggressive trapping efforts using replicated plover nest sets baited with quail eggs was attempted. Baiting efforts using hard boiled chicken eggs was attempted to attract ravens to feed on the eggs. Motion activated cameras were placed at each bait site to verify raven consumption of the egg baits. The use of #1-1/2 padded jaw leg-hold traps baited with hard boiled chicken eggs were placed exclusively in South Oso Flaco, North Oso Flaco shore, and six exclosure. It is believed most ravens traveled north from the south or from the east via the Oso Flaco agriculture fields. Ravens failed to visit either the quail egg sets or chicken egg baits. Predator watch shifts were employed by park resources staff and by WS Schaefer. Raven activity on nearby neighboring farm fields allowed WS Schaefer to focus effort toward removing ravens when given a safe opportunity. WS Michael Thompson assisted WS Schaefer and took one raven on 25 April off of Oso Flaco Road near Highway 1. WS Schaefer removed two adult ravens on 27 April and on 29 April on these neighboring properties. All raven damage on Oceano Dunes property ceased with no further raven predation during the remainder of the season following the removal of these individuals.

Gull predation to SNPL chicks at ODSVRA was observed during the 2018 season. On May 30, an immature Western gull *(Larus occidentalis)* was observed displaying suspicious foraging and hunting behavior among broods of young SNPL chicks on the six shoreline. A project lead and other resources staff then observed the gull take two SNPL chicks and were able to monitor the gull as WS Schaefer arrived at the scene. WS Schaefer was instructed to remove the gull, however the gull flushed and resources staff could not relocate the gull. WS Schaefer remained on the shoreline to observe gulls and later witnessed a different immature Western gull take a SNPL chick. WS Schaefer was in close proximity and quickly euthanized the gull. The gull was necropsied, and the remains of nine SNPL chicks were recovered. On June 17 and July 27, resources staff witnessed suspicious behavior from immature California gulls *(Larus californicus)* on six shoreline. WS Schaefer arrived and was requested to take the gulls as a precaution. The gulls were euthanized and upon necropsy, no SNPL remains or bands were found in either gull. On August 7, resources staff observed an immature California gull take two SNPL chicks on the six shoreline. District Supervisor Eric Covington arrived on scene and removed the gull. Necropsy results recovered two SNPL chicks.

Peregrine Falcons *(Falco peregrinis)* and other raptors were observed perching on or within exclosure fences and flying low over the shoreline on many occasions. WS Schaefer would locate avian predators and assist park staff and Bloom Biological, Inc. contractor Robert Chapman in hazing and some trapping efforts.

Great Horned Owls (*Bubo virginianus)* were a predation concern and were flushed from revegetation areas on occasion by WS Schaefer during predatory surveys. WS Schaefer would take note of owl tracks and report them to monitors as they were located in sensitive areas as well as collect and inspect owl pellets when found. Owl trapping attempts were performed by Chapman during the season, however WS Schaefer was not involved.

Seven coyotes were lethally removed during the 2018 season using #3 and #1.5 foot hold traps (Table 1). A coyote was trapped in North Oso Flaco vegetation after it had been consistently digging into the North Oso Flaco exclosure. A coyote was trapped on North Oso Flaco shoreline. A coyote was trapped in North Oso Flaco near the boardwalk. Two coyotes were trapped between Cottonwood and Acacia revegetation islands east of six exclosure. A coyote was trapped in South Oso Flaco in the fore dunes south of the Oso Flaco Creek lagoon. The last coyote was trapped on North Oso Flaco shoreline. Dates, age and sex can be found on Table 1.

During May, park staff and contractors captured trail camera photos of a nonnative red fox that had taken up residency in the vegetation islands immediately east of six exclosure. Track evidence revealed this animal to forage in the ORA as well as in the six pole alleyway near six shoreline. WS Schaefer was asked to trap this animal. On May 18, WS Schaefer was successful in capturing and removing an adult male red fox.

Two raccoons (*Procyon lotor*) were trapped using Tomahawk® cage traps. One adult raccoon was removed within west end of Pipeline revegetation. A second raccoon was removed from North Eucalyptus revegetation island. (Table 1 and Appendix 1).

One Virginia opossum *(Didelphis virginiana)* was removed during the 2018 season at the request of resources staff after the animal had been foraging throughout the exclosure among SNPL and CLTE chicks.

Five striped skunks (*Mephitis mephitis*) were removed using #1.5 foot hold traps and Tomahawk® cage traps during the 2018 season. The 2017 nesting season saw a high level of striped skunk predations that focused on SNPL nests and CLTE nests. Predation of CLTE chicks were suspected but not documented. Preemptive trapping efforts targeting striped skunks in 2018 took place in the North Oso Flaco fore dunes, West Boneyard, East Boneyard, eight exclosure, seven and a half exclosure/revegetation, six exclosure and in revegetation islands such as Pipeline, West Maidenform, Humpback Tabletop, Eucalyptus, and North Eucalyptus. The islands directly east of the exclosure areas are where WS Schaefer had repeatedly tracked most skunks across the Off Road Area from their point of exit/entrance in the exclosures to their denning areas (Table 1 and Appendix 1). Four striped skunks were trapped and removed with cage traps and one was trapped and removed with a padded jaw #1.5 foot hold trap. Spotlighting attempts were made this season to remove striped skunks found near the exclosure areas, but were unsuccessful.

Future Recommendations

WS encourages educating the public about the importance of not feeding wildlife in an effort to reduce predator attraction.

WS also recommends that all garbage containers have reinforced lids to prevent garbage consumption by wildlife.

WS recommends the state park continue maintaining the height and strength of the perimeter fence surrounding the enclosures during the nesting season. Maintenance of fencing where sand has shifted to create low spots or places where mammalian predators can breach should continue to be conducted on a regular basis to prevent predators from entering exclosures when fencing is compromised during the season.

WS recommends the state park continue to enforce the leash law for pets on the beach, which is crucial during nesting season.

WS recommends the state park continue removing animal carcasses from the beach to eliminate alternate food sources that serve as an attractant to scavenging predators such as coyotes.

WS recommends the selective removal of predators that are a potential or known threat to the CLTE and SNPL breeding population at ODSVRA. Removal of concerning predators prior to predation events should be the goal to protect CLTE and SNPL nesting and brooding areas.

Table 1: Predator Removal Summary

Date	Species	Age/Sex	Location
4/4/18	Coyote	Adult Male	NOF/BW
4/5/18	Raccoon	Adult Female	W.PLR
4/5/18	Coyote	Adult Male	NOF Shore
4/10/18	Skunk	Adult Male	Cottonwood
4/11/18	Raccoon	Adult Female	N. Eucalyptus
4/17/18	Coyote	Adult Male	NOF/BW
4/25/18	Raven	Adult N/A	Oso Flaco Lake Rd
4/27/18	Raven	Adult N/A	Teixeira Farms
4/29/18	Raven	Adult N/A	Teixeira Farms
5/18/18	Red Fox	Adult Male	Heather/Acacia
5/19/18	Coyote	Adult Female	Cottonwood/Acacia
5/24/18	Coyote	Adult Female	Cottonwood/Acacia
5/30/18	Western Gull	Sub Adult N/A	Six Shoreline
6/6/18	Skunk	Adult Female	West Boneyard
6/13/18	Skunk	Adult Male	East Boneyard
6/17/18	California Gull	Sub Adult N/A	Six Shoreline
7/15/18	Coyote	Adult Male	SOF/Lagoon
7/27/18	California Gull	Sub Adult N/A	Six Shoreline
7/31/18	Skunk	Adult Male	Eight Exclosure
8/7/18	California Gull	Sub Adult N/A	Six Shoreline
8/13/18	Opossum	Adult male	Eight Exclosure
8/21/18	Skunk	Sub Adult female	East Boneyard
8/27/18	Coyote	Adult Male	NOF Shoreline

Alexander Schaefer, Wildlife Specialist
San Luis District
CA Wildlife Services

Eric Covington, District Supervisor
San Luis District
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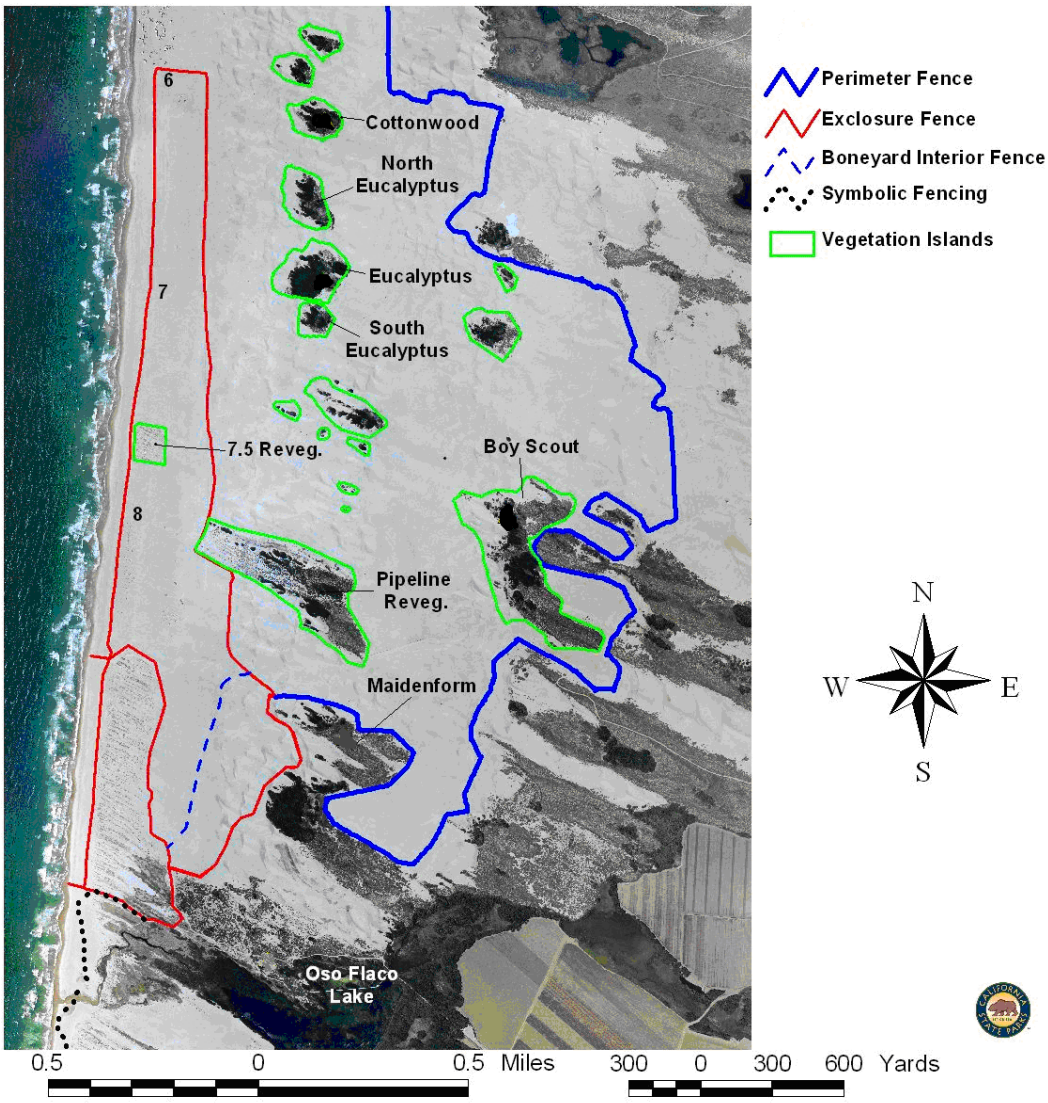
Appendix 1: Map of ODSVRA SNPL and CLTE Nesting Exclosures and Adjacent Areas



Appendix 2: DRC-1339 EPA Label

RESTRICTED USE PESTICIDE

Due to High Acute Inhalation Toxicity and Eye and Skin Corrosiveness to Humans; High Acute Toxicity to Nontarget Birds and Aquatic Invertebrates; and the Need for Highly Specialized Applicator Training.

For retail sale to and use only by USDA APHIS Certified Applicators trained in bird control or by persons under their direct supervision.

COMPOUND DRC-1339 CONCENTRATE – LIVESTOCK, NEST & FODDER DEPREDATIONS

For control of crows, ravens, and magpies that prey on newborn livestock, that prey on eggs or the young of Federally-designated Threatened or Endangered Species or of other species designated to be in need of special protection or that damage and feed on the contents of silage/fodder bags.

ACTIVE INGREDIENT:	
DRC-1339, 3-chloro-p-toluidine hydrochloride:	97.0%
OTHER INGREDIENTS:	3.0%
TOTAL:	100.0%

KEEP OUT OF REACH OF CHILDREN

DANGER-PELIGRO

POISON

FIRST AID

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. If you need immediate medical attention call the Poison Control Center at 1-800-222-1222 or a doctor. For non-emergency information concerning this product, call the National Pesticide Information Center at 1-800-858-7378.

If swallowed	- Call a poison control center or doctor immediately for treatment advice. - Have person sip a glass of water if able to swallow. - Do not induce vomiting unless told to do so by the poison control center or doctor. - Do not give anything to an unconscious person.
If on skin or clothing	- Take off contaminated clothing. - Rinse skin immediately with plenty of water for 15-20 minutes. - Call a poison control center or doctor immediately for treatment advice
If inhaled	- Move person to fresh air. - If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. - Call a poison control center or doctor immediately for treatment advice.
If in eyes	- Hold eye open and rinse slowly and gently with water for 15-20 minutes. - Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. - Call a poison control center or doctor immediately for treatment advice.

NOTE TO PHYSICIAN AND VETERINARIAN: Probable mucosal damage may contraindicate the use of gastric lavage. See additional "**PRECAUTIONARY STATEMENTS**" on right panel. If pet eats bait, call a veterinarian at once.

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

Acute Hazards: Fatal if inhaled. Corrosive. Causes irreversible eye damage and skin burns. May be fatal if swallowed. Harmful if absorbed through skin. Prolonged or frequently repeated skin contact may cause allergic reactions in some people.

Hazard Avoidance: Do not get in eyes, on skin, or on clothing. Do not breathe dust. Wear protective clothing, eyewear, and respiratory protection as listed under "PERSONAL PROTECTIVE EQUIPMENT." Wash thoroughly with soap and water after handling and before eating or smoking. Remove contaminated clothing and wash before reuse.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

Handlers who mix packages containing 1 lb (0.45 kg) or more of this product must wear:
- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant gloves (such as waterproof or rubber gloves)
- Chemical-resistant footwear plus socks
- Protective eyewear (goggles or face shield)
- A NIOSH approved particulate respirator with any N, R, or P filter with NIOSH approval number prefix TC-84A

Handlers who mix packages containing less than 1 lb (0.45 kg) of this product must wear:
- Long-sleeved shirt and long pants
- Chemical-resistant gloves (such as waterproof or rubber gloves)
- Protective eyewear (goggles or face shield)

Applicators who handle bait must wear:
- Long-sleeved shirt and long pants
- Chemical-resistant gloves (such as waterproof or rubber gloves)

User Safety Requirements:
- Follow manufacturer's instructions for cleaning/ maintaining PPE. If no such instructions are provided for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.
- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS:

This product is very highly toxic to birds and aquatic invertebrates. Do not use in any manner that may endanger nontarget and protected bird species. Runoff may be hazardous to aquatic organisms in neighboring areas. Do not apply when runoff is likely to occur. Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water by the cleaning of equipment or disposal of waste.

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
4700 River Road, Unit 149
Riverdale, MD 20737

EPA Reg. No. 56228-29
EPA Est. No. 56228-ID-1
Net Contents: _____
Batch Code No.: _____

Registration No. 56228-29, Page 1 of 3

ENDANGERED SPECIES CONSIDERATIONS:

Before undertaking any control operations with the product, consult with local, State, and Federal Wildlife authorities to ensure the use of this product presents no hazard to any Threatened or Endangered Species. DO **NOT** apply treated baits where there is a danger that Threatened or Endangered Species will consume baits unless special precautions are taken to limit such exposures.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ THIS LABEL:
Read the entire label. This product must be used strictly in accordance with this label's precautionary statements and use directions, as well as with all applicable State and Federal laws and regulations.

Before using this product, contact the U.S. Fish and Wildlife Service and the applicable State wildlife agency and obtain all necessary kill or collecting permits. Use only for the sites, pests, and application methods described on this label.

PRODUCT INFORMATION:

This product contains a slow-acting avicide which kills target bird species (see list below) in 1 to 3 days. As many types of nontarget birds are potentially vulnerable to DRC-1339, it is necessary to use care and to follow the requirements of this label to minimize impacts to nontarget species.

USE RESTRICTIONS:

Baits made from Compound DRC-1339 - Livestock, Nest & Fodder Depredations may only be used to control the following species:

- Common raven *(Corvus corax),*
- Chihuahuan raven *(Corvus cryptoleucus),*
- American crow *(Corvus brachyrhynchos),*
- Black-billed magpie *(Pica hudsonia),* and
- Fish crow *(Corvus ossifragus).*

This product may be used to prepare egg or meat-cube baits to control the target species listed above in the following use sites:

- Rangeland and pastureland areas where ravens or crows prey upon newborn livestock;

- Refuges or other areas where ravens or crows prey upon the eggs and/or young of Federally-designated Threatened or Endangered Species, or upon the eggs and young of other species which Federal or State wildlife agencies have determined to be in need of protection from nest predators due to documented declines in numbers and/or in nesting success; or

- Within 25 feet (7.6 m) of silage/fodder bags that have been damaged or are likely to be damaged by crows, ravens, or black-billed magpies.

Baits must be prepared and applied as specified on this label. DO NOT apply baits made from this product by air or by use of any mechanical equipment designed to broadcast baits or other pesticides. Users of this product must follow all limitations indicated on this label regarding the placement and monitoring of treated baits.

Before baits made from this product are applied, sites that are to be treated **must be observed** for evidence of nontarget activity **and must be prebaited** (see specific instructions for these activities). **DO NOT** apply treated baits where there is a danger that Threatened or Endangered Species will consume baits unless special precautions are taken to limit such exposures. Such precautions shall include observation of baited sites and use of hazing tactics to frighten away Threatened or Endangered Species that otherwise might feed upon baits.

DIRECTIONS FOR USE, continued

USE RESTRICTIONS, continued:

DO **NOT** apply treated baits within 50 feet (15.2 m) of permanent manmade or natural bodies of water, unless baited sites are under constant observation while baits are exposed.

DO NOT exceed a maximum application rate of 0.083 lbs of active ingredient per acre (0.93 g active ingredient/100 m^2), or a maximum yearly application rate of 0.5 lb of active ingredient per acre (5.61 g active ingredient/100 m^2).

DO **NOT** store treated bait in locations accessible to children, pets, domestic animals, or nontarget wildlife.

Prior to application, and during the time between the conclusion of application and the disposal of unconsumed bait, DO **NOT** temporarily place treated bait in locations accessible to children, pets, domestic animals, or nontarget wildlife. Follow the directions in "**ENTRY RESTRICTIONS**" to avoid exposure to children, pets, or domestic animals during application. Follow the directions in "**PRETREATMENT OBSERVATIONS**" to mitigate exposure to nontarget wildlife during application.

DO **NOT** apply bait in a way that will contact workers or other persons.

DO **NOT** use treated baits as food or feed.

DO **NOT** apply baits made from this product in any way that could contaminate human food or animal feed.

ENTRY RESTRICTIONS:

Only protected applicators may be in the area during bait application. Keep pets and livestock, and persons other than authorized handlers away from the bait at all times, and exclude all unauthorized persons from application sites during prebaiting and baiting. For example, post signage near, in the vicinity of, or at main entrances or commonly used access points to prebaiting and baiting sites that warns persons not to pick up or handle any baits and to keep pets and livestock away from bait.

PRETREATMENT OBSERVATIONS:

Prior to application, carefully observe target birds' feeding habits to locate their preferred feeding sites, determine the optimum time of application, and evaluate potential hazards of the application to nontarget and protected species.

PREBAITING:

Prebaiting with untreated bait materials (or use of a draw station) is necessary to promote feeding by target species and to assess potential for exposure of nontarget species. Apply prebait using the same procedures that are prescribed below for the type of bait ("**EGG BAITS**" or "**MEAT BAITS**") that is to be used for toxic baiting.

Observe baited areas (from blinds) early in prebaiting period to determine whether nontarget species are approaching baits. Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them.

(See next page for additional "DIRECTIONS FOR USE")

DIRECTIONS FOR USE, continued

BAIT PREPARATION:

MEAT BAITS:

MEAT BAIT PREPARATION:
Mix 0.027 oz (0.75 g) of this product with 0.18 oz (5.0 g) of powdered sugar.
Pour or sprinkle concentrate-sugar mixture over 200 meat cubes that measure about 0.5 in (1.3 cm) on each side.
Mix or tumble bait slowly until all meat cubes appear to be evenly covered.

MEAT BAIT APPLICATION:

NOTE: During application, wear all PPE as listed under "PERSONAL PROTECTIVE EQUIPMENT."

Control of crows, magpies, and ravens with meat baits prepared from this product is limited to the sites indicated above under "**USE RESTRICTIONS**." Wear rubber gloves while handling baits. Place no more than 75 meat cube baits at each baited site. Place 5 to 10 baits in clusters over an area not to exceed 1,000 ft^2 (93 m^2) where control of ravens, magpies, and/or crows is to be affected. **Draw stations** (fresh, unpoisoned animal carcasses) may be needed to attract ravens, magpies, and/or crows to the locations selected for bait exposure. If draw stations are used, place meat baits on or within a few feet of the animal carcasses.

WHILE TREATED MEAT BAITS ARE EXPOSED, BAITED AREAS MUST BE OBSERVED CONTINUOUSLY FROM A DISTANCE OF NO MORE THAN 1,000 YARDS (914 m) TO DETECT APPROACHES BY THREATENED OR ENDANGERED SPECIES AND OTHER NONTARGET OR PROTECTED ANIMALS LIKELY TO EAT BAITS. Because of wariness of target bird species, it may be necessary to observe baits from behind natural or specially-constructed blinds. Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them.

Unconsumed bait cubes must be retrieved daily, at the conclusion of each observation period and no later than one hour after sunset. Dispose of retrieved baits in accordance with applicable State and Federal laws.

EGG BAITS:

EGG BAIT PREPARATION:

Dissolve 0.07 oz (2 g) of the product in 0.2 pint (100 ml) of warm potable water at 110 °F (43.3 °C) to make an approximately 2% solution; or dissolve 0.14 oz (4 g) of the product in 0.2 pint (100 ml) of warm potable water at 110 °F (43.3 °C) to make an approximately 4% solution; or in other proportions to produce a 2% or 4% solution.

Using an 18-gauge hypodermic needle or similarly-sized implement, make an entry hole in the end of each hard-boiled chicken, turkey, or duck egg to be used. Using a syringe and a 20-gauge hypodermic needle, slowly inject 0.002 pints (1 ml) of the 2% solution (or 0.001 pints or 0.5 ml of the 4% solution) into the yolk of each egg.

Make only enough solution to treat the desired number of eggs. Mark treated eggs with small skull and crossbones or the word POISON.

DIRECTIONS FOR USE, continued

EGG BAIT APPLICATION:

NOTE: During application, wear all PPE as listed under "PERSONAL PROTECTIVE EQUIPMENT."

Control of crows, magpies, and ravens with egg baits prepared from this product is limited to the sites indicated above under "**USE RESTRICTIONS**". Place all egg baits to be used at one baited site within 25 ft (7.6 m) of the center of the site or within 25 ft (7.6 m) of any silage/fodder bags that are to be protected. Place 1-4 eggs in each bait set, and do not use more than a total of 18 eggs per baited site. If a draw station (fresh, unpoisoned animal carcass) is used, all bait sets must be located at least 10 ft (3 m) from the carcass. Wherever practical, bait sets should be made in "dummy" nests created by making small depressions in the ground. Dummy nests may be partially hidden by vegetation or other debris. In other situations, eggs may be placed on elevated wooden platforms 1 to 2 ft^2 (0.1 to 0.2 m^2) in area. Eggs placed on platforms must be restrained by wire to prevent them from falling off platforms or being removed by birds. Apply 2-3 eggs per platform.

DO NOT USE MORE EGGS THAN ARE NEEDED TO EFFECT CONTROL, as ravens and crows tend to cache surplus food.

Observe baited areas (from blinds) early in baiting period to determine whether nontarget species are approaching egg baits. Haze away Threatened or Endangered and nontarget species that might consume baits. Remove baits if such nontarget species continue to approach them.

Rebait with additional treated eggs when more than 50% of the treated eggs offered have been removed by ravens, magpies, or crows. When replacing baits, take care not to frighten target birds actively removing or feeding upon eggs. Retrieve unconsumed treated eggs within 7 days of exposure. Old treated eggs and treated eggs not eaten by the time control operations cease must be disposed of in accordance with applicable State and Federal laws.

POSTTREATMENT CLEAN-UP (Meat and Egg Baits):

NOTE: During clean-up, wear long-sleeved shirt and long pants and chemical-resistant gloves (such as waterproof or rubber gloves). To further reduce the potential for exposure, use appropriate implements such as scoops or other tools to collect carcasses or uneaten bait.

Collect unconsumed and leftover meat daily, and unconsumed and leftover egg baits, dying birds, and carcasses within 7 days of treatment. Dispose of such baits and carcasses by burning or burial, as authorized by applicable laws and ordinances.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

PESTICIDE STORAGE: Store only in original container, in a dry place inaccessible to children, pets, and domestic animals.

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spilled bait, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER HANDLING: Nonrefillable container. Do not reuse or refill this container. Offer for recycling, if available. Completely empty bags by shaking and tapping sides and bottom to loosen clinging particles. Empty residue into application equipment. If bags are not to be recycled, dispose of bags in a sanitary landfill or by incineration if allowed by State and local authorities. If burned, stay out of smoke.

Revised: 05-06-2016

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BLOOM BIOLOGICAL INC.
research | consulting | conservation

September 29, 2018

Mr. Ronnie Glick
Senior Environmental Scientist
Oceano Dunes District
California Department of Parks and Recreation
340 James Way, Suite 270
Pismo Beach, California 93449

[via email: Ronnie.Glick@parks.ca.gov]

SUBJECT: Summary of results of avian predator management activities during the 2018 season at Oceano Dunes State Vehicular Recreation Area, San Luis Obispo County, California

Dear Mr. Glick:

Bloom Biological, Inc. (BBI) was contracted by the State of California, Department of Parks and Recreation (CDPR) to provide an Avian Predator Specialist (APS) to trap and relocate problem avian predators (raptors and shrikes) for the management of the federally threatened Western snowy plover (*Charadrius nivosus nivosus*, 'plover') and the federally and state endangered California least tern (*Sternula antillarum browni*, 'tern') at the Oceano Dunes State Vehicular Recreation Area (ODSVRA, 'Project') in San Luis Obispo County, California.

This letter provides a summary of predator observations and predator management activities associated with the 2018 plover and tern breeding season.

INTRODUCTION

This report summarizes avian predator observations and hazing efforts made by BBI contractors between 1 February and 7 September 2018 (hereafter '2018 Season'). This period includes early-season observations made during February, before the start of the standard monitoring season (1 March, annually). Additional observations and hazing efforts were made by CDPR staff and other contractors, which are not represented in this report (see ODSVRA 2018 Annual Report).

The presence and behavior of avian predators changed with time throughout the 2018 Season, as described below (Summary of Predator Species Occurrence).

Raptor observations are addressed according to the following seasonal periods:

- **Wintering**: Individuals onsite and using the Project area early (prior to nesting period), these individuals may or may not migrate out of the area after the arrival of "spring."
- **Pre-nesting**: Individuals that arrive onsite during "spring" which begin to set-up nesting territories. They may stay on site or they may continue to other areas.
- **Nesting**: Individuals breeding on or near the Project site.
- **Post-breeding dispersal**: Juvenile birds that arrive on site during summer or adult birds that begin to roam.

In this report, trapping effort is quantified in 'trap hours', where one trap hour unit may result from the operation of a single trap for one hour, or multiple traps for a cumulative total of one hour. Likewise, the operation of two traps for one hour would result in 2 trap hours, and so on.

Hazing is a term used in this report to refer to an act directed at a potential predator to get it to leave an area. Hazing was performed by approaching the predator on foot (human approach), in a vehicle (by car), or by using Bird Whistlers®, which are pyrotechnic deterrent devices that make a very loud "SCREECH" sound designed to scare away pest birds and wildlife.

SUMMARY OF PREDATOR TRAPPING ACTIVITIES

During the 2018 Season, six raptors were targeted for capture and relocation, including one merlin (*Falco columbarius*), two great horned owls (*Bubo virginianus*), two peregrine falcons (*Falco peregrinus*), and one American kestrel (*Falco sparverius*). All targets except the merlin were eventually captured and relocated. All trapping and relocation actions were authorized by existing permits and through coordination with the California Department of Fish & Wildlife (CDFW; Carie Battistone, Senior Environmental Scientist) and the U.S. Fish & Wildlife Service (USFWS; Jennifer Brown, Wildlife Biologist). Justification for removal was based on the observed predation of plover fledglings/adults and chicks and the habitual disturbance to the nesting colonies. Information pertaining to the five relocated birds is summarized below (Table 1), and additional information for all six birds targeted for capture is provided in the following paragraphs.

Table 1. Raptors Captured and Relocated During 2018 Season

Species	VID Band #	Age/Sex	Date	Trapping Location	Release Location	Distance
GHOW	None	Adult/U	16 May 2018	35°02'40.41" N, 120°37'28.09" W	35°17'51.49" N, 118°36'46.13" W	115 Miles
GHOW	None	Adult/U	24 May 2018	35°02'40.41" N, 120°37'28.09" W	35°17'51.49" N, 118°36'46.13" W	115 Miles
PEFA	74/D	Adult/M	10 Jul 2018	35°01'55.89" N, 120°37'59.10" W	41°51'21.60" N, 122°04'21.54" W	475 Miles
PEFA	W/03	Juv/M	31 Aug 2018	35°01'55.89" N, 120°37'59.10" W	36°33'35.88" N, 118°03'28.15" W	179 Miles
AMKE	None	Adult/F	8 Jun 2018	35°00'45.57" N, 120°38'08.01" W	35°44'00.65" N, 119°35'21.04" W	77 Miles

Early in the season, a juvenile male merlin was habitually hunting the east side of the North Oso Flaco foredunes/ West Boneyard sensitive areas. Merlins usually depart the Central California coast by 1 April[1] and not typically overlap very long with breeding terns and plovers, but this individual lingered in the area until mid-May. The bird was identified as a target for trapping and relocation due to its consistent presence in a sensitive area where plover nests were due to hatch. However, despite the allocation of four trap days and 4.75 trap hours from 27 April through 9 May, the bird evaded capture. This individual eventually did move out of the area and no plover predations were documented.

Two apparently un-paired and non-breeding great horned owls, resident in the Pipeline revegetated area (PLR), were identified for trapping and relocation based on their habitual disturbance to the plover and tern colonies during the nesting period. These PLR birds were captured via the same verbail trap (CDFW-approved leg snare) positioned along the north ridge of PLR. Both birds were captured over a period of 6

[1] Edell, T. The Birds of San Luis Obispo County, California. Fourth Edition. April 2006.

trapping days between 14 and 24 May, comprising 125.75 trap hours. Both birds were relocated to the Tehachapi Mountains near Caliente, Kern County, California.

The first relocated peregrine falcon was an adult male with visual identification (VID) band '74/D' (white lettering on black) on the left leg and a USGS band on the right leg. This bird is known from Vandenberg AFB as the 'Lion's Head' male and was originally banded in 2007 by J. Pagel and N. Todd at the Lobo Canyon aerie, Santa Rosa Island, California. This individual was identified for trapping and relocation due to its repeated targeting and taking of SNPLs (see ODSVRA 2018 Annual Report for additional information). The adult male was successfully trapped during the 2018 Season near the mouth of Oso Flaco Creek in South Oso Flaco on 10 July. The capture of this bird required 44 trap hours over eight trapping days. A GPS satellite transmitter was affixed to the bird using a 'backpack' harness. The bird was then released on 13 July at the Butte Valley Wildlife Area, Siskiyou County, California, 475 miles to the north. This individual was observed back on site one month later 10 August. He was sighted once again by the APS on 23 August.

The second relocated peregrine falcon was an unbanded juvenile male, which was captured on 31 August, also near the mouth of Oso Flaco Creek in South Oso Flaco. Capture of this bird required 32.5 trap hours over eight trapping days. This bird was banded with a USGS band (#2206-85657) on the right leg and VID band 'W/03' (white lettering on black) on the left leg. It was released on 3 September in the Owen's Valley, Inyo County, California, 179 miles to the northeast.

A female American kestrel was identified for trapping and relocation due to its persistent foraging in a sensitive area of South Oso Flaco where newly hatched plover chicks were present. This 'after second year' (ASY) adult female was observed hunting at the south boundary of the Project on several occasions. No food carrying behavior was observed, but the bird's continued presence indicated it was a floater with no current nest attachment. This individual was trapped on 8 June on one trapping day comprising 0.25 trap hours. The bird was relocated to the Kern National Wildlife Refuge, Kern County, California, 77 miles to the northeast.

SUMMARY OF PREDATOR SPECIES OCCURRENCE

AMERICAN KESTREL

No American kestrel nests were found in the Project area and this species was not observed predating or attempting to predate a plover or tern. However, the species was regularly observed throughout the Project area, particularly early and late in the season. The highest numbers of observations occurred during the months of February (n=6), March (n=8) and August (n=13). Nesting was suspected at the Phillips 66 refinery adjacent to the Project to the east, with numerous observations of territorial behavior and food carrying behavior. At least one pair was believed to have nested on the refinery grounds in the refinery structure itself. Dead willow trees (*Salix spp.*) at Long Valley, located 1.05 miles east of PLR and Jack Lake, located 1.3 miles east southeast of PLR, both of which are in the eastern portion of the Project area, provide numerous cavities, suitable for kestrel nesting, but no evidence of nesting was documented. Two, or possibly three other kestrel pairs were suspected of nesting within the Project, with territorial birds observed regularly at the following locations: 1) Carpenter creek, 2) the dune area immediately south of Grand Avenue ramp and 3) the Oceano Campground north of the Interpretive Trail. During the 2018 Season, observations were documented through the wintering and pre-nesting period, from 1 February through 5 April. Observations of kestrels were lower in April (n=2) and declined or stayed steady through July. In August, during the post-breeding dispersal period, the number of observations increased markedly as numerous birds passed through the Project area. A definitive south to north movement was noted and seemed to be made up of juvenile birds. The 13 observations of kestrels in August was the monthly high for the 2018 Season. Observations of individuals continued through 7 September, with many of these observations occurring in sensitive areas. One female was trapped and relocated (see above, 'Summary of Predator Observations and Trapping Activities').

MERLIN

Merlins winter in the Project area and migrate out of San Luis Obispo County, typically becoming 'casual' by 1 April annually and 'vagrant' after 1 May[2]. Twenty-two merlin observations were documented during the 2018 Season; a much higher number than the six observations during the 2017 Season, but more comparable to the 16 observations during the 2016 Season. Authorization was obtained to trap and relocate one 'jack' (species-specific term for a male) merlin but attempts to capture the bird were unsuccessful (see above, 'Summary of Predator Observations and Trapping Activities'). This late jack merlin was observed hunting West Boneyard on five days in May and was last observed 9 May. This represents a significant record with only a small handful of May records for the county (n=7)[3]. No merlins were documented after 9 May and none had returned to the Project area as of 7 September.

PEREGRINE FALCON

Two peregrine falcons were trapped and relocated, with CDFW and USFWS authorization, during the 2018 Season on 10 July and 31 August. The complete details associated with these birds can be found above (see 'Summary of Predator Observations and Trapping Activity') and are not repeated here.

Through the 2018 Season, peregrine falcons were the most numerous raptors onsite at the Project. Red-tailed hawks and great horned owls, while numerous, are mainly non-migratory residents and their numbers remain relatively stable from year-to-year, restricted by available appropriate habitat. Peregrine falcons wander greatly, primarily during the 'winter' and 'post-breeding dispersal' periods. As specialists in avian prey, they are a significant threat to plovers and terns. The precise number of peregrine falcons observed is impossible to ascertain but numbers appear to increase each year. Ninety-six observations of peregrine falcons were made during the 2018 season by the APS. Unbanded males and females of all age classes (adults, sub-adults and juveniles) were present onsite at some point during the season. In addition to numerous observations of unbanded individuals, four uniquely banded birds were identified, including the newly banded and relocated juvenile male (see 'Summary of Predator Observations and Trapping Activity'):

1. **VID '17/D' black right, 1687-2214 silver left**, an adult female banded in Southern California in 2013. This large female was photographed onsite on 12 April and again on 7 June. She has been documented each of the last 3 seasons and is a frequent visitor.
2. **VID '90/AH' black left, 1947-27427 silver right,** a juvenile female, was banded this spring as a nestling at the Point Loma aerie in San Diego, California by Diego Johnson of the American Eagle Research Institute.
3. **VID '74/D' black left, silver right,** an adult male, previously discussed.
4. **VID 'W/03' black left, 2206-85657 silver right,** the juvenile male trapped, banded, and relocated this season.

Peregrine falcon observations occurred throughout the Project area, from Pismo Creek to the north, south to the Guadalupe-Nipomo NWR border, and east to the Project limits, this includes the protected and sensitive areas. Common locales for resting birds were near the mouths of Pismo, Carpenter, Arroyo Grande and Oso Flaco creeks. Oso Flaco Creek and the associated lagoon warrant special notation here; this creek is the only flowage onsite that reaches the ocean throughout the Project term. This constant flow is due to the irrigation of the agricultural fields to the east, making this a popular bathing and hunting location.

[2] Edell, T. The Birds of San Luis Obispo County, California. Fourth Edition. April 2006.

[3] T. Edell, personal communication.

Hunting raptors were documented in areas populated by appropriate avian prey; the shoreline by gulls, terns and shorebirds, and the dunes by horned larks (*Eremophila alpestris*), Brewer's blackbirds (*Euphagus cyanocephalus*) and house finches (*Carpodacus mexicanus*). The composition and number of the shoreline prey base fluctuated throughout the 2018 Season, with June being the least populous month for sanderlings (*Calidris alba*) and western sandpipers (*Calidris mauri*), the two most numerous shorebird species along the Central California coast. Several species of locally nesting and nonbreeding (floater) gulls, including California (*Larus californicus*), Heermann's (*Larus heermanni*) and western (Larus *occidentalis*), provided an adequate prey base for the larger more aggressive individuals such as '17/D'. Documented kills; observed predations, clipped-wings or feather piles indicative of peregrine kills, were of the following species (2016-2018):

- Mallard (*Anas platyrhncos*)
- Eared grebe (*Podiceps nigricollis*)
- Clark's/Western grebe (*Aechmophorus spp*.)
- Western snowy plover
- Willet (*Tringa semipalmata*)
- Whimbrel (*Numenius phaeopus*)
- Long-billed curlew (*Numenius americanus*)
- Marbled godwit (*Limosa fedoa*)
- Sanderling
- Western sandpiper
- Heermann's gull
- California gull
- Sabines gull (*Xema sabini*)
- Western gull
- California least tern
- Elegant tern (Thalasseus elegans)
- Common tern (*Sterna hirundo*)
- Rock pigeon (*Columba livia*)
- Eurasian collared-dove (*Streptopelia decaocto*)
- Mourning dove (*Zenaida macroura*)
- Horned lark (*Eremophila alpestris*)
- Blue-gray gnatcatcher (*Polioptila caerulea*)
- Swainson's thrush (*Catharus ustulatus*)

Peregrine falcons were hazed out of sensitive areas on six occasions, all by use of bird whistler. Passive flushing by approach of vehicle was incidental and occurred on numerous occasions.

Peregrine falcons were observed throughout the 2018 Season, however the frequency and age composition changed by season. A total of 28 peregrine falcons were observed during the 'wintering' and 'pre-nesting' periods of February and March. During this period, subadult birds comprised the majority of age-identified observations (n=19 of 27). This trend was reversed during the 'nesting' period (i.e., from April through June), when a total of 31 peregrine falcon observations were made. During this period, *adults* comprised the majority of age-identified observations (n=16 of 23). Finally, during the 'post-breeding dispersal' period (July through early August), a total of 33 peregrine falcon observations were made, and the number of juvenile bird observations increased sharply, comprising 16 of 30 age-identified observations (the remainder were of adult or subadult birds, which are difficult to distinguish at this time of year).

Species Unknown

Unidentified raptors were documented six times in the Project during the 2018 Season by the APS. These observations represent quick glimpses of birds where few field marks could be obtained and are of relatively little significance.

Sharp-shinned Hawk

The Sharp-shinned hawk (*Accipiter striatus*) is an uncommon winter resident in San Luis Obispo County[4], and likely overwinters in small numbers in and around the Project area, particularly to the east where there are thick stands of eucalyptus. They appear during migration, but usually pass through the area quickly.

Two migrants were observed on 29 and 30 March 2018, one perched at Carpenter Creek and one hunting Indian Midden revegetation island (approximately one mile east of marker post 7 and the nesting area shore). The species is not documented to pose a threat to plovers and terns at the Project.

Cooper's Hawk

Over the course of the 2018 Season, Cooper's hawks (*Accipiter cooperi*) were observed on 29 occasions in the Project by the APS. All but one of the sightings in March (n=14) and April (n=6), were of subadult birds still in juvenal plumage. The occurrence of this species significantly dropped after 30 April with one sighting in May, one in June, none in July, and just two in August, while only one was observed in September. Twenty of the identified 28 birds were subadults or juveniles. Five observations were of birds hunting from the large dune just south of the boardwalk overlook in South Oso Flaco, and six observations were of birds hunting the back bowl of PLR. No Cooper's hawks were hazed. While observations of this species are typically 'rare' after 15 April annually in San Luis Obispo County[3], it probably nests on the fringes of the Project area in small numbers. This species has not been identified as a threat to plovers and terns at the Project.

Northern Harrier

Northern harriers (*Circus hudsonius*) are a frequently observed species within the Project area. While the revegetated islands, teaming with various size rodents, lagomorphs and insects, provide good winter foraging, the dunes, for the most part, do not provide adequate nesting habitat. There are however, patches of appropriate habitat that do occur. Arroyo Grande Creek, which forms a small lagoon and associated wetlands, in the past attracted numerous Northern harriers (there was one documented sighting from this location this season). Oso Flaco Creek and its associated lagoon and wetlands has held nesting Northern harriers in years past, but no nesting attempt was documented this season. There is also suitable habitat in the Dune Lakes area, which is adjacent to the east boundary of the park, where nesting has been documented in the past.

There were 12 observations of Northern harrier during the 2018 Season with nine of these sightings being in sensitive areas. At least three unique individuals were observed during the 2018 Season: an adult female, a subadult male and a juvenile of unknown sex.

Red-tailed Hawk

Red-tailed hawks (*Buteo jamaicensis*) are ubiquitous throughout the Project area. One nest was found in the Project area, in Long Valley, 1.05 miles east of PLR. Two other historic nests are located very near and adjacent to the Project. One nest in a eucalyptus grove 0.80 mile east of the mouth of south Oso Flaco Creek, at the western edge of the agricultural fields. A second nest is located 50 yards south of the boundary

[4] Edell, T. The Birds of San Luis Obispo County, California. Fourth Edition. April 2006.

within Guadalupe-Nipomo National Wildlife Refuge, and 0.6 mile east-southeast of the shoreline. These two nests each fledged three young in 2017 but were not inspected in 2018. The Long Valley nest was determined to be active early in 2018, but there was no follow-up and the fate of this nest was unknown.

There were 113 documented observations of red-tailed hawks in February (n=33), March (n=41) and April (n=39) during the 'wintering' and 'pre-nesting' periods and only 5 for the remainder of the season. This is not surprising, as this species' routine has been well-established at the Project. The South Oso Flaco and North Oso Flaco foredunes, the creek areas, and the Dunes Preserve each provide rich hunting grounds for these large buteos, but little in the way of nesting habitat. By May these birds have moved east into appropriate nesting habitat, set-up territories and initiated nesting, after which they tend to remain out of sensitive areas until later in the season. Surprisingly, no juveniles were observed during the 'post breeding dispersal' period of July and August.

Prior to 2017, red-tailed hawks had not been documented predating plovers, terns or their chicks at the Project, although they have been documented doing so at other sites. On 17 August 2017, a juvenile red-tailed hawk was observed predating a plover chick. The young red-tailed hawk was one of two similar looking juveniles documented hunting the dunes of South and North Oso Flaco sensitive areas. There were no such incidents during the 2018 Season.

Three red-tailed hawk hazing events occurred from 7 March through 24 April by way of bird whistler. All were in North Oso Flaco and South Oso Flaco foredunes.

Great Horned Owl and Large Owl Species Unknown

Two great horned owls were identified for trapping and relocation during the 2018 Season and two birds were successfully trapped in PLR on 16 May and 24 May 2018 respectively. The complete details of these birds are described above (see 'Summary of Predator Observations and Trapping Activities') and will not be repeated here. While other great-horned owls were considered for trapping and relocation there was no directive to initiate trapping efforts.

Great horned owls are ubiquitous in the Project and occupy every niche available to them. They have been documented by their sign, including track, scat, pellets and feathers, the entire length and breadth of the Project area. The physical observation of an owl is a highly opportunistic occurrence due to their secretive and nocturnal habits. Therefore, their actual impact on plover and tern nesting colonies is not well known. The historic nests and the associated trees which held them have all collapsed in the last few years, and no new great-horned owl nests were identified this season.

Great horned owls are an important management concern at the Project due to their abundance throughout the Project area, invariably resulting in disturbance to the nesting colonies. While there has been no documented loss due to great horned owls at the Project they are considered a substantial threat. Owl pellets are examined when found, through the course of each season, and while there are slight changes to the make-up of these remains, depending on location, the majority contain, in varying combinations: kangaroo rat (*Dipodomys sp*.), Norway rat (*Rattus norvegicus*), California vole (*Microtus californicus*), mice *(Peromyscus spp)*, Western harvest mouse (*Reithrodontomys megalotis*), woodrat (*Neotoma spp*.), Jerusalem cricket (*Stenopelmatus intermedius*), or other various insect remains and some vegetative matter. Of the many dozens of pellets found and inspected on the Project only one pellet, found near the Oso Flaco gate by Resource personnel in 2016, contained avian remains (they were not identifiable to species).

Barn owls possibly forage with some regularity in the Project area and are known to nest in the eucalyptus groves and hunt the agricultural fields to the east. There has not been any documentation of this species nesting in the Project area. It is apparent that they are present to some extent within the Project area; the

impact to terns and plovers is unknown, but could be diminished in part because of competition with great horned owls. No barn owls were documented this season.

Of the two large owl species possible at the Project, the track of great horned owl and barn owl are separable given good, clear prints. Both tracks exhibit the typical 'K' pattern owing to their zygodactylous toes, although the great horned owl is thicker toed with numerous 'knuckles' along their length, giving the track a 'knobby' appearance. Barn owl toes on the other-hand are slenderer and lack the obvious 'knuckles.'

Burrowing Owl

The burrowing owl occurs rarely along the coast and has been designated a 'Species of Special Concern' (SSC) by the CDFW[5]. During the 2018 Season, a lone bird was present at the Fence Corral from 6-16 March. This species has not been identified as a threat to plovers or terns at the Project.

Loggerhead Shrike

Loggerhead shrikes are a threat to plovers and terns at the Project, and their numbers fluctuate from year to year. Historically shrikes were a regular nester in the Project area, but in recent years there has been no documented or suspected nesting. From 9-16 February 2018, a lone adult was present at the fence corral. No other observations of loggerhead shrike were documented by the APS.

If you have any questions or comments regarding this letter, please feel free to call us at 949-272-0905.

Sincerely,

BLOOM BIOLOGICAL, INC.

Robert Chapman
Biologist

Michael Kuehn
Senior Biologist/Statistical Analyst

[5] CDFW, Natural Diversity Database. August 2018. Special Animals List. Periodic publication. 66 pp.

CDFW SEABIRD MORTALITY EVENT NECROPSY REPORT

California Department of Fish and Wildlife
Office of Spill Prevention and Response
Marine Wildlife Veterinary Care and Research Center
151 McAllister Way
Santa Cruz, CA 95060
(831) 469-1719

MWVCRC#: 18-0430
Species: LETE
Band: G/Y:B/A
Report Status: Gross

EVENT PROFILE

COMMON NAME: California Least Tern

SCIENTIFIC NAME: *Sterna antillarum browni*

DATE: 8/26/2018

COLLECTION AREA: Oceano Dunes State Vehicular Recreation Area

COUNTY: San Luis Obispo County

STATE: California

CARCASS CONDITION: Moderate

OILED/FOULED: No

NECROPSY DATE: 8/28/2018

NECROPSY BY: Corinne Gibble

REPORT DATE: 9/25/2018

REPORT BY: Corinne Gibble

HISTOPATHOLOGY TAKEN (Y/N?): N

REVIEWING PATHOLOGIST: Melissa Miller

EVENT BACKGROUND

This California Least Tern was a banded G/Y:B/A fledgling found in the wash zone of the Oceano Dunes State Vehicular Recreation Area (ODSVRA) exclosure shoreline on 8/26/2018 at 1240pm. The bird was known to have fledged on 8/2/20183 and was from a known nest, LT34 hatching on 8/2/2018. This bird was last seen alive on 8/25/2018 in the same stretch of beach it was found dead. Other juvenile terns were noted to have been in the area at the same time.

NECROPSY SUMMARY

No bone fractures or luxations were observed on postmortem radiographs (Figure 1). This bird was moderately decomposed, and was actively molting. Externally, two puncture wounds were visible in the dorsal thoracic subcutis near the junction between the lower cervical spine and upper thoracic spine (Figure 2A, 2B). Hemorrhage was visible surrounding the wounds. Subcutaneous and intramuscular hemorrhage and congestion were found internally at the wound site. Moderate systemic venous dilation, and congestion and possible hemorrhage at the back of the skull were noted (Figure 3B, Figure 4) potentially due to shock. Although the cause of the acute trauma is unknown, wounds from predation by a large bird is plausible. Predation is one of the leading causes of decline in this species.

The bird was a juvenile male based on plumage characteristics, reproductive anatomy size and type, and presence of a prominent bursa of Fabricius. The proventriculus and ventriculus were full of small scales and fish bones, and the gastrointestinal tract was full of digesta, indicating that the fledgling was actively foraging prior to death. Adequate pericardial, subcutaneous and internal adipose, and absence of pectoralis muscle atrophy indicate the bird was in excellent nutritional condition (Figure 3A). There was no gross evidence of significant disease or postmortem scavenging.

COMPLETED TESTS/PROCEDURES

1.) Gross photographs
2.) Gross necropsy (including morphometric measurements)
3.) Cryoarchived samples

GROSS FINDINGS

Acute trauma, presumptive, characterized by:

- Acute puncture wounds at dorsal thoracic subcutis near insertion of cervical spine (Figure 1A, 1B).
- Marked, vascular congestion and hemorrhage throughout body, but especially concentrated near wound site (Figure 3B)
- Acute congestion at back of skull (Figure 4)

INCIDENTAL FINDINGS

HISTOPATH SUMMARY

Histopathology not taken

HISTOPATH DIAGNOSES

Histopathology not taken

FINAL DIAGNOSES

Presumptive cause of death: Acute trauma

COMMENT

N/A.

SAMPLES SAVED

Cryoarchived samples (-20): pectoral muscle, liver, kidney, spleen, bile, gastric, cecum and cloacal content.

IMAGES

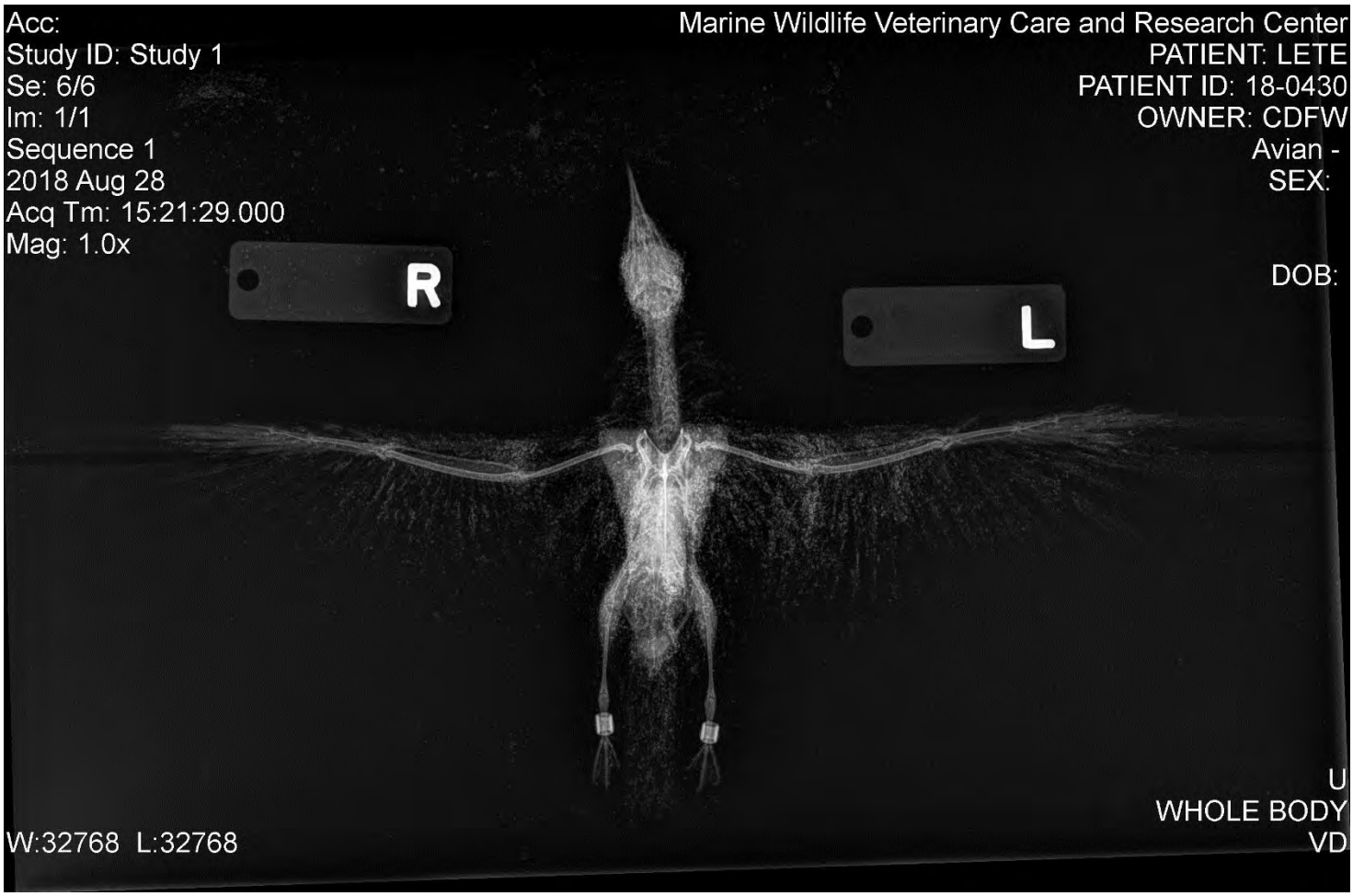

Figure 1. Ventrodorsal radiograph

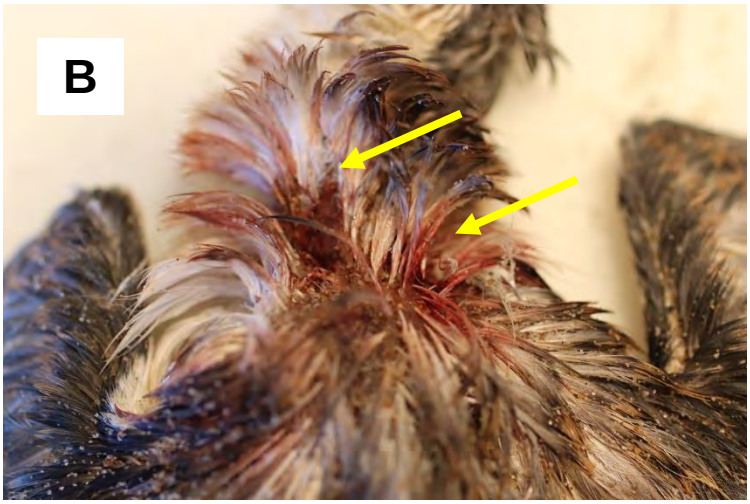

Figure 2A. External view of moderately decomposed fledgling with two dorsal puncture wounds; Figure 2B. Two dorsal puncture wounds

Figure 3A. Adequate subcutaneous adipose and absence of pectoralis muscle atrophy 3B. Internal view showing moderate systemic venous dilation and congestion

Figure 4. Congestion and possible hemorrhage at the back of the skull

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NATIONAL WILDLIFE HEALTH CENTER
6006 Schroeder Road
Madison, Wisconsin 53711-6223
608-270-2400 (FAX 608-270-2415)

DIAGNOSTIC SERVICES CASE REPORT

Case: 28801
Epizoo:

Final Report

7/26/2018

Legal ☐ **Declassified** ☐ **INV#:**

Submitter:
Ronnie Glick
California Department of Parks and Recreation/Pismo Beach
340 James Way
Suite 270
Pismo Beach, CA 93449

Date Submitted: 7/10/2018

Specimen description/Identification/Location:

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER's ID	COUNTY	STATE
001	Plover, Western Snowy	CARCASS	SF64 1 BB:VG		San Luis Obispo	CA

Diagnosis:

1. Pulmonary hemorrhage, severe
2. Intestinal cestodiasis
3. Intestinal trematodiasis

Event History:

One Western snowy plover fledge was found dead at the Oceano Dunes State Vehicular Recreation Area breeding site on 7/2/18. This is a federally threatened species. The plover was from ODSVRA nest SF64-18. This bird was last seen alive on 6/30/18 at 38 days old and appeared normal. It was found lying immediately on the north edge of an active nest bowl (SP174) of another plover while the SP174 adult was incubating. The carcass was in rigor and appeared very fresh when found. No indication that weather or other environmental conditions played a part in the death of this bird.

Two chicks banded BB:VG fledged from the SF64 nest (reached 28 days on 20 June) and both were last seen alive on 30 June at 38 days old in the same area this carcass was found (8 shoreline: west of marker posts W66W-W67W). They have recently had two other sightings of two different young plover fledges on separate days brooding at two other nest sites in the last week. This is not necessarily abnormal behavior but it is uncommon to observe.

Comment:

Accession 001

Necropsy findings/Histology:
A fledgling Western Snowy Plover in poor body condition and fair postmortem state is presented for necropsy. On external examination, eyes are severely sunken and eyelids are covered with sand. Abundant fecal material is present in the feathers around the vent. There are no palpable fractures. On internal examination, there is scant subcutaneous, visceral and epicardial fat. The esophagus and proventriculus are empty. The ventriculus contains sand. Intestines are sent to parasitology for possible acanthocephalan ID. Kidneys are pale with a prominent reticular pattern. The cloaca is very distended. There is moderate autolysis of most visceral organs. There are no additional significant gross findings. Histopathologic evaluation was hindered by postmortem autolysis. Significant histologic findings included severe pulmonary hemorrhage.

Diagnostic test results:
Routine culture of the liver yielded light mixed growth of *Enterococci* sp. and *Escherichia coli* which are considered contaminants. No parasites were observed on a Sheather's exam. Within the intestine, 162 cestodes and 3 *Microphallid* (trematode) were observed. An Avian Influenza Virus matrix RT-PCR Screen using tracheal and cloacal swabs was negative.

Comments:
Cause of death in this Western Snowy Plover is pulmonary hemorrhage, but the cause of the hemorrhage is not determined. On histopathology, suspect protozoal organisms were identified in several organs but could not be confirmed due to tissue decomposition. Cestodes and trematodes were identified in the intestines, but no acanthocephalans were observed.

Legal ☐ **Declassified** ☐ **INV#:**

Susan Knowles

Susan Knowles DVM, PhD, DACVP
Staff Pathologist
Phone: 608-270-2462 **Email:** sknowles@usgs.gov

The USGS-National Wildlife Health Center conducts wildlife disease investigations with state, federal and tribal partners, and we welcome collaborative dissemination of this information (e.g., publication, press release, technical report, etc.). Please contact the pathologist or wildlife disease epidemiologist assigned to this case to ensure that information is accurately interpreted and appropriately credited.

Copies To:

MIGRATORY BIRD COORDINATOR (R8)
USFWS Sacramento (RO8), 2800 Cottage Way W-2606, Sacramento, CA 95825

ENDANGERED SPECIES (RO8)
USFWS Sacramento (RO8), 2800 Cottage Way W-2606, Sacramento, CA 95825

KRYSTA ROGERS
California Dept of Fish & Game/WildlifeInvLab/Rancho Cordova, Wildlife Investigations Lab, 1701 Nimbus Rd. Suite D, Rancho Cordova, CA 95670

LENA CHANG
UWFWS Fish&Wildlife Office (ES/EC/SE)/Ventura, 2493 Portola Rd, Suite B, Ventura, CA 93003

LAIRD HENKEL
California Dept of Fish & Game/Santa Cruz, 1451 Shaffer Road, Santa Cruz, CA 95060

This is a Report for your submission to the National Wildlife Health Center.

For consultation regarding diagnostic findings or laboratory testing and results, please contact the pathologist. Contact information can be found underneath the signature line on this report.

For consultation on the significance of this disease to wildlife populations in your area, assistance with disease control and response, or to report field updates (numbers and species affected, geographical distribution, end date, etc.), please contact an NWHC epidemiologist at NWHC-epi@usgs.gov or 608-270-2480.

CASE#: 18-540 SPECIES: SNOWY PLOVER

Date Admitted	Band	Reference Number	Name
1:53 pm			

Intake

Admitted By	Sue Morgenthaler		
Address Found	928 Pacific Blvd. – Oceano, CA	**Date Found**	
Reasons for Admission	filament injury to foot		
Care by Rescuer			

Initial Exam

Dehydration	Mild	**Weight**	37g	**Sex**	Unknown
Age	Adult	**Attitude**	Alert	**BCS**	Thin
Mucous Membrane Color		**Temperature**	F		

Eyes / Ears / Mouth / Nares	Slight malocclusion tip of bill
Feathers / Skin	Lice-maybe not preening efficiently b/c of malocclusion?
Legs / Feet / Hocks	Fine hair wrapped multiple times around foot and bases of digits, L foot. Third digit almost completely severed-necrotic. D4 dangling, but still viable. D2 has significant wound at base, but is in the best shape of all of the digits.
Comments	Removed constriction w/small suture scissors. Deep lacerations around all digits. Removed D3 b/c barely attached and devitalized. Flushed other sites w/saline. Injected w/bupivacaine. Wound sites very vascular, so hoping will be some healing. Placed several horiz matt sutures using 7-0 vicryl around bases of D2 and D4 to appose skin in effort to preserve digits. Covered site w/tegaderm. House on sheets for next few days until sutures have a chance to heal a bit. Recheck tomorrow.
Treatments	Removed constriction, midazolam, butorphanol, sutured remaining digits, 4ml LRS SQ, enrofloxacin, meloxicam, tramadol, pentoxifylline, ivermectin
Examiner	SR/ES

Treatment Log

Apr 26, 2018	RX: 0.01ml of 10mg/ml Butorphanol im sd from 4/26/2018 until 4/26/2018
Apr 26, 2018	RX: 0.02ml of 1mg/ml DILUTE midazolam im sd from 4/26/2018 until 4/26/2018
Apr 26, 2018	RX: 0.03ml of 22.7mg/ml Enrofloxacin po bid from 4/26/2018 until open
Apr 26, 2018	RX: 0.02ml of 1.6mg/ml Meloxicam po bid from 4/26/2018 until 4/30/2018
Apr 26, 2018	RX: 0.03ml of 25mg/ml Tramadol po bid from 4/26/2018 until 4/28/2018
Apr 26, 2018	RX: 0.04ml of 20mg/ml Pentoxifylline po bid from 4/26/2018 until open
Apr 26, 2018	RX: 0.01ml of 1mg/ml DILUTE ivermectin po sd from 4/26/2018 until 4/26/2018
Apr 26, 2018	**Intake Exam**, **Weight**: 37g, **Temperature**: F, **Age**: Adult, **Sex**: Unknown, **BCS**: Thin, **Dehydration**: Mild, **Attitude**: Alert, **Comments:** Removed constriction w/small suture scissors. Deep lacerations around all digits. Removed D3 b/c barely attached and devitalized. Flushed other sites w/saline. Injected w/bupivacaine. Wound sites very vascular, so hoping will be some healing. Placed several horiz matt sutures using 7-0 vicryl around bases of D2 and D4 to appose skin in effort to preserve digits. Covered site w/tegaderm. House on sheets for next few days

	until sutures have a chance to heal a bit. Recheck tomorrow., **Treatment:** Removed constriction, midazolam, butorphanol, sutured remaining digits, 4ml LRS SQ, enrofloxacin, meloxicam, tramadol, pentoxifylline, ivermectin, **Examiner:** SR/ES
Apr 26, 2018 1:56 pm	Moved to TXR
Apr 27, 2018	FECAL: Float=Negative, Direct=Negative, NSF. Technician: SR
Apr 27, 2018 12:00 pm	Moved to SBR
Apr 27, 2018 6:56 pm	**BW: 36.00g** Very BAR. Difficult to assess use of leg b/c moving around so quickly, but obviously bearing some weight on it. Dressing in place and tissue looks clean underneath, so left alone. Recheck Monday. SR
Apr 29, 2018	FECAL: Float=Negative, Direct=Positive, D+ giardia, 2 trophozoites seen. Technician: VM
Apr 29, 2018	RX: 0.03ml of 50mg/ml Metronidazole po bid from 4/29/2018 until 5/3/2018
Apr 30, 2018 8:12 am	Found dead in enclosure in AM. ES

Disposition

Disposition	Died +24hr	**Criminal Activity?**	**Transfer Type**
Disposition Date		**Carcass Saved?**	**Release Type**
Disposition Location	PWC CA		

CASE#: 18-1432 SPECIES: SNOWY PLOVER

Date Admitted 2:15 pm **Band** White/Yellow R; Pink/Green L **Name**

Reference Number **Microchip Number**

Intake

Admitted By MA
Address Found 928 Pacific Blvd. – Oceano, CA **Date Found**
Reasons for Admission broken leg/wing
Care by Rescuer
Notes About Rescue

Initial Exam

Dehydration	Moderate	**Weight**	6g	**Sex**	Unknown
Age	Hatchling / Chick	**Attitude**	Depressed	**BCS**	Reasonable
Mucous Membrane Color	Pink	**Temperature**	F		

Legs / Feet / Hocks R leg held fully extended, possible knee luxation or slipped tendon. Knuckling R foot, mild abrasion on top of R pedal joint

Comments biologists reported observing injured leg for several days
Treatments placed in 103F incubator, .6 ml LRS with b complex SQ, meloxicam
Examiner VM

Treatment Log

Jul 8, 2018 FECAL: Float=Negative, Direct=Positive, D+2 giardia. Technician: VM

Jul 8, 2018 RX: 0.01ml of 25mg/ml Flagyl bid from 7/8/2018 until 7/13/2018

Jul 8, 2018 **Intake Exam**, **Weight**: 6g, **Temperature**: F, **Age**: Hatchling / Chick, **Sex**: Unknown, **BCS**: Reasonable, **Dehydration**: Moderate, **Mucous Membrane Color**: Pink, **Mucous Membrane Texture**: Tacky, **Attitude**: Depressed, **Comments:** biologists reported observing injured leg for several days, **Treatment:** placed in 103F incubator, .6 ml LRS with b complex SQ, meloxicam, **Examiner:** VM

Jul 8, 2018 RX: 0.02ml of 0.4mg/ml Dilute Meloxicam bid, (Loading Dose: 0.03ml) from 7/8/2018 until 7/12/2018

Jul 8, 2018 3:31 pm Moved to SBR, incubator

Jul 8, 2018 3:41 pm Stressed, open-mouthed breathing, not stable enough to withstand much handling. Housed in soft cup nest to keep R leg in more natural position. Handfeeding 1-2 mini-mealworms soaked in 5% dextrose q 30 minutes (natural food items unavailable until tomorrow per ODSVRA staff, and bird very unlikely to self feed in current condition). Plan to apply tape splint to R leg when bird more stable. VM

Jul 9, 2018 RX: 0.01ml of 100mg/ml Calcium Carbonate sid from 7/9/2018 until open

Jul 9, 2018 9:31 pm **BW: 6.00g** Much more alert, standing, and walking though still knuckling R foot. Continued handfeeding regimen throughout day. Applied splint/shoe to R foot at 9 PM, seems to be holding foot normally with splint in place. Continue housing in incubator and hope to test for self feeding

tomorrow. VM

Jul 10, 2018 7:38 pm **BW: 6.00g** BAR, holding foot normally with shoe on though still not bending R knee. Introduced talitrids into incubator in AM, at 130 wt up to 6.9 g, at 7 to 7.3 g; eating well. VM

Jul 12, 2018 7:48 pm BAR. Very active in enclosure. Shoe on R foot in place. Foot in normal position, but doesn't appear to be able to bring leg forward from stifle. Looks like sciatic nerve injury. If no improvement with a week of treatment, would be quite skeptical of bird's ability to function well enough for release. Plan to remove shoe tomorrow and see how things go. SR

Jul 13, 2018 7:25 pm BAR. Active. Vocal. Still not flexing R leg at hock. Removed shoe R foot. Continued to place foot normally after shoe removed. Bears weight normally on R leg at rest, even seemed to be shifting weight from L onto R, but when tries to move quickly, tends to hop on L leg only. Difficult to say if improvement overall since just saw bird yesterday. Left foot unwrapped. Recheck Monday. SR/Nalana

Jul 16, 2018 6:21 pm Very BAR. Walking normally! Placing R foot normally. Flexing and extending hock normally, although does feel a bit weaker on palpation. Made remarkable improvement over the weekend. Continue to monitor for another couple of days, but after that, might be able to return to nest site. SR

Jul 18, 2018 RX: 0.01ml of 12mg/ml Ronidazole sid from 7/18/2018 until 7/22/2018

Jul 18, 2018 FECAL: Direct=Positive, D+giardia, 1 seen. Technician: VM

Jul 18, 2018 6:14 pm BAR. Running around, looking like a pretty normal plover. Was concern that vocalizations were sounding abnormal, but sounding OK to me. Ausculation WNL. ODSVRA may want to transfer to SB zoo until fledging rather than attempt reunite. We will keep through weekend while they decide what they will do. SR/Marianna

Jul 19, 2018 12:00 pm Moved to SBR, basket

Jul 22, 2018 FECAL: Direct=Negative. Technician: VM

Jul 23, 2018 6:47 pm BAR. Has grown noticeably since last seen. Walking normally, but noticed mild swelling of R pedal joint. Joint doesn't feel hot and bird is using normally. Small abrasion on dorsal surface, likely from when bird was knuckling. Recheck Wed to see if has changed. SR

Jul 25, 2018 RX: 0.02ml of 22.7mg/ml Enrofloxacin po bid from 7/25/2018 until 8/1/2018

Jul 25, 2018 RX: 0.01ml of 1.6mg/ml Meloxicam po bid from 7/25/2018 until 7/29/2018

Jul 25, 2018 6:09 pm **BW: 22.00g** BAR, but limping noticeably on R foot. Looks little more swollen, red. Feels warm. Third digit folds under foot intermittently. Doesn't appear that bands are tight. Rx enrofloxacin and meloxicam. Recheck Friday. SR

Jul 27, 2018 1:33 pm BAR and vocal, but still favoring R leg significantly. Swelling of foot resolved, but now swelling has moved up to the hock area. Removed bands on that leg just in case they are a complicating factor. Continue meds. Recheck Monday. SR

Jul 31, 2018 7:02 pm BAR, but still heavily favoring R leg. Hock more swollen, esp along posterior surface. Has trouble extending completely. Might need to make small incision and see if can flush out any material. Plan for tomorrow. SR

Aug 1, 2018 RX: 0.03ml of 2mg/ml Butorphanol im sd from 8/1/2018 until 8/1/2018

Aug 1, 2018 RX: 0.01ml of 1mg/ml Midazolam im sd from 8/1/2018 until 8/1/2018

Aug 1, 2018 8:48 pm BAR, but placing minimal weight on R leg. Sedated w/midazolam and butorphanol. Injected R hock w/bupivacaine. Cleaned site w/saline. Made small incision along lateral surface of joint w/25g needle. Expressed small amt debris. Joint feels a little lax-concerned about damage that may have been done to stabilizing ligaments. Covered incision w/telfa and tegaderm. Placed supporting wrap of cast padding and vetwrap around R hock. Change ABs to cefpodoxime. Recheck Friday. SR/Marianna

Aug 2, 2018 RX: 0.04ml of 25mg/ml Cefpodoxime po bid from 8/2/2018 until open

Aug 3, 2018 7:42 pm BAR and vocal. Running around, but not using R leg much. Removed wrap from R hock. Swelling decreased, but still signficant. ROM still slightly reduced, more so in extension. Seems to place a little more weight on than was on Wed. Covered incision site w/tegaderm, but left otherwise unwrapped. Recheck Monday. SR/ES

Aug 4, 2018 6:16 pm **BW: 26.00g** JM

Aug 8, 2018 RX: 0.02ml of 1.6mg/ml Meloxicam po bid from 8/8/2018 until 8/12/2018

Aug 8, 2018 12:00 pm Moved to F5 Annex

Aug 8, 2018 3:29 pm **BW: 30.00g** BAR. Good body condition. Still heavily favoring R leg, but is placing significantly more weight on that foot. Swelling of hock decreased, but not completely resolved. ROM of joint WNL. Doesn't feel lax. Continue ABs. Start another round of meloxicam. Recheck Friday. SR/Brian

Aug 13, 2018 2:15 pm BAR. Good body condition. Use of R leg improving in small increments every time seen. R hock still mildly swollen. ROM WNL. Continue ABs. Recheck Thurs. SR

Aug 15, 2018 12:12 pm BAR. Good body condition. Limp almost undetectable when bird running, but still shifts weight off of R foot when standing still. FF almost completely emerged. Swelling noticeably improved as well. Since going to be gone this weekend, going to continue meds to make sure nothing goes awry while I'm gone. Recheck Tues. SR

Aug 17, 2018 12:00 pm Moved to AV1

Aug 22, 2018 6:41 pm Very BAR and vocal. Runs around quickly, so much so, that you can barely tell that bird doesn't place R foot completely flat. Seems like still may not be able to fully extend R hock. Regardless, very mobile. Swelling of R hock resolved. Isn't developing any wear lesions on either foot. D/C meds. Think OK to transfer for continued evaluation as to whether or not the bird will be releasable. SR

Aug 24, 2018 8:10 pm BAR. Good body condition. Practically an adult by this time. Moves quickly, but does only toe touch w/R foot, not extending R hock fully. Hock continues to look a little thickened, but not inflamed. Plan to reassess Monday and if no change in condition, will transfer to SB Zoo. SR

Aug 25, 2018 1:53 pm Stringy seaweed was tightly wrapped around L leg. Removed. KD

Aug 27, 2018 2:14 pm Very BAR. Good body condition. Moves quickly. Still only toe-touching w/R foot. No change in appearance of R leg. Think it is what it is. OK to transfer to SB Zoo and evaluate potential for release. SR

Disposition

Disposition	Transferred	**Criminal Activity?**	**Transfer Type**
Disposition Date		**Carcass Saved?**	**Release Type**
Disposition Location	ODSVRA CA		

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CASE#: 18-1631 SPECIES: SNOWY PLOVER

Date Admitted 11:16 am **Band** **Reference Number** **Name**

Intake

Admitted By	Nicole Graham		
Address Found	on beach – Oceano, CA	**Date Found**	
Reasons for Admission	pecked/thrown around by adult in area		
Care by Rescuer			
Notes About Rescue			

Initial Exam

Dehydration	Moderate	**Weight**	5.5g	**Sex**	Unknown
Age	Hatchling / Chick	**Attitude**	Depressed	**BCS**	Reasonable
Mucous Membrane Color		**Temperature**	F		

Eyes / Ears / Mouth / Nares	Large amt (for size of bird) sand in conjunctival sac OU. Flushed w/saline
Feathers / Skin	Matted feathers on neck. Tiny puncture wounds visible on either side
Comments	Placed in incubator on arrival. After ~30 minutes, performed exam, gave fluids. Couple hours later, was walking around a bit, although still quite weak. HF small mealworms and talitrids.
Treatments	Heat, oral 50% dextrose, 0.5ml LRS SQ
Examiner	SR/Keely

Treatment Log

Jul 27, 2018	**Intake Exam**, **Weight**: 5.5g, **Temperature**: F, **Age**: Hatchling / Chick, **Sex**: Unknown, **BCS**: Reasonable, **Dehydration**: Moderate, **Attitude**: Depressed, **Comments:** Placed in incubator on arrival. After ~30 minutes, performed exam, gave fluids. Couple hours later, was walking around a bit, although still quite weak. HF small mealworms and talitrids., **Treatment:** Heat, oral 50% dextrose, 0.5ml LRS SQ, **Examiner:** SR/Keely
Jul 27, 2018 6:11 pm	Moved to TXR-incubator
Jul 27, 2018 6:19 pm	Moving around a bit in pm, but intermittently open-mouthed breathing. Doesn't appear too warm in incubator. Check again before leaving. SR
Jul 28, 2018 9:24 am	Dehydrated in AM. All food and water dish dried out. Lost weight overnight, FF soaked MW. Gave 0.5 ml LRS SQ. ES
Jul 28, 2018 9:15 pm	Turned incubator down a little. Bird was open mouth breathing, eyes partially closed, gave 0.4ml LRS SQ. Perked up shortly after. KD
Jul 29, 2018	FECAL: Float=Negative, Direct=Negative, direct inconclusive. Technician: VM
Jul 29, 2018 7:26 pm	**BW: 5.50g** BAR. Observed eating small mealworms from floor of enclosure. Discontinued handfeeding @ 10 AM, @ 1 PM wt= 5.7. Eating well throughout day. VM
Jul 30, 2018	FECAL: Float=Negative, Direct=Negative. Technician: VM
Jul 31, 2018 7:13 pm	**BW: 6.80g** BAR. Running around in incubator. NSF on physical exam. Would be OK to return anytime, if that is the plan. SR

Disposition

Disposition	Transferred	**Criminal Activity?**		**Transfer Type**	Other
Disposition Date		**Carcass Saved?**		**Release Type**	
Disposition Location	Santa Barbara Zoo CA				

Appendix G. Pesticide Information

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Pesticides in the HCP Area

The U. S. Fish and Wildlife Service (USFWS) analyzed the effects of pesticides on several taxa in the *Recommended Protection Measures for Pesticide Applications of Region 2* (White 2007). In this report, protective measures are based on a screening-level hazard assessment for pesticide ecotoxicity. Pesticides are rated by a classification system that categorizes the level or type of protection to be given for a pesticide with respect to ecotoxicity. The classification system is as follows:

- Class 0 includes pesticides that are practically nontoxic to a specific group of animal species that have similar toxicological responses (e.g., fungicidal toxicity for large mammal species). Class 0 pesticides ordinarily do not require protection measures for animal species.
- Class 1 includes pesticides that are slightly to moderately toxic to a specific group of animal species that have similar toxicological responses. Buffer zones and other protection measures for Class 1 pesticides would be necessary, but limited, for animal species (e.g., malathion toxicity for small mammal species).
- Class 2 includes pesticides that are highly toxic to a specific group of animal species that have similar toxicological responses. Buffer zones and other protection measures for Class 2 pesticides would be relatively substantial for animal species.

The application and function, targeted invasive species groups, and potential environmental effects of the pesticides used in the Habitat Conservation Plan (HCP) area are discussed in more detail below.

Glyphosate

Glyphosate (RoundUp) is a non-specific post-emergent systemic herbicide that kills both broadleaf and grass species; it is highly toxic to plants but has low toxicity to birds, fish, and mammals (White 2007). The Oceano Dunes District uses glyphosate alone or mixed with other herbicides to treat European beach grass (*Ammophilia arenaria*), Russian wheat grass (*Elytrigia juncea* ssp. *boreali-atlantica*), veldt grass (*Ehrharta calycina*), ice plant (*Carpobrotus edulis*), and Cape ivy (*Delairea odorata*).

Laboratory studies show glyphosate transforms primarily by microbial degradation. Under aerobic conditions, the half-life of glyphosate in soil ranges from 1.8 to 5.4 days. Glyphosate metabolism is limited under anaerobic conditions, with a half-life of 7 to 199 days in anaerobic water-sediment systems. Dissipation of half-lives in the field was noted at 2.4 to 160 days. Dissipation appeared to correlate with climate, glyphosate being more persistent in colder climate conditions (U.S. EPA 2008).

According to the USFWS report (White 2007), when using glyphosate in aquatic systems, glyphosate is classified as Class 0; in terrestrial systems, glyphosate is classified as Class 1.

Imazapyr

Imazapyr is a systemic, non-selective herbicide used for control of most annual and perennial broadleaf weeds and grasses, woody species, and riparian and floating and emergent aquatic weed species in terrestrial and aquatic environmental settings (U.S. EPA 2007). Aqueous imazapyr formulations may be mixed with surfactants or oils for application as well as mixed with other herbicides and fertilizers. The Oceano Dunes District mixes a one percent solution of Imazapyr with a one percent solution of glyphosate and a surfactant to treat solid stands of Russian wheat grass and European beach grass.

The active ingredient imazapyr is marketed by the trade name Habitat®. Habitat® is an aqueous solution containing 28.7 percent imazapyr in its isopropylamine salt form and contains 71.3 percent inert ingredients. Upon contact, imazapyr can interfere with DNA synthesis and cell growth of plants. Specifically, imazapyr inhibits an enzyme (acetolactate synthase [ALS]) required for the biosynthesis of the three branched-chain aliphatic amino acids valine, leucine, and isoleucine. Because animals do not synthesize branched-chained aliphatic amino acids but rather obtain them from eating plants, the engineered mechanism for plant toxicity (i.e., the interruption of protein synthesis due to a deficiency of the amino acids valine, leucine, and isoleucine) is not generally relevant for birds, mammals, fish, or invertebrates. The U.S. EPA rating of toxicity to aquatic organisms is Category V (practically non-toxic), the lowest level on the scale. Imazapyr is relatively slow-acting, taking several weeks for the plants to show lethal effects. However, plants cease growth within 24 hours of a successful application (Shaner and O'Connor 1991). It normally takes 2 to 4 weeks after treatment to see visible effects such as yellowing of the leaves, and complete plant death can take several months.

Imazapyr acts more quickly and is less toxic than other low-volume herbicides. According to the San Francisco Estuary Invasive Spartina Project's 2005 report, *Use of Imazapyr Herbicide to Control Invasive Cordgrass (Spartina spp.) in the San Francisco Estuary* (Pless 2005), imazapyr is a safe, highly effective treatment for cordgrass eradication that does not result in the degradation of water quality. The report states that a number of field studies demonstrated that imazapyr rapidly dissipated from water within several days, and no detectable residues of imazapyr were found in either water or sediment within two months; in estuarine systems, dilution of imazapyr with the incoming tides contributes to its rapid dissipation, suggesting that imazapyr is not environmentally persistent in the estuarine environment. The report concludes that application of imazapyr herbicides is a highly effective treatment for control and eradication of non-native cordgrass species in the San Francisco Estuary and offers an improved risk scenario over the existing treatment regime with glyphosate herbicides.

According to the USFWS report (White 2007), imazapyr is classified as Class 0.

Fluazifop-p-butyl (Fusilade)

Fluazifop-P-butyl is a post-emergent herbicide used to control both annual and perennial grasses (i.e., monocots in the *Poaceae* plant family); however, it is much less toxic to dicots and non-*Poaceae* monocots (Syracuse Environmental Research Associates [SERA] 2014). California Department of Parks and Recreation (CDPR) does not use Fluazifop-P-butyl near aquatic systems in the HCP area; it is only used for spot treatment when Russian wheatgrass, veldt grass, and European beach grass are intermixed with native plants.

In the USFWS report (White 2007), Fluazifop-P-butyl is classified as Class 0 for avian species; Class 2 for aquatic and terrestrial amphibians and warm water fish; and, Class 1 for cold water fish.

Triclopyr (Garlon)

Triclopyr is a systemic non-selective herbicide used to control broadleaf (dicot) weeds and woody plants (U.S. EPA 2009). It is a member of the pyridinyloxyacetic acid chemical family, and the picolinic acid group, whose mode of action is growth regulation (mimics the effects of plant hormones), resulting in abnormal growth of plants (U.S. EPA 2009). Triclopyr breaks down into several other compounds before ultimately breaking down to carbon dioxide (CO_2). In water, triclopyr is mainly broken down by exposure

to sunlight (U.S. EPA 2009, National Pesticide Information Center [NPIC] 2002). The half-life of triclopyr in water ranges from 1 to 10 days depending on water conditions and has a half-life in soil ranging from 1.1 to 90 days (NPIC 2002). CDPR sprays a 0.5 percent triclopyr concentration mixed with a 0.5 percent glyphosate concentration and a silicon surfactant on Cape ivy infestations.

In the USFWS report (White 2007), Triclopyr has two formulations: amine salt formulations and ester formulations. CDPR uses the amine salt formulation, Garlon 3A. Garlon 3A is classified as Class 1 for avian species and terrestrial amphibians; and, Class 0 for aquatic amphibians and warm- and cold-water fish.

Aminocyclopyrachlor

Aminocyclopyrachlor is a pyrimidine carboxylic acid herbicide developed by DuPont™ that acts by mimicking the activity of plant auxins (a plant hormone produced in the stem tip that promotes cell elongation) and thereby interfering with the normal growth of plants. This is a relatively new herbicide as it was only registered in 2010. Aminocyclopyrachlor is used, along with chlorsulfuron, in a product called Perspective. This HCP examines each chemical separately. CDPR only uses Perspective at a 0.5 percent concentration for glyphosate-resistant ice plant. CDPR's current application rates and use patterns for chlorsulfuron pose a negligible risk to wildlife.

The U.S. EPA (2010) classifies aminocyclopyrachlor as Practically Non-toxic or only Slightly Toxic to mammals, birds, fish, and aquatic invertebrates (SERA 2012). As with most ecological risk assessments of herbicides, the largely benign assessment of the hazards or lack of hazards to groups of nontarget species is tempered by the fact that toxicity data are available on only a few species, relative to the numerous species that may be exposed to aminocyclopyrachlor. In addition, the specific lack of data regarding toxicity to terrestrial-phase or aquatic-phase amphibians and the general lack of toxicity data in the open literature further constrain the hazard identification for aminocyclopyrachlor. Most of the data on the potential toxicity of aminocyclopyrachlor to animals is from a limited number of registrant-submitted studies required by the EPA for pesticide registration (SERA 2012).

Chlorsulfuron

Chlorsulfuron is an herbicide that controls select broadleaf weeds and undesirable grasses. Chlorsulfuron stops cell division in plant roots and shoots, which in turn causes plants to stop growing. Chlorsulfuron is used, along with aminocyclopyrachlor, in a product called Perspective. This HCP examines each chemical component separately. CDPR uses Perspective at a 0.5 percent concentration for glyphosate-resistant ice plant.

The half-life for chlorsulfuron ranges from 1 to 3 months in soils with a typical half-life of 40 days. Soil microbes break down chlorsulfuron. Breakdown is faster in moist soils and at higher temperatures. Chlorsulfuron is practically nontoxic to birds. The acute LD50 (i.e., lethal dose or amount of the substance required (usually per body weight) to kill 50 percent of the test population) for mallard ducks and bobwhite quail is greater than 5000 milligrams/kilogram. Chlorsulfuron is practically nontoxic to fish and does not tend to bioaccumulate in fish. Chlorsulfuron is practically nontoxic to aquatic (water) insects and does not tend to bioaccumulate

In the USFWS report (White 2007), Chlorsulfuron is classified as Class 1 for avian species and terrestrial amphibians and Class 0 for aquatic amphibians and warm and cold water fish.

Aminopyralid (Milestone)

Aminopyralid is a systemic non-selective herbicide used to control broadleaf (dicot) weeds and woody plants (Dow Chemical Company [DOW] 2008). Its mode of action is growth regulation (mimics the effects of plant hormones), resulting in abnormal growth of plants (DOW 2008). The U.S. EPA has judged that aminopyralid appears to be a reduced risk herbicide and was accepted for review and registration under the Reduced Risk Pesticide Initiative (U.S. EPA 2005). CDPR sprays a 0.5 percent solution mixed with a non-ionic surfactant on Cape ivy infestations.

In aquatic systems, the primary route of degradation is photolysis (the decomposition or separation of molecules by the action of light), where a laboratory experiment yielded a half-life of 0.6 days (U.S. EPA 2005). In addition to CO_2, oxamic and malonamic acid were identified as major degradates (U.S. EPA 2005). Aminopyralid was stable to direct hydrolysis (chemical breakdown of a compound due to reaction with water) and in anaerobic sediment-water systems. In aerobic sediment-water systems, degradation proceeded slowly, with observed total system half-lives of 462 to 990 days. The degradation resulted in the formation of non-extractable residues and no other major products. Under aerobic conditions, degradation of aminopyralid in five different soils resulted in the production of CO_2 and non-extractable residues. Half-lives ranged from 31.5 to 533.2 days in 5 soils. For risk assessment purposes, EPA used a half-life of 103.5 days. Aminopyralid photolyzed moderately slowly on a soil surface. The half-life was 72 days and CO2, non-extractable residues and small amounts of acidic volatiles were the degradates.

White's 2007 USFWS report does not evaluate aminopyralid for ecotoxicity.

VectoBac G

VectoBac G is a granular formulation of spores and endotoxins of *Bacillus thuringiensis* subsp. *israelensis* (Bti; strain AM65-52) for control of mosquito larvae. The potency is 200 International Toxin Units (ITU) per milligram against *Aedes aegypti* larvae. The size, shape, and density of VectoBac granules lessen the potential for off-target application due to aerial drift and enable good penetration of dense vegetation. VectoBac G was the first Bti granule established for public health use in the early 1980s and contains both floating and sinking granules to ensure distribution of the active ingredient throughout the larval feeding zone.

Bti is very target specific with activity largely restricted to mosquitoes and related flies (in the sub-order Nematocera of the order Diptera; Valent BioScience, Accessed September 2017). In addition to Bti's non-toxicity to beneficial insects, numerous toxicology studies have shown Bti to be non-pathogenic and non-toxic to other forms of wildlife (birds, fish, mammals, etc.) and humans. The World Health Organization has approved the use of Bti for drinking water.

Persistence is low in the environment, and efficacy depends on careful timing of application to coincide with periods in the life cycle when larvae are actively feeding. Pupae and late 4th stage larvae do not feed and, therefore, will not be controlled by Bti. Low water temperature inhibits larval feeding behavior, reducing the effectiveness of Bti during very cold periods. High organic conditions also reduce the effectiveness of Bti. Therefore, use of Bti requires frequent inspections of larval sources during periods of larval production, and may require frequent applications of material. CDPR applies VectoBac G with aerial spraying (e.g., helicopter).

CDPR uses a contract agricultural application service to provide helicopter treatments. Helicopter operation are done at very low altitude in areas away from people. An advantage of using a helicopter is the high rate of application to large areas without contact with the ground surface (no disturbance of vegetation) at a reasonable per acre cost. A helicopter can treat up to 200 acres per hour. Helicopter treatments occur during daylight hours, typically before noontime when little or no wind occurs, and at an altitude that is less than 40 feet above the surface of the site being treated.

Two potential routes exist for secondary exposure to Bti. First, insect predators may ingest larvae affected by Bti, or second, dead organic matter may be ingested. However, as the mode of action of Bti is so specific, most predators of mosquitos will not be affected (Swedish Chemicals Agency 2015). It is considered that the risk of secondary poisoning and toxic effects on organisms at higher trophic levels is unlikely (Swedish Chemicals Agency 2015).

White's (2007) USFWS report does not evaluate Bti for ecotoxicity.

Clethodim (Vaquero®)

Clethodim is a selective post-emergent herbicide used to control annual and perennial grasses (i.e., monocots of the family Poaceae); however, it is less toxic to dicots and non-Poaceae monocots (SERA 2014). Clethodim is also used to control a variety of broad leaf crops. Clethodim is rapidly degraded on the leaf surfaces by an acid-catalyzed reaction and photolysis; remaining clethodim penetrates the cuticle and enters the plant (Cornell et al 1995).

CDPR applies Vaquero® (Wilbur-Ellis Co.), an aqueous solution, with aerial spraying (e.g., helicopter). Aerial application allows a large area to be sprayed in a short amount of time (e.g., 90 acres in about 2.5 hours for veldt grass control), allowing for efficient coverage. CDRP uses Vaquero® in combination with Renegade-EA Activator-Surfactant® (Wilbur-Ellis Co.) and Crosshair Drift Management Agent® (Wilbur-Ellis Co.) to control vedlt grass in and near the Phillips 66 property and Coreopsis Hill.

In the USFWS report (White 2007), clethodim is classified as Class 1 for avian species, terrestrial and aquatic amphibians, and warm and cold water fish.

Sethoxydim (Poast®)

Sethoxydim is a selective post-emergent herbicide used to control annual or perennial grasses. Sethoxydim is absorbed rapidly by foliage and moves both upward and downward in plants from the point of absorption. The reported oral LD50s are 3000-6000 mg/kg and 2500-5000 mg/kg in male and female rats, respectively (SERA 2001). CDPR sprays Poast® (BASF), a commercial formulation of sethoxydim and an aqueous solution containing 18 percent sethoxydim and 82 percent inert ingredients (USEPA 2004). CDPR may use Poast® and Vaquero® interchangeably.

In the USFWS report (White 2007), sethoxydim is classified as Class 1 for terrestrial and aquatic amphibians, and warm and cold water fish, and Class 0 for avian species.

Surfactants

For most foliar applications of herbicide formulations, surfactants must be added to spray solutions to improve the performance and minimize the variability of herbicide efficacy. Surfactants are prepared from petrochemicals, natural vegetable oils, and/or natural animal fats. Surfactants are designed to

improve the spreading, dispersing/emulsifying, sticking, absorbing, and/or pest-penetrating properties of the spray mixture (Tu et al. 2001). The pure herbicide formulation mixed with water will stand as a droplet on the leaf surface, and the small area of contact therefore provides little potential for uptake of the active ingredient into the foliage. Water droplets containing a surfactant will spread in a thin layer over a leaf surface and improve herbicide uptake by maximizing herbicide distribution and forcing the fluid into the plant. The aquatic imazapyr formulation of Habitat®, as well as the glyphosate herbicide Roundup Custom®, require the addition of a surfactant for post-emergent applications.

CDPR uses Competitor®, a surfactant labeled for aquatic use, with either imazapyr or glyphosate. Competitor® (Wilbur-Ellis Co.) is a methylated seed oil containing a non-ionic emulsifier system and was recommended for use with imazapyr by the original manufacturer of the herbicide (BASF).

CDPR uses Renegade-EA® with the application of Vaquero® (clethodim) and Crosshair®. Renegade-EA®, a surfactant labeled for aquatic use, is a proprietary blend of methylated seed oil, non-ionic surfactant, and urea-ammonium nitrate (UAN) solution.

Drift and Deposition Agents

Crosshair® is a drift and deposition control agent that is formulated for use with most fungicides, herbicides, and insecticides. It is approved for aquatic use. Crosshair reduces the number of spray droplet fines (less than 105 microns) and increases the volume median diameter of the spray droplets. Crosshair also generates a more uniform droplet size, which results in enhanced deposition and coverage of the spray on the targeted surface (Willbur-Ellis 2015).

References

Cornell University, Michigan State University, Oregon State University, University of California at Davis. EXTOXNET. Extension Toxicology Network. Pesticide Information Profile: Clethodim. July 1995.

The Dow Chemical Company [DOW]. 2008. Product Safety Assessment: Aminopyralid.

National Pesticide Information Center (NPIC). 2002. Triclopyr (General Fact Sheet).

Pless, P. 2005. Use of Imazapyr Herbicide to Control Invasive Cordgrass (*Spartina* spp.) in the San Francisco Estuary, Water Quality, Biological Resources, and Human Health and Safety. Prepared for San Francisco Estuary Invasive Spartina Project. Berkeley, CA.

Shaner, D.L. and S.L. O'Connor. 1991. The Imidazolinone Herbicides. CRC Press Taylor & Francis Group, Boca Raton, FL.

Swedish Chemicals Agency. 2015. Product Assessment Report Related to product authorization under Regulation (EU) No 528/2012: VectoBac G and VectoBac GR. April 29.

Syracuse Environmental Research Associates (SERA). 2001. Sethoxydim [Poast] - Human Health and Ecological Risk Assessment Final Report. Prepared for USDA Forest Service. Forest Health Protection. Riverdale, MD. October 31.

_____ . 2012. Aminocyclopyrachlor Human Health and Ecological Risk Assessment Final Report. Submitted to USDA Forest Service. Forest Health Technology Enterprise Team. Morgantown, WV. September 27.

_____ . 2014. Scoping/Screening Level Risk Assessment on Clethodim: Final Report. Submitted to USDA Forest Service. Forest Health Technology Enterprise Team. Morgantown, WV. October 30.

_____ . 2014. Scoping/Screening Level Risk Assessment on Fluazifop-P-butyl Final Report. Submitted to USDA Forest Service. Forest Health Technology Enterprise Team. Morgantown, WV. July 21.

Tu, M., C. Hurd, J.M. Randall, and The Nature Conservancy, "Weed Control Methods Handbook: Tools & Techniques for Use in Natural Areas" (2001). All U.S. Government Documents (Utah Regional Depository). Paper 533.

U.S. Environmental Protection Agency [U.S. EPA]. 1998. Reregistration Eligibility Decision Document: Triclopyr; EPA-738-R-98-011; U.S. Environmental Protection Agency, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, Oct 1998; 3-58.

_____ . 2004. BASF Poast® herbicide. 7969-58. December 8.

_____ . 2005. Pesticide Fact Sheet: Aminopyralid.

_____ . 2007. Risks of Imazapyr Use to the Federally Listed California Red-legged Frog (*Rana aurora draytonii*), Pesticide Effects Determination. Environmental Fate and Effects Division, Office of Pesticide Programs. Washington D.C.

_____ . 2008. Risks of Glyphosate Use to Federally Threatened California Red-legged Frog (*Rana aurora draytonii*), Pesticide Effects Determination. Environmental Fate and Effects Division, Office of Pesticide Programs. Washington D.C.

_____ . 2009. Risks of Triclopyr Use to Federally Threatened California Red-legged Frog (*Rana aurora draytonii*), Pesticide Effects Determination. Environmental Fate and Effects Division, Office of Pesticide Programs. Washington D.C.

U.S. Environmental Protection Agency/Office of Pesticide Programs [U.S. EPA/OPP]. 2010. Ecological Risk Assessment for the Section 3 New Chemical Registration of Aminocyclopyrachlor on Non-crop Areas and Turf. Document dated January 22, 2010. E-Docket File Name: EPA-HQ-OPP-2009-0789-0004.pdf. [E-Docket01]

White, J. A. 2007. Recommended Protection Measures for Pesticide Applications in Region 2. U.S. Fish and Wildlife Service. Region 2. Environmental Contaminants Program. Austin TX.

Wilbur-Ellis Company. 2019. Pest Control Recommendation No. 190129A. Permit/ID#: 40-19-4010510

Appendix H. Vegetation Report

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Pismo State Beach and Oceano Dunes State Vehicular Recreation Area
Vegetation Mapping Report

MIG|TRA Environmental Sciences, Inc.
February 2015

Pismo State Beach and Oceano Dunes State Vehicular Recreation Area (SVRA) Vegetation Mapping Report

Prepared for:

California Department of Parks and Recreation
Off-highway Motor Vehicle Recreation Division
Oceano Dunes District

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February 2015

PISMO STATE BEACH AND OCEANO DUNES SVRA VEGETATION MAPPING REPORT

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ACRONYMS AND ABBREVIATIONS

Cal-IPC	California Invasive Plant Council
CESA	California Endangered Species Act
CDPR	California Department of Parks and Recreation
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
District	Oceano Dunes District
Dunes Preserve	Pismo Dunes Natural Preserve
EIR	Environmental Impact Report
FAC	Facultative
FACW	Facultative wetland
FESA	Federal Endangered Species Act
HCP	Habitat Conservation Plan
MCV2	*A Manual of California Vegetation, Second Edition* (Sawyer et al. 2009)
NOAA	National Oceanic and Atmospheric Administration
OBL	Obligate wetland
OHMVR	Off-highway Motor Vehicle Recreation
OHV	Off-highway vehicle
Post	Marker Post
SB	State Beach
SP	State Parks
SVRA	State Vehicle Recreation Area
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1.0 INTRODUCTION

1.1 REPORT PURPOSE AND OUTLINE

The purpose of this report is to characterize the vegetation in the study area, which includes Pismo State Beach (SB) and Oceano Dunes State Vehicle Recreation Area (SVRA) in coastal San Luis Obispo County, California. This report is intended for several applications, including the following:

1) To inform the habitat monitoring program conducted by California Department of Parks and Recreation (CDPR), Off-highway Motor Vehicle Recreation (OHMVR) Division, and Oceano Dunes District (District);
2) To provide background information for the proposed Oceano Dunes SVRA Habitat Conservation Plan (HCP) and the Environmental Impact Statement/Environmental Impact Report (EIR) for the HCP;
3) To provide information for the biological resources chapter of the EIR for the Oceano Dunes SVRA Dust Control Project; and
4) To inform implementation of the Particulate Matter Reduction Plan.

This report describes the study area setting (Chapter 1); the methods used to map the vegetation (Chapter 2); and the results, including the vegetation alliances (Chapter 3), the vegetation zones (Chapter 4), and the special-status plant species known to occur in the study area (Chapter 5).

1.2 LOCATION

The 5,020-acre study area includes Pismo SB and Oceano Dunes SVRA in San Luis Obispo County (Figure 1-1). It is bounded by Pismo Pier to the north, the Guadalupe-Nipomo Dunes National Wildlife Refuge to the south, urban and agricultural land to the east, and the Pacific Ocean to the west. Cities to the east of the study area include Pismo Beach, Grover Beach, Nipomo Mesa, and Oceano. Primary access to the area is via United States (U.S.) Highway 101 and California Highway 1.

1.3 OWNERSHIP, MANAGEMENT AND LAND USES

The majority of the study area lands are owned by CDPR. However, 34 acres are owned by Union Oil and 657 acres are owned by Phillips 66 Refinery (Phillips 66), formerly refererd to as Conoco Phillips Refinery or Tosco Corporation. The Union Oil and Phillips 66 lands are leased to CDPR.

Management of the study area lands is the responsibility of CDPR; however, activities over a small portion of Pismo SB are managed by the City of Pismo Beach under a lease agreement with CDPR. This area extends from the south end of the North Beach Campground to the northern Pismo SB boundary. This area has been leased by the City of Pismo Beach since 1951. Within this report, this area is included in the area that is referred to as the “Pismo Zone.”

The majority of the study area consists of undeveloped lands; however, some locations within the study area are developed. The developed lands include 136 acres that are under agricultural cultivation near Little Oso Flaco Lake, a 31-acre golf course, 67 acres that are designated campgrounds, 11 acres associated with the Pier Avenue parking lot and facilities, and 6 acres associated with the ranger station/maintenance yard and CDPR staff residences. The undeveloped lands in the study area include 1,490 acres of land used for off-highway vehicle (OHV) recreation and camping, 91 acres of land used for street legal vehicle recreation, and 3,118-acres managed for natural resource protection and non-motorized recreation (Figure 1-2). The 70-acre undeveloped Pismo Lake area was not mapped for this report. The areas open to OHV use include the Oceano Dunes SVRA and a portion of Pismo SB. The non-OHV areas include the Pismo Dunes Natural Preserve (Dunes Preserve) and other protected areas south of the Dunes Preserve. In this report, the leased Phillips 66 lands are referred to as the "Phillips 66 Leasehold Zone".

The two park units that comprise the study area, Pismo SB and Oceano Dunes SVRA, are described in more detail below.

1.3.1 PISMO STATE BEACH

The 1,530-acre Pismo SB includes beach habitat, the Dunes Preserve, and a developed portion of the park that includes two designated campgrounds, a golf course, a ranger station/maintenance yard, and CDPR staff residences (Figures 1-1 and 1-2).

Recreational opportunities at Pismo SB include hiking, swimming, fishing, surfing, kite surfing and wildlife viewing. In addition to non-motorized recreation, Pismo SB provides access to Oceano Dunes SVRA via sand ramps at Grand Avenue in the City of Grover Beach and Pier Avenue in Oceano (Figure 1-2). Marker posts (Post) are placed along the beach at half-mile intervals beginning with Post 1 near the mouth of Arroyo Grande Creek. The area between the Grand Avenue access ramp and Post 2 is designated as a day use only area and is predominately used by people who want to drive their street-legal vehicles on the beach and enjoy day use beach activities such as picnicking, sunning, fishing, and wading. The open riding area south of Post 2 allows camping and OHV use and is predominately used by OHV enthusiasts (Figure 1-2).

The Dunes Preserve is a 694-acre subunit of Pismo SB consisting of undisturbed sand dunes, dune slack, and freshwater wetlands. The Dunes Preserve is bordered on the north by Arroyo Grande Creek and the community of Oceano; on the south by Oceano Dunes SVRA; on the east by private agricultural, recreational, and residential lands; and on the west by the seaward toe of a foredune system, which is stabilized with invasive exotic European beach grass (*Ammophila arenaria*), Russian wheat grass (*Elymus farctus*), and ice plant (*Carpobrotus* spp.). Recreational use of the Dunes Preserve is restricted to pedestrians and equestrians. Motorized vehicles of any type and bicycles are prohibited in the Dunes Preserve except in cases of emergency or approved resource management projects. Dogs are also prohibited. The Dunes Preserve is fenced and signs are posted to indicate that access is restricted.

1.3.2 OCEANO DUNES SVRA

The 3,490-acre Oceano Dunes SVRA is south of the City of Grover Beach and Oceano (Figure 1-2). Oceano Dunes SVRA is accessible via the sand ramps in Pismo SB at Grand Avenue and Pier Avenue as well as from a pedestrian entrance located at the end of Oso Flaco Lake Road.

Oceano Dunes SVRA provides vehicular and non-vehicular recreation opportunities. It contains an OHV recreation area, restrooms, a day use area, informational kiosks, and hiking trails. Non-vehicular recreation is permitted throughout the majority of the area but usually occurs within those areas closed to OHV recreation. These include the Pismo SB/Oceano Dunes SVRA day use area between the Grand Avenue access ramp and Post 2 and the Oso Flaco Lake area in the southern portion of Oceano Dunes SVRA. There are no designated campsites, but up to 1,000 registered camping vehicles per day are allowed to camp within the beach and dune areas (referred to as the open riding area on Figure 1-2).

1.4 STUDY AREA SETTING

1.4.1 CLIMATE

The study area has a Mediterranean climate characterized by year-round mild temperatures, moist winters, and warm dry summers. As a result of the marine influence, temperatures along the coast remain moderate during summer and winter. A band of low clouds is commonly present along the immediate coast during the summer months. This cloudy zone moves inland at night and during early morning hours and recedes offshore during the day. The wind direction is predominately from the west and northwest. Winds are light and variable at night and in the early morning. By mid-morning, wind speed increases with the addition of an onshore breeze, and averages 15-22 miles per hour by mid-afternoon through sunset (CDPR 2012).

From 2004 to 2010, average annual precipitation in the study area varied from 19.31 to 28.23 inches and average temperature varied from 57.65 and 58.58 degrees Fahrenheit (CDPR 2012).

1.4.2 GEOLOGY, TOPOGRAPHY AND SOILS

The study area is located within the Coast Range geomorphic province of California, at the intersection of the Pacific and North American tectonic plates. The geomorphic province is typified by northwest trending mountain ranges and valleys, almost parallel to the San Andreas Fault located about 40 miles east of the study area. Most of San Luis Obispo County sits atop a 180-million year old mix of consolidated igneous, metamorphic, and sedimentary rock.

The study area is dominated by sand dunes. It is located at a low elevation, ranging from about 0-192 feet above mean sea level (based on U.S. Geological Survey [USGS] National Elevation Dataset, 1/3 arcsecond Digital Elevation Model 2013). The topography of the study area is flat adjacent to the ocean, and undulates through the dunes east of the beach. Dune crests run north to south. On the western (windward) side of the dunes, slopes are gentle. On the eastern (leeward) side of the dunes, slopes are steep. Wave action, wind, and water erosion cause the dunes to

move slowly over time. Lake, creek and wetland areas within or adjacent to the dunes are generally flat.

Beach sand is the dominant soil in the study area, much of which is barren of vegetation. Soil permeability is high and rapid, and wind and wave action erosion hazard is high. Beach sands originate from rivers and streams, are deposited onto the beach by ocean currents, and are shaped by prevailing ocean winds.

1.4.3 HYDROLOGY

The Pismo SB portion of the study area lies within the boundary of the Arroyo Grande Creek watershed. This watershed covers approximately 150 square miles of the southern portion of San Luis Obispo County. The lower one mile of Arroyo Grande Creek and the Arroyo Grande Creek Estuary are both located within Pismo SB (Figure 1-2). The lower portion of Arroyo Grande Creek and the estuary are influenced by upstream water uses. Lopez Dam impounds runoff from about 67 square miles of the watershed for use as the primary water supply for local municipalities and agricultural interests. Small domestic and agricultural water uses downstream of Lopez Dam also reduce the amount of surface water available for lower reaches of Arroyo Grande Creek. In dry or drought years, groundwater pumping and surface diversions may cause portions of lower Arroyo Grande Creek to completely dry up, resulting in dry creek beds and a much smaller lagoon (Reischbeiter 2008; 2009). The creek is impounded during summer months and does not reach the ocean. Arroyo Grande Creek downstream of Lopez Dam is listed on the Clean Water Act Section 303(d) Impaired Waters List for *E. coli* and fecal coliform from urban runoff, grazing, and agricultural activities (State Water Resources Control Board 2010).

The portion of the Arroyo Grande Creek watershed within the study area also includes the lower portion of Pismo Creek (Figure 1-2). The creek does not typically drift as far south as Meadow Creek, which runs along the southern border of North Beach Campground, although the two channels may connect. The Pismo Creek lagoon forms seasonally at the mouth of Pismo Creek and is surrounded by City of Pismo Beach property. Meadow Creek runs roughly parallel to the eastern boundary of Pismo SB and north of Arroyo Grande Creek (Figure 1-2). South of the North Beach Campground, Meadow Creek flows through a culvert underneath Grand Avenue and enters Arroyo Grande Creek via levee and flood control gates. A small outfall off Meadow Creek called Carpenter Creek may occasionally connect to the Pismo Lagoon south of the North Beach Campground.

The southern portion of the Oceano Dunes SVRA lies within the Oso Flaco Creek watershed. The Oso Flaco Creek watershed encompasses approximately 7,400 acres, nearly all of which consist of prime agricultural land. The western terminus of the watershed is Oso Flaco Lake, the largest of the freshwater lakes associated with the 18-mile-long Guadalupe-Nipomo Dune Complex. These freshwater lakes occupy a surface area of 82 acres and are classified as palustrine emergent wetlands. Water quality in the Oso Flaco watershed has been found by the Regional Water Quality Control Board to be impaired by several pollutants, including pesticides, nitrate, and excessive sediment (Coastal San Luis Resource Conservation District 2013). Oso Flaco Creek drains into Oso Flaco Lake and ultimately to the Pacific Ocean.

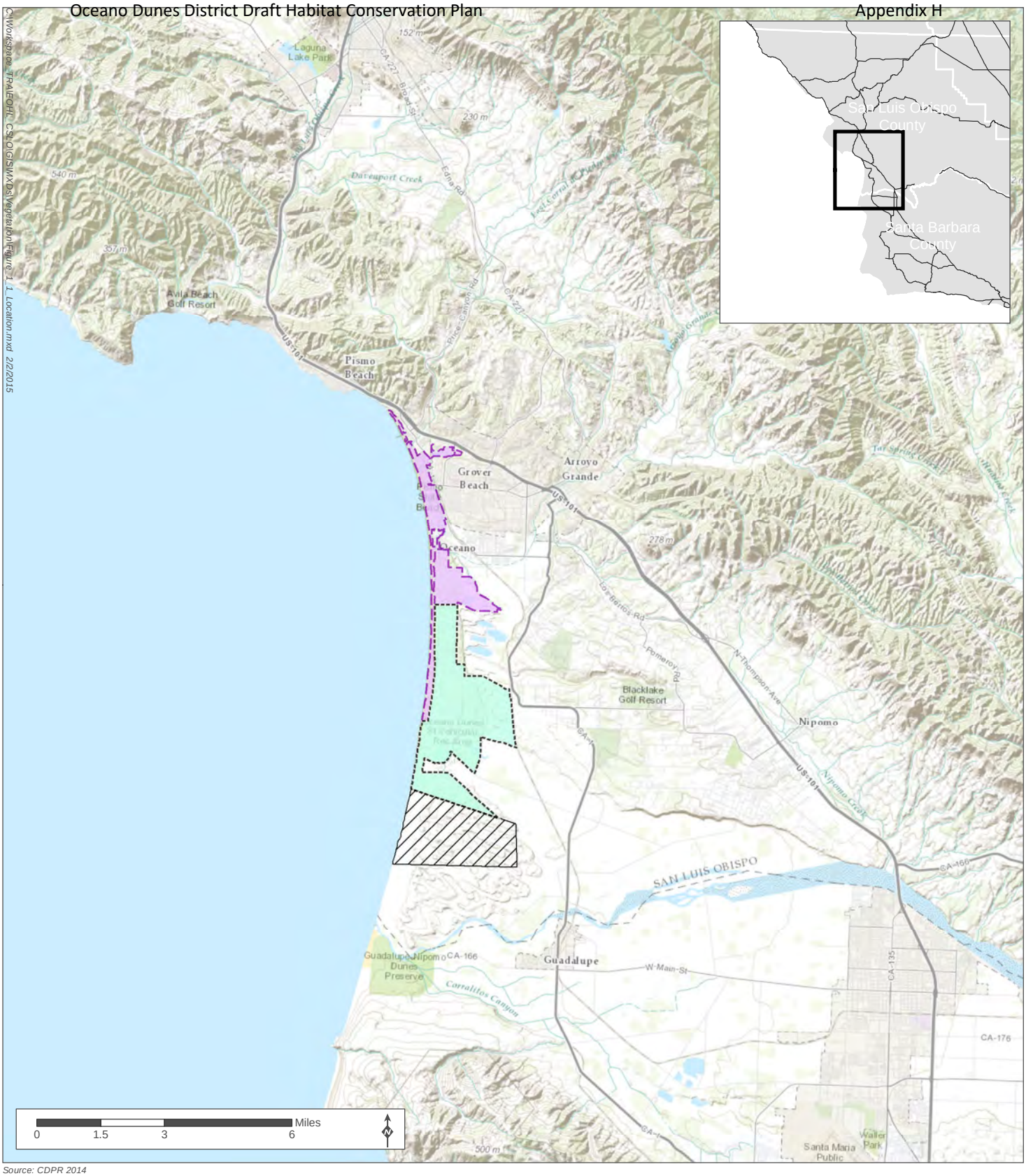
Those areas of Oceano Dunes SVRA that do not lie within the Oso Flaco Creek watershed drain directly to the Pacific Ocean.

1.4.4 Habitats

The portion of the study area open to OHV use includes habitats consisting of open sand and fenced vegetation islands. Other habitats in the study area include dune lakes, freshwater streams, coastal lagoons, wetlands, fore- and backdunes, dune scrub, and riparian areas.

The study area includes approximately 25 percent of the 18-mile stretch of the Guadalupe-Nipomo Dunes Complex (Figure 1-1). This complex is a relatively intact coastal dune and dune scrub ecosystem varying in width from two to five miles. The Guadalupe-Nipomo Dunes Complex extends from Pismo Beach to Point Sal, and roughly from California Highway 1 west to the Pacific Ocean in Santa Barbara and San Luis Obispo counties.

Beach dunes may be divided into two zones characterized by their location and dominant vegetation. The most seaward zone of the dunes is called the foredune. It is characterized as a low, wind deposited dune that is sparsely vegetated with the hardiest of dune stabilizing plants. Foredune plants must be able to tolerate periods of drought, saltwater spray, storm waves, and alternating periods of sand burial and erosion. In contrast, the backdune, also called coastal strand, is a more stabilized coastal dune that is vegetated with a dense thicket of salt-tolerant shrubs.



Source: CDPR 2014

- Oceano Dunes SVRA
- Pismo State Beach
- Guadalupe National Wildlife Refuge

Figure 1-1 Study Area Location and Boundary

Figure 1-2 Aerial Overview of the Study Area

2.0 STUDY METHODS

2.1 VEGETATION ZONES

Vegetation "zones" were created in the study area to facilitate vegetation mapping. The eight zones do not represent or adhere to jurisdictional or land use boundaries (Figure 2-1):

- *Pismo SB Zone*: This includes the 558-acre portion of Pismo SB extends from near Pismo Pier in the north south to Arroyo Grande Creek.
- *Dunes Natural Preserve Zone*: This is a 773-acre area that includes the 674-acre Dunes Preserve and the 98-acre portion of Pismo SB bordering the Dunes Preserve to the west.
- *Vegetation Island Zone*: This includes the 1,646-acre portion of the open riding and camping area south of the Dunes Preserve, which is largely in the Oceano Dunes SVRA, although the westernmost portion is part of Pismo SB.
- *Phillips 66 Leasehold Zone:* This includes 892 acres east of the open riding and camping area, which is composed of CDPR land and land leased to CDPR by Phillips 66.
- *North Oso Flaco Zone:* This includes the 83-acre vegetated foredunes bordered by the open riding and camping area to the north and northeast, Oso Flaco Creek to the south, the Pacific Ocean to the west, and the Maidenform Zone to the southeast. A small portion of this zone overlaps the open riding and camping area where foredune vegetation extends past the boundary.
- *Maidenform Zone:* This 130-acre zone includes a vegetated "peninsula" bordered on three sides (north, east, and west) by the open riding and camping area, Oso Flaco Creek to the south, and the North Oso Flaco Zone to the southwest.
- *Oso Flaco Lake and Creek Zone:* This 200-acre zone includes Oso Flaco Lake, Oso Flaco Creek, and the surrounding area.
- *South Oso Flaco Zone:* This 593-acre zone includes all land in the Oceano Dunes SVRA south of the Oso Flaco Lake and Creek Zone, including both foredune and backdune areas.

The vegetation zones are described in detail in Chapter 4.

2.2 VEGETATION MAPPING

Vegetation types in the study area are classified as vegetation alliances defined by their dominant or co-dominant species, following the classification system in *A Manual of California Vegetation, Second Edition* (MCV2) (Sawyer et al. 2009). . However, coastal dune vegetation types are under-represented in the MCV2 because these areas have not been well studied (Keeler-Wolf, pers. comm., to S. Little June, 2012). Therefore, portions of the study area also contain dominant plants that do not have an MCV2 corresponding alliance. As a result, District staff and their consultants created unique alliances to describe the alliances not classified by MCV2, and these are referred to as District alliances in this report.

Vegetation mapping was conducted during the week of September 10 through14, 2012 by a team of seven individuals representing biologists from the District, TRA Environmental Sciences, Inc. (TRA), and independent consultants. District biologists independently continued vegetation mapping in subsequent weeks and completed the effort in December 2012.

Mapping was conducted by teams of two biologists. Vegetation was mapped in the following areas: vegetation islands, Maidenform, Oso Flaco Lake and Creek, portions of the Phillips 66 leasehold, and North and South Oso Flaco. Aerial base maps, acquired from the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center (2011), were used for vegetation mapping. A checklist of common plant species in the study area, developed by District biologists, was also used to aid in documenting plants observed in the study area. The mapping methodology used was consistent with Sawyer et al. (2009). Each mapping unit was mapped as one vegetation alliance only (i.e., different vegetation layers were never mapped separately as different alliances in the same mapping unit). In areas dominated by shrubland species where dominant species of two or more shrubland alliances were present in the same mapping unit, the unit was mapped as the shrubland alliance corresponding with the dominant shrub species. Likewise, in areas dominated by herbaceous species where dominant species of two or more herbaceous alliances were present in the same unit, the unit was mapped as the herbaceous alliance corresponding to the most dominant herbaceous species. In addition, the following methods were used in those locations where dominant species from both shrubland and herbaceous alliances were present in the same mapping unit:

- In areas of higher than 20 percent total vegetative cover, the unit was mapped as the shrubland alliance if shrubs had at least 10 percent cover, even if total cover of herbs was higher than that of shrubs. If shrubs covered less than 10 percent and herbaceous vegetation was dominant, the unit was mapped as the herbaceous alliance.

- In areas of less than 20 percent total vegetative cover, the unit was mapped as the shrubland alliance even if shrubs were less than 10 percent cover if shrubs were evenly distributed across the area. If shrubs were less than 2-5 percent cover and unevenly distributed, the unit was mapped as the herbaceous alliance.

Vegetation alliance boundaries were sketched onto 11 x 17-inch base maps. All distinctive vegetation types were mapped in the field regardless of size. Plant species observed in each area mapped were checked off on the checklist of common plant species or added to the list, if necessary. Observations likely did not include every plant species present in the study area (e.g., fall annuals that were not present when mapping took place would not have been detected). During vegetation mapping one team member sketched the vegetation alliances while the other completed the species checklist. All species detected are listed in Appendix A.

Once on-site work was completed, field maps were georeferenced and digitized using ArcGIS 10.1. Vegetation alliance outlines were digitized to produce vector data representing hand-drawn polygons. Desktop mapping was performed at different scales appropriate to the variable scales of each field map. This process was started by CDPR staff and completed by TRA. Quality assurance and quality control were provided by CDPR biologists.

2.3 PLANT SPECIES NOMENCLATURE AND ALLIANCE CODES

Scientific names for plant species in this report follow MCV2 for dominant species that form the basis of an MCV2 alliance (Sawyer et al. 2009). For all other species independent of MCV2 alliances, naming conventions follow *The Jepson Manual, Vascular Plants of California*, Second Edition (Baldwin et al. 2012). In those instances where naming conflicts between an MCV2 alliance and Baldwin et al. (2012), the name used in Baldwin et al. 2012 is qualified with brackets and noted in the text. When a new species to the study area is first documented in this report, both the common name and scientific name (in parentheses) are presented. Subsequent references use only the common name.

2.4 SPECIAL-STATUS PLANT SPECIES DEFINITION AND SOURCES

For the purposes of this report, special-status plant species are defined as follows:

- Species listed as threatened or endangered under the federal Endangered Species Act (FESA), or proposed for listing under FESA;
- Species listed as threatened or endangered under the California Endangered Species Act (CESA), or candidate for listing under CESA;
- Species with a California Rare Plant Rank (CRPR), defined as follows:

  Ranks:
  CRPR 1B: Plants rare, threatened, or endangered in California and elsewhere;
  CRPR 2: Plants rare, threatened, or endangered in California but common elsewhere;
  CRPR 3: More information about this plant needed (Review List); and
  CRPR 4: Limited distribution (Watch List).

  CRPR Threat Code extensions and their meanings:
  .1 – Seriously endangered in California (over 80 percent of occurrences threatened / high degree and immediacy of threat);
  .2 – Fairly endangered in California (20-80 percent occurrences threatened); and
  .3 – Not very endangered in California (< 20 percent of occurrences threatened or no current threats known).

Known or potential occurrences of special-status plants in the study area are derived from the following sources:

- Species lists compiled during vegetation mapping conducted by District staff and their consultants from September through December 2012;
- A focused survey for four federal and/or state listed plant species (surf thistle [*Cirsium rhothophilum*], La Graciosa thistle [*Cirsium scariosum* var. *loncholepis*], beach

spectaclepod [*Dithyria maritima*], and Nipomo Mesa lupine [*Lupinus nipomensis*]) conducted by Oceano Dunes District staff in 2008;

- Annual population data for the Nipomo Mesa lupine from the San Luis Obispo County Land Conservancy;
- Vegetation transect surveys conducted by District staff from 2004 to 2009 as part of their ongoing habitat monitoring program (CDPR 2012);
- Records from the California Natural Diversity Database (CNDDB), including the Oceano USGS Quadrangle and eight surrounding Quads (CNDDB 2013); and

Species listed as occurring in the Oceano USGS Quadrangle and eight surrounding Quads by the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants (CNPS 2013).

Figure 2-1 Vegetated Zones of the Study Area

3.0 VEGETATION ALLIANCES IN THE STUDY AREA

3.1 OVERVIEW

There are forty-six vegetation alliances in the study area, including 35 MCV2 alliances and 11 District alliances. There are 8 forest and woodland alliances, 13 shrubland alliances, and 25 herbaceous alliances.

The vegetation alliances mapped in this survey are listed in Table 3-1, which includes the following information:

- Column 1 specifies the alliance name.
- Column 2 specifies whether the alliance is derived from the MCV2 or created by District staff.
- Column 3 specifies the area, in acres, for each alliance in descending order (largest area, which represents the dominant alliance, is listed first).
- Column 4 specifies whether the dominant plant in the alliance is native or non-native to the study area; the asterisk indicates alliances that are native to California but not to the study area (i.e., the study area is outside the natural range of the dominant species in the alliance).
- Column 5 specifies whether the alliance occurs in the foredunes, backdunes, or within both.
- Column 6 specifies whether the alliance occurs in an upland, a wetland, or is equally likely to occur in both, based on the 2012 U.S. Army Corps of Engineers (USACE) National Wetland Plant List (USACE 2012).

The dominant alliance in the study area is the silver dune lupine–mock heather scrub (*Lupinus chamissonis-Ericameria ericoides* Shrubland Alliance). It is an upland alliance that covers 1,079 acres of the backdunes and is native to the study area. The next most dominant alliance is the native arroyo willow thickets (*Salix lasiolepis* Shrubland Alliance), covering 359 acres in the backdunes. Arroyo willow thickets is considered a wetland alliance, however, standing water or other wetland species are not associated with every stand. European beach grass swards (*Ammophila arenaria* Semi-natural Herbaceous Stands Alliance) are the third most prevalent alliance, covering 194 acres of upland foredune habitat. This is a non-native, invasive species. Dune mat is a native herbaceous alliance (*Abronia latifolia-Ambrosia chamissonis* Herbaceous Alliance) that occurs in 140 acres of foredune upland habitat. Non-native perennial veldt grass stands (*Erharta calycina* Semi-natural Herbaceous Stands Alliance) cover about 90 acres of the backdunes in the study area. The remaining 40 alliances range in size from less than one acre to 45 acres, and mostly occur in the more heavily vegetated backdunes. The composition of alliances in the foredunes differed from those in the backdunes. European beach grass swards dominate the foredunes and the backdunes are dominated by the silver dune lupine–mock heather scrub.

Table 3-1 Summary of Vegetation Alliances in the Study Area

Alliance Name	MCV2/ District[1]	Area (acres)	Native/ Non-native	Fore-/ backdunes	Upland/ wetland[2]
Forest and Woodland Alliances					
Eucalyptus groves (*Eucalyptus globulus* Semi-Natural Woodland Stands Alliance)	MCV2	16	Non-native[3]	Backdunes	Upland
Black cottonwood forest (*Populus trichocarpa* Forest Alliance)	MCV2	11	Native	Backdunes	Both
Monterey pine forest (*Pinus radiata* Forest Alliance)	MCV2	7	Non-native	Backdunes	Upland
Torrey pine stands (*Pinus torreyana* Woodland Special Stands Alliance)	MCV2	3	Non-native	Backdunes	Upland
Monterey cypress stands (*Callitropsis [Hesperocyparis] macrocarpa* Woodland Stands Alliance)	MCV2	1	Non-native	Backdunes	Upland
Pepper tree or myoporum groves (*Schinus molle/terbinthifolius-Myoporum laetum* Semi-Natural Woodland Stands Alliance)	MCV2	1	Non-native	Backdunes	Upland
Coast live oak woodland (*Quercus agrifolia* Woodland Alliance)	MCV2	0.6	Native	Backdunes	Upland
Beach pine forest (*Pinus contorta ssp. contorta* Forest Alliance)	MCV2	0.1	Non-native	Backdunes	Both
Shrubland Alliances					
Silver dune lupine–mock heather scrub (*Lupinus chamissonis-Ericameria ericoides* Shrubland Alliance)	MCV2	1,089	Native	Backdunes	Upland
Arroyo willow thickets (*Salix lasiolepis* Shrubland Alliance)	MCV2	395	Native	Backdunes	Wetland
Golden wattle stands (*Acacia longifolia* Semi-Natural Shrubland Alliance)	District	40	Non-native	Backdunes	Upland
Coyote brush scrub (*Baccharis pilularis* Shrubland Alliance)	MCV2	16	Native	Backdunes	Upland
Wax myrtle scrub (*Morella californica* Shrubland Alliance)	MCV2	10	Native	Backdunes	Wetland
Blochman's groundsel scrub (*Senecio blochmaniae* Shrubland Alliance)	District	7	Native	Backdunes	Upland
Giant coreopsis scrub (*Coreopsis [Leptosyne] gigantea* Shrubland Alliance)	MCV2	6	Native	Backdunes	Upland
Coastal brambles (*Rubus ursinus* Shrubland Alliance)	MCV2	3	Native	Backdunes	Upland

[1] Alliance derived from *A Manual of California Vegetation, Second Edition* (Sawyer et al., 2008; MCV2) or Oceano Dunes District staff (District)
[2] Wetland alliances include those with a dominant plant species that is listed by the USACE (2012) as obligate (OBL) or facultative wetland (FACW) plants in the Arid West Region. OBL means almost always a hydrophyte, rarely in uplands; while FACW means usually a hydrophyte but occasionally found in uplands. Alliances listed as "both" have dominant plants that are facultative (FAC), meaning it commonly occurs as either a hydrophyte or non-hydrophyte.
[3] Non-native= native to California, but not to the study area.

Alliance Name	MCV2/ District[1]	Area (acres)	Native/ Non-native	Fore-/ backdunes	Upland/ wetland[2]
Deer weed scrub (*Lotus scoparius [Acmispon glaber]* Shrubland Alliance)	MCV2	1	Native	Backdunes	Upland
California coffee berry scrub (*Frangula californica* Shrubland Alliance)	MCV2	1	Native	Backdunes	Upland
Poison oak scrub (*Toxicodendron diversilobum* Shrubland Alliance)	MCV2	1	Native	Backdunes	Upland
Blue elderberry stands (*Sambucus nigra* ssp. *caerulea* Shrubland alliance)	MCV2	0.4	Native	Backdunes	Both
California sagebrush-black sagebrush scrub (*Artemisia californica-Salvia mellifera* Shrubland Alliance)	MCV2	0.02	Native	Backdunes	Upland
Herbaceous Alliances					
European beach grass swards (*Ammophila arenaria* Semi-Natural Herbaceous Alliance)	MCV2	194	Non-native	Foredunes	Upland
Dune mat (*Abronia latifolia-Ambrosia chamissonis* Herbaceous Alliance)	MCV2	140	Native	Foredunes	Upland
Perennial veldt grass stands (*Ehrharta calycina* Semi-Natural Herbaceous Stands Alliance)	District	90	Non-native	Backdunes	Upland
California bulrush marsh (*Schoenoplectus californicus* Herbaceous Alliance)	MCV2	45	Native	Backdunes	Wetland
Iceplant mats (*Carpobrotus edulis* or Other Ice Plants Semi-Natural Herbaceous Alliance)	MCV2	38	Non-native	Both	Upland
Crisp monardella sands (*Monardella undulata* ssp. *crispa* Herbaceous Alliance)	District	17	Native	Both	Upland
Salt rush (a.k.a. dune rush) swales (*Juncus lescurii* Herbaceous Alliance)	MCV2	15	Native	Backdunes	Wetland
Russian wheat grass stands (*Elymus farctus* Semi-Natural Herbaceous Alliance)	District	9	Non-native	Foredunes	Upland
Searocket sands (*Cakile maritima* Semi-Natural Provisional Herbaceous Alliance)	MCV2	6	Non-native	Foredunes	Both
California sandaster mats (*Corethrogyne filaginifolia* Herbaceous Alliance)	District	24	Native	Backdunes	Upland
Field sedge meadows (*Carex praegracilis* Herbaceous Alliance)	District	4	Native	Both	Wetland
Tall stephanomeria meadows (*Stephanomeria virgata* Herbaceous Alliance)	District	3	Native	Backdunes	Upland
Wedge-leaved horkelia–California spineflower meadows (*Horkelia cuneata–Mucronea californica* Herbaceous Alliance)	District	4	Native	Backdunes	Upland
Cattail marshes (*Typha latifolia* Herbaceous Alliance)	MCV2	3	Native	Backdunes	Wetland

Alliance Name	MCV2/ District[1]	Area (acres)	Native/ Non-native	Fore-/ backdunes	Upland/ wetland[2]
Mats of bur-reed leaves (*Sparganium eurycarpum* Herbaceous Alliance)	MCV2	1	Native	Backdunes	Wetland
Pickleweed mats (*Sarcocornia [Salicornia] pacifica* Herbaceous Alliance)	MCV2	1	Native	Backdunes	Wetland
Salt grass flats (*Distichlis spicata* Herbaceous Alliance)	MCV2	1	Native	Backdunes	Both
Annual brome grasslands (*Bromus diandrus-Brachpodium distachyon* Semi-Natural Herbaceaus Alliance)	MCV2	1	Non-native	Backdunes	Upland
Fields of fat hen and brass buttons (*Atriplex prostrata-Cotula coronopifolia* Semi-Natural Herbaceous Alliance)	MCV2	0.5	Non-native	Foredunes	Wetland
Pacific silverweed marshes (*Argentina egedii* Herbaceous Alliance)	MCV2	0.4	Native	Foredunes	Wetland
White sweetclover mats (*Melilotus albus* Herbaceous Alliance)	District	0.3	Non-native	Foredunes	Upland
Jaumea mats (*Jaumea carnosa* Herbaceous Alliance)	District	0.1	Native	Foredunes	Wetland
Giant wild rye grassland (*Leymus [Elymus] condensatus* Herbaceous Alliance)	MCV2	0.1	Native	Backdunes	Upland
American bulrush marsh (*Schoenoplectus americanus* Herbaceous Alliance)	MCV2	0.2	Native	Foredunes	Wetland
Duckweed blooms [*Lemna (minor)* and Relatives Provisional Herbaceous Alliance]	MCV2	Less than 0.01 acre	Native	Backdunes	Wetland

3.2 NATIVE UPLAND ALLIANCES

Native upland alliances are dominated by plants native to the study area that usually or always occur in uplands. These include one woodland alliance, ten shrubland alliances, and six herbaceous alliances. Native upland alliances occupying 10 or more acres in the study area include silver dune lupine–mock heather scrub, coyote brush scrub, dune mat, and crisp monardella sands. Silver dune lupine–mock heather scrub is widespread and covers more area than any other alliance in the study area. Although the dominant species in blue elderberry stands (*Sambucus nigra* ssp. *caerulea*), is listed by the USACE (2012) as facultative (FAC), or equally likely to occur in wetlands or uplands, this alliance is included here because it occurs within uplands in the study area. Both black cottonwood forest (*Populus trichocarpa*) and salt grass flats (*Distichlis spicata*) are FAC, but primarily occupy wetter areas in the study area so are included in the native wetland forest and native wetland herbaceous alliances, respectively. The native upland alliances and their location in the study area are described in detail below.

3.2.1 NATIVE UPLAND FOREST AND WOODLAND ALLIANCES

MCV2 Alliances

Coast live oak woodland (*Quercus agrifolia* Woodland Alliance); 0.6 acre
Coast live oak is dominant or co-dominant in the tree canopy in this alliance, exceeding 50 percent relative cover. In California, this alliance occurs on alluvial terraces, canyon bottoms, stream banks, slopes, and flats from 0-4,000 feet; soils are deep, sandy or loamy, with high organic matter (Sawyer et al. 2009). This alliance was documented as a single tree at five locations in the backdunes of the study area, including one near Pier Avenue in the Pismo SB Zone, one in the northeast corner of the Dunes Preserve Zone, one near the southern border of the Phillips 66 Leasehold Zone, and two in the South Oso Flaco Zone.

District Alliances

No unique native upland forest or woodland District alliances occur in the study area.

3.2.2 NATIVE UPLAND SHRUBLAND ALLIANCES

MCV2 Alliances

Silver dune lupine–mock heather scrub (*Lupinus chamissonis–Ericameria ericoides* Shrubland Alliance); 1,089 acres
This alliance occurs in California on stabilized dunes of coastal bars, river mouths, sand spits along coastlines, coastal bluffs, and terraces from 0-100 feet (Sawyer et al. 2009). Which of the two species (i.e., silver dune lupine or mock heather scrub) dominates varies, probably due to a combination of soil texture, aspect, hydrology, and stand age. Sometimes the species are co-dominant. Within the study area, other common native shrub and herbaceous species that occur in this alliance include lizard tail (*Eriophyllum staechadifolium*), California croton (*Croton californicus*), seacliff buckwheat (*Eriogonum parvifolium*), deerweed (*Lotus scoparius [Acmispon glaber]*), California sandaster (*Corethrogyne filaginifolia*), yarrow (*Achillea millefolium*), cudweed (*Psuedognaphalium* sp.), Monterey Coast paintbrush (*Castilleja latifolia,* a CRPR 4.3 plant), and Southern California dudleya (*Dudleya lanceolata*). Silver dune lupine–mock heather scrub is dominant in the backdunes of the study area. This alliance covers more area, and is more widespread than any other alliance in the study area and occurs in every vegetation zone of the study area.

Coyote brush scrub (*Baccharis pilularis* Shrubland Alliance); 16 acres
Coyote brush is dominant or co-dominant in the shrub canopy, exceeding 50 percent absolute cover in the shrub layer or exceeding 15 percent shrub cover over a grassy understory, with a relative cover exceeding 50 percent of other shrub species. In California, this alliance occurs from 0-5,000 feet elevation at river mouths, stream sides, terraces, stabilized dunes of coastal bars, coastline spits, coastal bluffs, open slopes, ridges on variable soils, and sandy to relatively heavy clay (Sawyer et al. 2009). Within the study area, this alliance occurs at a few locations in the backdunes, often near silver dune lupine–mock heather scrub, arroyo willow thickets, and/or salt rush swales (*Juncus lescurii*). It is relatively widespread but does not cover much of the

study area. It occurs near Arroyo Grande Creek and at one other location in the Dunes Preserve Zone, at several of the vegetation islands in the Vegetation Island Zone, at one location in the Phillips 66 Leasehold Zone, in the southeastern part of the North Oso Flaco Zone, the southwestern part of the Maidenform Zone, near Oso Flaco Creek in the Oso Flaco Lake and Creek Zone, and at three locations in the South Oso Flaco Zone.

Giant coreopsis scrub (*Coreopsis [Leptosyne][4] gigantea* Shrubland Alliance); 6 acres
Giant coreopsis is dominant or co-dominant in the shrub canopy in this alliance, exceeding 30 percent relative cover. In California, this alliance occurs on the immediate coast within 1.2 miles of the ocean, usually on steep bluffs or stable slopes, from 0-1,300 feet (Sawyer et al. 2009). Within the study area, this alliance occurs at five locations in the backdunes, including a small patch in the south end of the Phillips 66 Leasehold Zone, in the middle part of the Maidenform Zone, and at three locations in the South Oso Flaco Zone. It is usually surrounded by silver dune lupine–mock heather scrub, but at one of the locations in the South Oso Flaco Zone it also occurs near European beach grass swards. Giant coreopsis also occurs extensively in one other area of the backdunes of the South Oso Flaco Zone, but that area is classified as silver dune lupine–mock heather scrub because silver dune lupine is dominant.

Coastal brambles (*Rubus ursinus* Shrubland Alliance); 3 acres
In this alliance, thimbleberry (*Rubus parviflorus*), salmonberry (*R. spectabilis*), and California blackberry (*R. ursinus*) are dominant or are co-dominant in the shrub canopy. In California, this alliance occurs in coastal bluffs, headlands, exposed slopes, and gaps in forest stands from 0-100 feet (Sawyer et al. 2009). Only California blackberry is present in the study area. Within the study area, this alliance occurs at a few locations in low-lying portions of the backdunes, often near areas dominated by rushes or other wetland vegetation. It occurs near Arroyo Grande Creek in the Dunes Preserve Zone, at one vegetation island (Heather Island) in the Vegetation Island Zone, at one location in the Phillips 66 Leasehold Zone, in the Oso Flaco Lake and Creek Zone, and in the southeast corner of the South Oso Flaco Zone.

Deerweed scrub (*Lotus scoparius [Acmispon glaber]*[5] Shrubland Alliance); 1 acre
In this alliance, deerweed is dominant or co-dominant in the shrub canopy, exceeding 50 percent relative cover. In California, this alliance occurs in areas with recent disturbance, such as clearing, fire, or intermittent flooding, from 80-5,000 feet (Sawyer et al. 2009). Within the study area, this alliance is limited to three small patches, including one at the BBQ Flats vegetation island in the Vegetation Island Zone and two in the Maidenform Zone.

California coffeeberry scrub (*Frangula californica* Shrubland Alliance); 1 acre
In this alliance, California coffeeberry is dominant or co-dominant in the shrub canopy, exceeding 50 percent relative cover. In California, this alliance occurs on concave slopes, lower slopes, along drainages, and undulating moderate to steep slopes of sedimentary or serpentine substrates from 0-3,300 feet where soils retain moisture much of the year (Sawyer et al. 2009). Within the study area, this alliance is limited to several small patches in the Phillips 66 Leasehold Zone and one small patch in the mid-eastern part of the South Oso Flaco Zone. This

[4] This species is known a *Leptosyne gigantea* in Baldwin et al. (2012).
[5] This species is known as *Acmispon glaber* in Baldwin et al. (2012).

alliance was usually observed surrounded by silver dune lupine–mock heather scrub, although one patch is located within a stand of invasive perennial veldt grass.

Poison oak scrub (*Toxicodendron diversilobum* Shrubland Alliance); 1 acre
In this alliance, poison oak is dominant in the shrub canopy, exceeding 50 percent relative cover. In California, this alliance occurs on the immediate coast in mesic hollows receiving salt-laden fog to interior sheltered mesic and disturbed dry slopes, from 0-2,400 feet (Sawyer et al. 2009). In the study area, this alliance occurs in the backdunes at a few locations with various moisture regimes (from dry to mesic). It occurs at five of the vegetation islands in the Vegetation Island Zone, at two locations in the Phillips 66 Leasehold Zone, at Oso Flaco Lake in the Oso Flaco Lake and Creek Zone, and at one location near the southeast part of the South Oso Flaco Zone. In some locations in the study area it co-occurs with the coastal brambles alliance.

Blue elderberry (*Sambucus nigra* ssp. *caerulea* Shrubland Alliance); 0.4 acre
In this alliance, blue elderberry is dominant in the shrub canopy, exceeding 50 percent relative cover. In California, blue elderberry occurs on stream terraces and in bottomlands from 0-1,000 feet where soils are typically alluvium and intermittently flooded (Sawyer et al. 2009). This alliance occurs at one location in the study area in the Phillips 66 Leasehold Zone.

California sagebrush-black sagebrush scrub (*Artemisia californica-Salvia mellifera* Shrubland Alliance); 0.02 acres.
In this alliance, California sagebrush and black sagebrush are co-dominant in the shrub canopy, with 30-60 percent relative cover. In California, this alliance occurs in colluvial soils on slopes that are steep and usually east to southwest facing from 800-2,450 feet (Sawyer et al. 2009). Within the study area, this alliance occurs at only one location at the south end of the Phillips 66 Leasehold Zone.

District Alliances

Blochman's groundsel scrub (*Senecio blochmaniae* Shrubland Alliance); 7 acres
In this alliance, Blochman's groundsel is dominant or co-dominant in the shrub layer. It is native to California and occurs in coastal strand habitats from 0-1,100 feet (Calflora 2013). Blochman's groundsel is a CRPR 4.2 plant (CNPS 2013), but it is locally common within the study area. Blochman's groundsel thrives in environments with an intermediate amount of disturbance. It sometimes co-occurs with yarrow and often occurs next to stands of crisp monardella (*Monardella undulata* ssp. *crispa*). This alliance transitions into silver dune lupine–mock heather scrub as soils become more stable. In the study area, this alliance occurs at the edges of the silver dune lupine–mock heather scrub in the backdunes, including at nine of the vegetation islands in the Vegetation Island Zone, in many locations within the Phillips 66 Leasehold Zone, at one location in the Maidenform Zone, and at a few locations in the South Oso Flaco Zone.

3.2.3 NATIVE UPLAND HERBACEOUS ALLIANCES

MCV2 Alliances

Dune mat (*Abronia latifolia-Ambrosia chamissonis* Herbaceous Alliance); 140 acres

In this alliance, yellow sand verbena (*Abronia latifolia*) and/or beach bur (*Ambrosia chamissonis*) mix with other perennial herbs, grasses and low shrubs to form a low canopy. In California, this alliance occurs on sand dunes of coastal bars, river mouths, and spits along the immediate coastline from 0-35 feet (Sawyer et al. 2009). In the study area, other common herbaceous plants in this alliance include red sand verbena (*Abronia maritima,* a CRPR 4.2 plant), pink sand verbena (*Abronia umbellata*), European searocket (*Cakile maritima*), beach evening primrose (*Camissoniopsis cheiranthifolia* var. *cheiranthifolia*) and Pacific silverweed (*Potentilla anserina* var. *pacifica*). This is the most common native vegetation type on the foredunes of the study area. It occurs intermittently along the foredunes from the Pismo Zone south to the western portion of the South Oso Flaco Zone (i.e., from the northern to the southern border of the study area).

Giant wild rye grassland (*Leymus [Elymus][6] condensatus* Herbaceous Alliance); 0.1 acre
In this alliance, giant wild rye is dominant or co-dominant in the herbaceous layer, exceeding 50 percent relative cover. In California, this alliance is found in somewhat steep, often northerly slopes at low elevations on loamy soils, from 0-4,900 feet elevation (Sawyer et al. 2009). Within the study area, this alliance only occurs at a single location in the backdunes of the South Oso Flaco Zone.

District Alliances

Crisp monardella sands (*Monardella undulata* ssp. *crispa* Herbaceous Alliance); 17 acres
In this alliance, crisp monardella is dominant or co-dominant, exceeding 50 percent relative cover in the herbaceous layer. In California, crisp monardella is a perennial endemic that is highly localized to unstable sand sheets and blowing sands located at the edge of established shrubland and tree alliances from 30-400 feet. It often co-occurs with beach bur. Crisp monardella is a CRPR 1B.2 plant (CNPS 2013), although it is locally common and widespread within the study area. The study area is covered with small pockets of crisp monardella in both the fore- and backdunes. It occurs near Arroyo Grande Creek and in several other pockets in the Dunes Preserve Zone, at the edges of eight of the vegetation islands in the Vegetation Island Zone, in the Phillips 66 Leasehold Zone, in the Maidenform Zone, in the Oso Flaco Lake and Creek Zone, and in several bare sand areas of the South Oso Flaco Zone.

California sandaster mats (*Corethrogyne filaginifolia* Herbaceous Alliance); 24 acres
In this alliance, the California sandaster is dominant or co-dominant, exceeding 50 percent relative cover in the herbaceous layer. California sandaster is a perennial herb native to California that occurs in coastal bluff scrub, maritime chaparral and coastal scrub from 0-7,000 feet (Calfora 2013). In the study area, this alliance occurs in the backdunes amongst silver dune lupine–mock heather scrub in areas where silver dune lupine seems to be dying back. It occurs in scattered patches usually surrounded by larger areas of the silver dune lupine–mock heather scrub at one location in the Dunes Preserve Zone, in eight of the vegetation islands in the Vegetation Islands Zone, at several locations in the Phillips 66 Leasehold Zone, in the Maidenform Zone, and in the Oso Flaco Lake and Creek Zone.

[6] This species is known as *Elymus condensatus* in Baldwin et al. (2012).

Tall stephanomeria meadows (*Stephanomeria virgata* Herbaceous Alliance); 3 acres
In this alliance, tall stephanomeria is dominant in the herbaceous layer, exceeding 50 percent relative cover. Emergent shrubs may also be present at low density in this alliance. In California, tall stephanomeria is a native annual herb characteristic of disturbed places in a variety of habitats, from 0-7,000 feet (Calflora 2013). In the study area, this alliance occurs in the south end of the Phillips 66 Leasehold Zone.

Wedge-leaved horkelia–California spineflower meadows (*Horkelia cuneata–Mucronea californica* Herbaceous Alliance); 4 acres
In this alliance, wedge-leaved horkelia and California spineflower are dominant or co-dominant in the herbaceous layer, exceeding 50 percent relative cover. Shrubs may also be present in this alliance. In California, wedge-leaved horkelia is a perennial herb that occurs in coastal habitats from 0-2,300 feet. (Calflora 2013) and California spineflower is a CRPR 4.2 plant that occurs in sandy habitats from 1-4,500 feet (CNPS 2013). The two species usually occur together, but which species is dominant varies. Within the study area, this alliance occurs in low lying meadows of the backdunes, often adjacent to shrubland alliances including silver dune lupine–mock heather scrub and/or coyote brush scrub. It occurs at six locations in the middle and southeast portions of the South Oso Flaco Zone and at one location above the southeast corner of the Phillips 66 Leasehold Zone. Wedge-leaved horkelia is the dominant species in the South Oso Flaco Zone locations, while California spineflower is the dominant species in the Phillips 66 Leasehold Zone.

3.3 NATIVE WETLAND ALLIANCES

Native wetland alliances are dominated by plants native to the study area that usually or always occur in wetlands. While dominant plants in the wax myrtle scrub (*Morella californica*), arroyo willow thickets, salt rush swale alliances are listed by the USACE (2012) as facultative wetland (FACW), or usually hydrophytes but occasionally found in uplands, these alliances are widespread in the study area and also commonly occur in uplands. Field sedge (*Carex praegracilis*), the dominant plant in field sedge meadows, is also listed as FACW and usually occurs in study area wetlands. Dominant plants in the remaining alliances described in this section are listed by the USACE (2012) as obligate wetland (OBL), or almost always hydrophytes and rarely occurring in uplands. These alliances only occur in wetlands within the study area.

There are fourteen native wetland alliances in the study area, including one forest alliance, two shrubland alliances, and eleven herbaceous alliances. Native wetland alliances occupying 10 or more acres in the study area include black cottonwood forest, arroyo willow thickets, California bulrush marsh, and salt rush swales. Native wetland alliances and their location in the study area are described in detail below.

3.3.1 NATIVE WETLAND FOREST AND WOODLAND ALLIANCES

MCV2 Alliances

Black cottonwood forest (*Populus trichocarpa* Forest Alliance); 11 acres

This alliance occurs where black cottonwood is dominant or co-dominant in the tree canopy, exceeding 5 percent absolute cover and 30 percent relative cover. In California, it is found in seasonally flooded and permanently saturated soils on streambanks and alluvial terraces between 0-9,000 feet (Sawyer et al. 2009). Within the study area, this alliance typically grows at scattered locations in the wetter areas of the backdunes, usually near larger arroyo willow thickets. It occurs near Arroyo Grande Creek and elsewhere in the eastern portion of the Dunes Preserve Zone, in the Cottonwood and Heather vegetation islands in the Vegetation Island Zone, in the Maidenform Zone, and in the eastern portion of the South Oso Flaco Zone. Although it is relatively widespread, the total area that this alliance occupies in the study area is small.

District Alliances

No unique native wetland forest or woodland District alliances occur in the study area.

3.3.2 NATIVE WETLAND SHRUBLAND ALLIANCES

MCV2 Alliances

Arroyo willow thickets (*Salix lasiolepis* Shrubland Alliance); 395 acres
In this alliance, arroyo willow is dominant or co-dominant in the shrub or tree canopy, exceeding 50 percent relative cover or 25 percent absolute cover. In California, it occurs along stream banks and benches, slope seeps, and along drainages from 0-7,120 feet (Sawyer et al. 2009). Within the study area, arroyo willow sometimes occurs with wax myrtle. This alliance occurs at scattered locations in the backdunes of all of the vegetation zones in the study area, often adjacent to or surrounded by silver dune lupine–mock heather scrub.

Wax myrtle scrub (*Morella californica* Shrubland Alliance); 10 acres
In this alliance, wax myrtle is dominant in the shrub canopy, exceeding 50 percent relative cover. In California, it occurs around brackish and freshwater lagoons, along small seeps, streams and on coastal dunes and bluffs from 0-1,000 feet (Sawyer et al. 2009). It prefers soils that are moist or wet and include moderately coarse sandy loams (Sawyer et al. 2009). This alliance often co-occurs with arroyo willow thickets. Within the study area, this alliance is relatively widespread but does not cover much area. Specifically, it occurs near the interpretive trail and Strand Way in the Pismo Zone, in the Dunes Preserve Zone, at 12 of the vegetation islands in the Vegetation Island Zone, in the Maidenform Zone, in the Oso Flaco Lake and Creek Zone, and at two locations in the South Oso Flaco Zone.

District Alliances

No unique wetland shrubland District alliances occur in the study area.

3.3.3 NATIVE WETLAND HERBACEOUS ALLIANCES

MCV2 Alliances

California bulrush marsh (*Schoenoplectus californicus* Herbaceous Alliance), 45 acres

In this alliance, California bulrush is dominant or co-dominant in the herbaceous layer, exceeding 10 percent absolute cover. In California, it occurs in brackish to freshwater marshes, shores, bars, and channels of river estuaries from 0-650 feet (Sawyer et al. 2009). It prefers soils that have a high organic content and are poorly aerated (Sawyer et al. 2009). This alliance is relatively widespread in the study area, occurring in wetter areas of the backdunes usually adjacent to or surrounded by arroyo willow thickets or near creeks and lakes. It is found near the interpretive trail and Strand Way in the eastern part of the Pismo Zone, at one location each in the Dunes Preserve Zone, at the southwestern edge of the Maidenform Zone, in the Oso Flaco Lake and Creek Zone, and in the southeast portion of the South Oso Flaco Zone.

Salt rush swales (*Juncus lescurii* Herbaceous Alliance); 15 acres
In this alliance, salt rush is dominant or co-dominant in the herbaceous layer, exceeding 50 percent relative cover. In California, it occurs in seasonally wet, slightly brackish marshes at the upper edges of salt marshes or behind dikes in former salt marsh at intermediate elevations, from 0-320 feet (Sawyer et al. 2009). Species diversity in this alliance type is low within the study area. Typically, salt rush, also known as dune rush, is usually the only species present in this alliance; however, it may be mixed with a few other species with low absolute and relative cover. This alliance is widespread and occurs in all of the vegetation zones in the study area. It is patchily distributed in the backdunes usually at the outer edges of arroyo willow thickets, silver dune lupine–mock heather scrub, wax myrtle scrub, or coyote brush scrub.

Cattail marshes (*Typha latifolia* Herbaceous Alliance); 3 acres
In this alliance, narrowleaf cattail (*T. angustifolia*), southern cattail (*T. domingensis*), or broadleaf cattail (*T. latifolia*) are dominant or co-dominant in the herbaceous layer, exceeding 50 percent relative cover (Sawyer et al. 2009). In California, this alliance occurs in semi-permanently flooded freshwater or brackish marshes with clayey or silty soils from 0-1,150 feet (Sawyer et al. 2009). Within the study area, this alliance occurs at a large wetland in the Phillips 66 Leasehold Zone and at one small wetland under an arroyo willow thicket in the southeastern corner of the South Oso Flaco Zone. Only southern cattail and broadleaf cattail are present in the study area.

Mats of bur-reed leaves (*Sparganium eurycarpum* Herbaceous Alliance); 1 acre
In this alliance, narrow leaved bur-reed (*S. angustifolium*) or other bur-reed species, are dominant on the water surface, exceeding 50 percent relative cover. In California, it occurs in ponds with shallow water or near the shoreline of deeper ponds or lakes with gravelly or muddy bottoms from 0-12,100 feet (Sawyer et al. 2009). Within the study area, this alliance occurs only at two locations near Oso Flaco Lake in the Oso Flaco Lake and Creek Zone and at one location in the southeast corner of the South Oso Flaco Zone where it is surrounded by willow thickets (i.e., arroyo willow thicket alliance). Broadfruit bur-reed (*S. eurycarpum*) is the only bur-reed species present in the study area.

Pickleweed mats (*Sarcocornia [Salicornia] pacifica*[7] Herbaceous Alliance); 1 acres
In this alliance, pickleweed (*S. pacifica*) or Virginia glasswort (*S. depressa*) are dominant or co-dominant in the subshrub and herbaceous layers, exceeding 10 percent absolute cover, or

[7] This species is currently known as *Salicornia pacifica* in Baldwin et al. (2012).

exceeding 50 percent relative cover in the herbaceous layer; salt grass must be less than 30 percent relative cover (Sawyer et al. 2009). . In California, this alliance occurs in coastal salt marshes and alkaline flats from 0-10 feet (Sawyer et al. 2009). Within the study area, this alliance occurs only at a few locations in North Beach Campground in the Pismo Zone. Only pickleweed is present in the study area.

Salt grass flats (*Distichlis spicata* Herbaceous Alliance); 1 acre
In this alliance, salt grass is dominant or co-dominant in the herbaceous layer. It either exceeds 50 percent relative cover and has higher cover than any other single grass species or it exceeds 30 percent relative cover in the herbaceous layer and pickleweed is present with less than 30 percent relative cover. In California, this alliance occurs in coastal salt marshes and inland habitats including playas, swales, and terraces along washes that are typically intermittently flooded, from 0-5,000 feet (Sawyer et al. 2009). It prefers soils that are often deep, alkaline or saline, and often have an impermeable layer making them poorly drained. When the soil is dry, the surface usually has salt accumulations (Sawyer et al. 2009). Within the study area, other species that occur in this alliance include jaumea (*Jaumea carnosa*), Pacific silverweed (*Potentilla anserina*), field sedge, dune rush and rabbitsfoot grass (*Polypogon monspeliensis*). This alliance occurs at six low-lying wetland areas near arroyo willow thickets north of Oso Flaco Creek in the Maidenform Zone.

Pacific silverweed marshes (*Argentina egedii [Potentilla anserina]*[8] Herbaceous Alliance; 0.4 acre
In this alliance, pacific silverweed is dominant or co-dominant in the herbaceous layer, exceeding 60 percent relative cover in the herbaceous canopy (Sawyer et al. 2009). In California, it occurs in seasonally flooded brackish marshes at intermediate tidal elevations from 0-500 feet (Sawyer et al. 2009). Within the study area, it occurs only at two locations near Oso Flaco Creek in the Oso Flaco Lake and Creek Zone.

American bulrush marsh (*Schoenoplectus americanus* Herbaceous Alliance); 0.2 acre
In this alliance, American bulrush is dominant or co-dominant in the herbaceous layer, exceeding 10 percent absolute cover or 50 percent relative cover. In California, it occurs along streams, around ponds and lakes, in sloughs, swamps and fresh and brackish marshes, and in roadside ditches from 150-5,000 feet (Sawyer et al. 2009). It prefers soils that have a high organic content and are poorly aerated (Sawyer et al. 2009). Within the study area, this alliance occurs only at two locations along the foredunes of the South Oso Flaco Zone.

Duckweed blooms [*Lemna (minor)* and Relatives Provisional Herbaceous Alliance], 36 acres (area of Oso Flaco Lake)
In this alliance, duckweed (*Lemna* spp.), duckmeat (*Spirodela* spp.), water meal (*Wolffia* spp.), or bogmat (*Wolffiella* spp.) are dominant herbs on the water surface or characteristically present in the herbaceous layer. In California, this alliance occurs in seasonal and perennial freshwater habitats with still water or on ground surfaces after water levels have dropped, from 0-7,550 feet (Sawyer et al. 2009). Within the study area, this alliance occurs only on the surface of Oso Flaco Lake in the Oso Flaco Lake and Creek Zone. Only *Lemna minor* is present in the study area.

[8] This species is known as *Potentilla anserina* in Baldwin et al. (2012).

District Alliances

Field sedge meadows (*Carex praegracilis* Herbaceous Alliance); 4 acres
In this alliance, field sedge is dominant or co-dominant in the herbaceous layer, exceeding 50 percent relative cover. In California, this alliance usually occurs in wetlands in a variety of coastal habitats between 0-9,000 feet (Calflora 2013). In the study area, this alliance occurs in both the fore- and backdunes in four small patches, including one in the mid-portion of the Dunes Preserve Zone surrounded by arroyo willow thickets, one in the midwest portion of the Phillips 66 Leasehold Zone at the edge of California sandaster mats and silver dune lupine–mock heather scrub, and two on the foredunes of the South Oso Flaco Zone near bare sand, silver dune lupine–mock heather scrub, and wax myrtle scrub.

Jaumea mats (*Jaumea carnosa* Herbaceous Alliance); 0.1 acres
In this alliance, jaumea is dominant in the herbaceous layer, exceeding 50 percent relative cover. In California, this alliance usually occurs in wetlands in coastal and salt marsh habitats, from 0-15 feet (Calflora 2013). Within the study area, it occurs only in three small patches in the northern foredunes of the South Oso Flaco Zone.

3.4 NON-NATIVE ALLIANCES

Non-native alliances are distinguished by dominant plants not native to California or those that are native to California but are not endemic to the study area. These alliances fall into three basic categories, including those that are not native to California and are invasive, those that are not native to California but are not invasive, and those that are native to California but are not native to the study area (i.e., the study area is outside of the natural range of these species). Non-native or naturalized alliances in the study area include six forest or woodland alliances, one shrubland alliance and eight herbaceous alliances.

The California Invasive Plant Council (Cal-IPC) defines non-native invasive plants as species that evolved in one region of the globe and are transported by humans to another region, where they flourish and crowd out native vegetation and wildlife that use native vegetation as a resource (Cal-IPC 2013a). Non-native invasive plants typically form monocultures that cover large areas. Non-native alliances in the study area with dominant plants listed as having a "Moderate" or "High" invasive potential by the Cal-IPC (Cal-IPC 2013b) include the following:

- Eucalyptus groves (*Eucalyptus globulus* Semi-Natural Woodland Stands Alliance) – blue gum eucalyptus is listed as moderate invasive potential;
- Pepper tree or myoporum groves (*Schinus molle*/*terbinthifolius-Myoporum laetum* Semi-Natural Woodland Stands Alliance) – myoporum is listed as moderate invasive potential;
- European beach grass swards Semi-Natural Herbaceous Alliance – European beach grass is listed as high invasive potential;
- Annual brome grasslands (*Bromus diandrus-Brachpodium distachyon* Semi-Natural Herbaceous Alliance) – ripgut brome (*Bromus diandrus*) is listed as moderate invasive potential;

- Iceplant mats (*Carpobrotus edulis* or other iceplants Semi-Natural Herbaceous Alliance) – freeway iceplant (*Carpobrotus edulis*) is listed as high invasive potential and sea fig (*C. chilensis*) is listed as moderate invasive potential; and
- Perennial veldt grass stands Semi-Natural Herbaceous Alliance – perennial veldt grass is listed as high invasive potential.

In addition, although Russian wheat grass (*Elymus farctus*) (i.e., the dominant plant in Russian wheat grass stands) is not listed on the Cal-IPC Inventory, this species behaves as an invasive species where it occurs in the study area and it is; therefore, considered an invasive species in the context of this study.

The study area contains a few non-native alliances that do not fit the description of invasive species. Not all species alien to California are invasive, and some have only a limited potential to be invasive (e.g., occurs only in limited areas, co-occurs with native species, and/or occurs at low densities). The dominant species in the golden wattle stands (*Acacia longifolia* Semi-Natural Shrubland Alliance) and white sweetclover mats (*Melilotus albus* Herbaceous Alliance) alliances – golden wattle and white sweetclover, respectively – are not listed on the Cal-IPC Inventory and are non-native, but not invasive. However, white sweetclover in the study area trends toward invasive behaviors (Skinner pers. comm. 2014). European searocket (*Cakile maritime*) in the searocket sands semi-natural provisional herbaceous alliance and brass buttons (*Cotula coronopifolia*) in the fields of fat hen (*Atriplex prostrate*) and brass buttons semi-natural herbaceous alliance are listed by the Cal-IPC as having "Limited" invasive potential (i.e., they are invasive but have minor ecological impact) (Cal-IPC 2013b). These species were observed to occur in few parts of the study area and/or co-occur with native species.

Alliances with dominant plants native to parts of California, but not endemic to the study area include Monterey cypress (*Callitropsis [Hesperocyparis] macrocarpa*) in the Monterey cypress woodland stands alliance, beach pine (*Pinus contorta* ssp. *contorta*) in the beach pine forest alliance, Monterey pine (*Pinus radiata*) in the Monterey pine forest alliance, and Torrey pine (*Pinus torreyana*) in the Torrey pine woodland special stands alliance. Monterey cypress, Monterey pine, and Torrey pine have a limited natural range and are CRPR 1B plants within their natural range. However, species rare in their natural range may be invasive elsewhere in the state. For example, Monterey cypress and Monterey pine are listed in Table 2: Species Native to Part of California, but Invasive in Other Parts of the State, of the 2006 Cal-IPC Inventory (Cal-IPC 2006). Torrey pine and beach pine are not native to the study area, but are also not invasive. Each of these alliances occurs in small areas of the study area, with each occurrence limited from one to a few trees. Although some of these occurrences are too small to be "groves," "forests," or "stands," all trees were mapped in the study area since there are so few and many are not endemic to the study area. It is likely that these trees were planted in the study area, or escaped from nearby developed areas.

All of the non-native alliances occur primarily or exclusively in uplands except for fat hen and brass button fields, beach pine forests, and searocket sands. Brass buttons is an OBL plant (USACE 2012) occurring only in wetlands. Beach pine and European searocket are listed as FAC (USACE 2012) and they are equally likely to occur in either wetland or upland areas.

Non-native alliances occupying 10 or more acres in the study area include eucalyptus groves, golden wattle stands, European beach grass swards, perennial veldt grass stands, and iceplant mats. Non-native alliances and their location in the study area are described in detail below.

3.4.1 NON-NATIVE OR NATURALIZED FOREST OR WOODLAND ALLIANCES

MCV2 Alliances

Eucalyptus groves (*Eucalyptus globulus* Semi-Natural Woodland Stands); 16 acres
In this alliance, blue gum eucalyptus, red river gum (*E. camaldulensis*), or other gum are dominant in the tree canopy, exceeding 80 percent relative cover. In California, eucalyptus is a non-native species from Australia that was planted as trees, groves, and windbreaks and has naturalized on uplands and stream courses, from 0-1,000 feet (Sawyer et al. 2009). In the study area, this alliance occurs at several locations in the Pismo Zone, including several eucalyptus groves and individual trees at North Beach Campground, and two trees near the interpretive trail and one south of Arroyo Grande Creek. It also occurs at the Eucalyptus Tree vegetation island in the Vegetation Island Zone, and there are groves adjacent to Highway 1, developed areas, and farmland in the northeastern and southeastern corners of the Phillips 66 Leasehold Zone. Blue gum eucalyptus is the only eucalyptus species in the study area.

Monterey pine forest (*Pinus radiata* Forest Alliance); 7 acres
In this alliance, Monterey pine is dominant or co-dominant in the tree canopy, exceeding 25 percent cover. In California, this alliance occurs on maritime terraces and headlands on well-drained soils from 0-1,000 feet (Sawyer et al. 2009). Monterey pine plantations occur in California and worldwide, but natural stands of Monterey pine exist in only three disjunct areas in mainland California which are near Año Nuevo, on the Monterey Peninsula, and in Cambria (Sawyer et al. 2009). Although Monterey pine is considered a CRPR 1B.1 plant where it is naturally occurring (CNPS 2013), it is not endemic to the study area. Within the study area, it occurs at scattered locations in both the fore- and backdunes at low densities, often with only a single tree at any given location. Specifically, it occurs at a few locations in the Pismo Zone and the Dunes Preserve Zone within the European beach grass swards alliance. In addition, one single tree occurs in the south end of the Phillips 66 Leasehold Zone and one single tree occurs in the Maidenform Zone amongst the arroyo willow thickets.

Torrey pine stands *Pinus torreyana* (Woodland Special Stands); 3 acres
In this alliance, Torrey pine is dominant in the tree canopy or is emergent over a shrub canopy. In California, it occurs in sandstone or diatomaceous derived soils on coastal bluffs, maritime terraces and slopes, from 0-600 feet (Sawyer et al. 2009). Torrey pine is the rarest pine in North America, occurring naturally only in the vicinity of Del Mar and Torrey Pines State Reserve in San Diego County and on Santa Rosa Island in Santa Barbara County (Sawyer et al. 2009). Although both subspecies (*P. torreyana* ssp. *torreyana* and *P. torreyana* ssp. *insularis*) are CRPR 1B.2 plants (CNPS 2013), *P. torreyana* is not native to the study area. Within the study area, there are scattered Torrey pines in the Pismo Zone near the interpretive trail and Oceano Campground, and one individual tree in the western portion of the Dunes Preserve Zone.

Monterey cypress stands (*Callitropsis [hesperocyparis][9] macrocarpa* Woodland Alliance); 1 acres

In this alliance, Monterey cypress is dominant or co-dominant in the tree canopy (Sawyer et al. 2009). In California, it occurs in granitic derived soils in headlands and sheltered areas near the coast from 0-100 feet (Sawyer et al. 2009). This species is a CRPR 1B.2 species in its natural range, with only two native Monterey cypress groves on the Monterey Peninsula (Sawyer et al. 2009). Nevertheless, it has invasive tendencies in many places along the California coast (Sawyer et al. 2009). In the study area, this alliance occurs at only a few scattered locations near the interpretive trail and near Le Sage Riviera Golf Course in the Pismo Zone, often with only a single tree at any given location. This species is also a nursery plant and was likely planted where it occurs in the study area.

Pepper tree or myoporum groves (*Schinus (molle, terbinthifolius)-Myoporum laetum* Semi-Natural Woodland Stands); 1 acre

In this alliance, Peruvian pepper tree (*S. molle*), Brazilian pepper tree (*S. terbinthifolius*), or myoporum are dominant in the tree canopy, exceeding 80 percent Peruvian pepper tree cover or 60 percent Brazilian pepper tree or myoporum relative cover (Sawyer et al. 2009). In California, this alliance occurs in coastal canyons, washes, slopes, riparian areas, and roadsides (Sawyer et al. 2009), from 0-650 feet (Calflora 2013). In the study area, it is only present between the North Beach Campground and Highway 1 in the Pismo Zone, and was likely planted there. Only myoporum is present in the study area.

Beach pine forest (*Pinus contorta* ssp. *contorta* Forest Alliance); 0.1 acre

In this alliance, beach pine is dominant in the tree canopy, exceeding 50 percent relative cover. In California, it occurs in coastal dunes, seaside bluffs, and exposed rocky headlands with salt spray and winds, from 0-500 feet (Sawyer et al. 2009). It prefers soils that are skeletal, sandy, and may be excessively or poorly drained; some may be temporarily flooded (Sawyer et al. 2009). This species is native to the north coast of California (Sawyer et al. 2009), but is not endemic to the study area. Within the study area, this alliance is limited to three individual trees at three different locations, including one north of Pier Avenue and one near Strand Way in the Pismo Zone, and one at the BBQ Flats vegetation island in the Vegetation Island Zone.

District Alliances

No unique non-native forest or woodland District alliances occur in the study area.

3.4.2 NON-NATIVE SHRUBLAND ALLIANCE

MCV2 Alliances

No unique non-native shrubland MCV2 alliances occur in the study area.

District Alliances

[9] This species is known as *Hesperocyparis macrocarpa* in Blake et al. (2012).

Golden wattle stands (*Acacia longifolia* Semi-Natural Shrubland Alliance); 40 acres
In this alliance, golden wattle is dominant, exceeding 80 percent relative cover in the shrub or tree canopy. Golden wattle is a small tree introduced from Australia and naturalized in California (Calflora 2013). Within the study area, this alliance occurs in the backdunes, usually adjacent to arroyo willow thickets, silver dune lupine–mock heather scrub, or perennial veldt grass stands. More specifically, there is a large stand north of Pier Avenue as well as several other smaller stands in the Pismo Zone, a stand in the middle of the Acacia vegetation island in the Vegetation Island Zone, and several small stands scattered throughout the Phillips 66 Leasehold Zone.

3.4.3 NON-NATIVE HERBACEOUS ALLIANCES

MCV2 Alliances

European beach grass swards (*Ammophila arenaria* Semi-Natural Herbaceous Stands); 194 acres
In this alliance, European beach grass is dominant in the herbaceous layer, exceeding 80 percent relative cover. In California, it occurs on dunes of coastal bars, foredunes, river mouths, and spits along the immediate coastline, from 0-65 feet (Sawyer et al. 2009). This species, originally from Europe, was introduced across the Atlantic and Pacific coasts of North America to stabilize shifting sand dunes. It is now the predominant vegetation type in many Pacific coast dune systems (Sawyer et al. 2009). European beach grass is highly invasive, and significantly reduces the diversity of plant and wildlife species in native dune systems. Within the study area, the largest European beach grass swards occur over large areas of the foredunes of the Pismo Zone, the western half of the Dunes Preserve Zone, and in the South Oso Flaco Zone, although it occupies smaller areas in scattered locations elsewhere as well.

Iceplant mats (*Carpobrotus edulis* or Other Ice Plants Semi-Natural Herbaceous Stands); 38 acres
In this alliance, freeway ice plant, sea fig, and other ice plant taxa are dominant in the herbaceous canopy. In California, it occurs on bluffs, disturbed land, sand dunes of the immediate coastline, coastal and alkaline terraces, from 0-330 feet (Sawyer et al. 2009). Within the study area, this alliance is widespread in both the foredunes and backdunes, and occurs in homogenous patches at scattered locations in all of the vegetation zones of the study area. Freeway iceplant, sea fig, and narrow-leaved iceplant (*Conicosia pugioniformis*) are all present in the study area. All three of these iceplant species are non-native and invasive.

Searocket sands (*Cakile maritima* Semi-Natural Provisional Herbaceous Alliance); 6 acres
In this alliance, American searocket (*Cakile edentula*) or European searocket are dominant in the herbaceous layer (Sawyer et al. 2009). In California, this alliance occurs on bare sand at the leading edge of the beach, within reach of the storm tides and extreme lunar tides greater than 16 feet (Sawyer et al. 2009). European searocket is a non-native species introduced from Europe, but has limited invasive potential (Cal-IPC 2013b). It only occurs sparsely along the leading edge of beaches (Sawyer et al. 2009). Within the study area, this alliance occurs intermittently on the foredunes in the Pismo Zone from near Pismo Lagoon to near Arroyo Grande Creek. European searocket also commonly occurs in the dune mat alliance, but is not dominant in these areas. Only European searocket is present in the study area.

Annual brome grasslands (*Bromus diandrus-Brachpodium distachyon* Semi-Natural Herbaceous Stands); 1 acre
In this alliance, ripgut brome, soft chess (*B. hordeaceus*), or false brome (*Brachpodium distachyon*) are dominant or co-dominant with other non-natives in the herbaceous layer (Sawyer et al. 2009). In California, this alliance occurs in all topographic settings in foothills, waste places, rangelands and openings in woodlands, from 0-7,220 feet (Sawyer et al. 2009). Ripgut brome and soft chess are introduced from Europe and are now widespread in California. This alliance accounts for the largest acreage of grassland vegetation in cismontane California (Sawyer et al. 2009). This alliance is not widespread in the study area, occurring only in one small area in the backdunes of the South Oso Flaco Zone. Ripgut brome and soft chess are both present in the study area.

Fields of fat hen and brass buttons (*Atriplex prostrata-Cotula coronopifolia* Semi-Natural Herbaceous Stands); 0.5 acre
In this alliance, fat hen and/or brass buttons are dominant or co-dominant in the herbaceous layer, exceeding 60 percent relative cover (Sawyer et al. 2009). Although neither species in this alliance is native to California, they have limited invasive potential (Cal-IPC 2013b). In California, this alliance occurs in seasonally flooded saline mudflats and brackish marshes from 0-1000 feet (Sawyer et al. 2009). It prefers soils that are alluvium (Sawyer et al. 2009). Within the study area, this alliance only occurs near Oso Flaco Creek (Oso Flaco Lake and Creek Zone). Although both species occur in the study area, only brass buttons exceeds 60 percent relative cover in the herbaceous layer.

District Alliances

Perennial veldt grass stands (*Ehrharta calycina* Semi-Natural Herbaceous Stands), 90 acres
In this alliance, perennial veldt grass exceeds 50 percent relative cover in the herbaceous layer, and shrubs are sparse or absent. Perennial veldt grass is a non-native invasive perennial herb found in disturbed grasslands, roadsides, and coastal habitats in California's south and central west regions. Perennial veldt grass is spreading very rapidly in the central California coast region, where it invades dunes and shrublands. It was originally imported to California for use as a pasture grass and for erosion control. Perennial veldt grass often displaces native vegetation and converts coastal scrub and chaparral communities to grasslands (Cal-IPC 2013c). Within the study area, this alliance occurs throughout the entire Phillips 66 Leasehold Zone and backdunes of the South Oso Flaco Zone, either with or without a silver dune lupine–mock heather over story. Only areas without a shrub over story are classified under this alliance.

Russian wheat grass stands (*Elymus farctus* Semi-Natural Herbaceous Stands); 9 acres
In this alliance, Russian wheat grass exceeds 50 percent relative cover in the herbaceous layer. Russian wheat grass is a perennial herb introduced from Eurasia and naturalized in California (Calflora 2013). Within the study area, this alliance is patchily distributed at scattered locations along the foredunes of the Pismo Zone, the Dunes Preserve Zone, and the 7.5 Revegetation Area in the Vegetation Island Zone.

White sweetclover mats (*Melilotus albus* Semi-Natural Herbaceous Alliance); 0.3 acre

In this alliance, white sweetclover is dominant exceeding 50 percent relative cover in the herbaceous layer. White sweetclover is an annual or biennial herb first introduced from Eurasia or soil reclamation and as a nectar source for honey bees. It was later used as livestock forage and to stabilize roadside cuts (Gucker 2009). In California, it occurs in a variety of disturbed habitats from 0-5,000 feet (Gucker 2009). Within the study area, this alliance occurs along the western edge of Pismo Lagoon in the Pismo Zone and in the Dunes Preserve Zone.

4.0 VEGETATION ZONES IN THE STUDY AREA

The eight vegetation zones in the study area contain many vegetation alliances (Table 4-1). Each vegetation zone is described further in this chapter.

Table 4-1. Summary of the Vegetated Parts of the Study Area

Vegetation Zone	Vegetation Alliances
Pismo Zone	Forest or Woodland: eucalyptus groves, Monterey cypress stands, pepper tree or myoporum groves, beach pine forests, Monterey pine forests, Torrey pine stands, coast live oak woodlands Shrubland: golden wattle stands, silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets Herbaceous: dune mats, European beach grass swards, iceplant mats, searocket sands, Russian wheat grass stands, salt rush swales, white sweetclover mats, pickleweed mats, California bulrush marsh
Dunes Preserve Zone	Forest or Woodland: eucalyptus groves, Monterey pine forests, Torrey pine stands, black cottonwood forests, coast live oak woodlands Shrubland: coyote brush scrub, silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets, Blochman's groundsel scrub Herbaceous: dune mats, European beach grass swards, iceplant mats, field sedge meadows, California sandaster mats, Russian wheat grass stands, salt rush swales, crisp monardella sands, California bulrush marsh, searocket sands, white sweetclover mats
Vegetation Island Zone	
Acacia	Shrubland: golden wattle stands, silver dune lupine–mock heather scrub, arroyo willow thickets Herbaceous: iceplant mats, California sandaster mats
BBQ Flats	Forest or Woodland: beach pine forests Shrubland: deer weed scrub, silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets Herbaceous: salt rush swales, crisp monardella sands
BBQ Flats South	Shrubland: silver dune lupine–mock heather scrub, arroyo willow thickets, Blochman's groundsel scrub, poison oak scrub Herbaceous: dune mats, salt rush swales
Bellybutton	Shrubland: arroyo willow thickets
Big Mac	Shrubland: arroyo willow thickets
Boyscout North	Shrubland: silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets Herbaceous: salt rush swales, crisp monardella sands
Boyscout Camp	Shrubland: coyote brush scrub, silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets Herbaceous: iceplant mats, field sedge meadows, California sandaster mats, perennial veldt grass stands, salt rush swales, crisp monardella sands
Caterpillar Hill	Shrubland: arroyo willow thickets Herbaceous: crisp monardella sands
Cottonwood	Forest or Woodland: black cottonwood forests Shrubland: silver dune lupine–mock heather scrub, arroyo willow thickets, Blochman's groundsel scrub Herbaceous: dune mats
Elvis	Shrubland: arroyo willow thickets
Eucalyptus North	Shrubland: silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo

	willow thickets, Blochman's groundsel scrub Herbaceous: salt rush swales
Eucalyptus South	Shrubland: silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets, Blochman's groundsel scrub Herbaceous: dune mats, California sandaster mats, salt rush swales
Eucalyptus Tree	Forest or Woodland: eucalyptus groves Shrubland: coyote brush scrub, silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets, Blochman's groundsel scrub Herbaceous: iceplant mats, California sandaster mats
Heather	Forest or Woodland: black cottonwood forests Shrubland: coyote brush scrub, wax myrtle scrub, arroyo willow thickets, Blochman's groundsel scrub, poison oak scrub Herbaceous: California sandaster mats, salt rush swales
Humpback	Shrubland: arroyo willow thickets
Indian Midden	Shrubland: silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets, Blochman's groundsel scrub, poison oak scrub Herbaceous: California sandaster mats, crisp monardella sands
Indian Midden South	Shrubland: silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets Herbaceous: salt rush swales, crisp monardella sands
Moymell	Shrubland: silver dune lupine–mock heather scrub, arroyo willow thickets, Blochman's groundsel scrub
Pavilion Hill	Forest or Woodland: black cottonwood forests Shrubland: coyote brush scrub, silver dune lupine–mock heather scrub, arroyo willow thickets, Blochman's groundsel scrub, poison oak scrub Herbaceous: dune mats, European beach grass swards, iceplant mats
Pipeline	Shrubland: silver dune lupine–mock heather scrub, arroyo willow thickets, coyote brush scrub, poison oak scrub Herbaceous: dune mats, iceplant mats, California sandaster mats, salt rush swales, crisp monardella sands
Tabletop	Shrubland: silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets Herbaceous: salt rush swales, crisp monardella sands
Wallflower	Shrubland: arroyo willow thickets Herbaceous: crisp monardella sands
Worm Valley	Shrubland: coyote brush scrub, silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets Herbaceous: iceplant mats, salt rush swales
7.5 Revegetation Area	Herbaceous: dune mats, iceplant mats, Russian wheat grass stands
Phillips 66 Leasehold Zone	Forest or Woodland: eucalyptus groves, coast live oak woodlands, Monterey pine forests Shrubland: golden wattle stands, coyote brush scrub, California coffee berry scrub, silver dune lupine–mock heather scrub, coastal brambles, arroyo willow thickets, wax myrtle scrub, Blochman's groundsel scrub, poison oak scrub, California sagebrush-black sagebrush scrub, giant coreopsis scrub Herbaceous: European beach grass swards, iceplant mats, field sedge meadows, California sandaster mats, perennial veldt grass stands, salt rush swales, crisp monardella sands, tall stephanomeria meadows, cattail marshes
North Oso Flaco Zone	Shrubland: coyote brush scrub, arroyo willow thickets Herbaceous: dune mats, European beach grass swards, iceplant mats, Russian wheat grass stands, salt rush swales, California bulrush marshes, fields of fat hen and brass buttons
Maidenform Zone	Forest or Woodland: Monterey pine forests, black cottonwood forests Shrubland: giant coreopsis scrub, deer weed scrub, silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets, Blochman's groundsel

	scrub, coyote brush scrub Herbaceous: Iceplant mats, California sandaster mats, salt rush swales, California bulrush marshes, crisp monardella sands
Oso Flaco Lake and Creek Zone	Forest or Woodland: Monterey pine forests, black cottonwood forests Shrubland: coyote brush scrub, silver dune lupine–mock heather scrub, wax myrtle scrub, coastal brambles, arroyo willow thickets Herbaceous: dune mats, European beach grass swards, iceplant mats, fields of fat hen and brass buttons, California sandaster mats, salt grass flats, salt rush swales, crisp monardella sands, field sedge meadows, Pacific silverweed marshes, American bulrush marshes, California bulrush marshes, mats of bur-reed leaves, cattail marshes
South Oso Flaco Zone	Forest or Woodland: black cottonwood forests, coast live oak woodlands Shrubland: coyote brush scrub, giant coreopsis scrub, California coffee berry scrub, silver dune lupine–mock heather scrub, wax myrtle scrub, coastal brambles, arroyo willow thickets, Blochman's groundsel scrub, poison oak scrub Herbaceous: dune mats, European beach grass swards, annual brome grasslands, iceplant mats, perennial veldt grass stands, wedge-leaved horkelia–California spine flower meadows, jaumea mats, salt rush swales, giant wildrye grasslands, crisp monardella sands, American bulrush marshes, California bulrush marshes, mats of bur-reed leaves, cattail marshes

4.1 PISMO ZONE

The Pismo Zone is narrower than the vegetation zones located to the south, and is adjacent to more development than the other vegetation zones, with residences, campgrounds and R.V. parks, a golf course, and the Oceano County Airport adjacent to the beach to the east (Figure 4-1). As such, non-native vegetation types are more prominent in the Pismo Zone. In addition, an area of unvegetated beach stretches from the ocean to the foredunes. The foredune plant community consists primarily of the native dune mat alliance and non-native European beach grass swards, iceplant mats, searocket sands and Russian wheat grass stands. The backdune plant community is dominated by native silver dune lupine–mock heather scrub and arroyo willow thickets. There are a number of non-native trees scattered throughout backdunes in the Pismo Zone, including blue gum eucalyptus, Monterey cypress, myoporum, beach pine, Monterey pine, and Torrey pine. A few areas in the backdunes of the Pismo Zone support California bulrush marsh. Minor alliances occurring in the backdunes include wax myrtle scrub, salt rush swales, white sweetclover mats, and pickleweed mats. Special-status plants (see Chapter 5) observed in the Pismo Zone during 2012 surveys include red sand verbena (*Abronia maritima*), Monterey Coast paintbrush (*Castilleja latifolia*), Blochman's leafy daisy (*Erigeron blochmaniae*), suffrutescent wall flower (*Erysimum suffrutescens*), crisp monardella (*Monardella undulata* ssp. *crispa*), and Blochman's groundsel (*Senecio blochmaniae*) (Table 5-1). The vegetation in the Pismo Zone is described in more detail below, moving through the geography from north to south.

4.1.1 PISMO PIER

This area is centered on the Pismo Pier and consists primarily of unvegetated sand. Vegetated areas predominantly consist of large swaths of non-native iceplant mats at the eastern edges of the sand between the beach and developed areas adjacent to the beach (Figure 4-1).

4.1.2 PISMO LAGOON

The Pismo Lagoon is a body of water located at the mouth of Pismo Creek which is separated from the ocean by sand bars during low flow periods (Figure 4-1). The eastern side of the lagoon adjacent to developed areas is primarily dominated by iceplant mats, with a small area of silver dune lupine–mock heather scrub. The western side of the lagoon consists predominantly of areas dominated by beach bur (i.e., dune mat alliance) or non-native European searocket (i.e., searocket sands alliance). In addition, smaller areas of vegetation at the Pismo Lagoon consist of white sweetclover mats, salt rush swales, and non-native Russian wheat grass stands. There is a wide area of unvegetated sand bordering the ocean in this area.

4.1.3 CARPENTER CREEK

This area includes the North Beach Campground and the northern part of the Le Sage Riviera Golf Course, as well as beach areas to the west of these sites. There is a wide stretch of unvegetated sand bordering the ocean in this area which is bordered to the east by sandy areas dominated by non-native iceplant mats or European sea rocket (i.e., searocket sands alliance). To the east, there are several non-native eucalyptus groves and native pickleweed mats interspersed with trails and campsites. Listed as they occur from north to south, smaller areas of vegetation near Carpenter Creek are dominated by myoporum (i.e., pepper tree or myoporum groves alliance), arroyo willow thickets, silver dune lupine–mock heather scrub, and Monterey cypress trees.

4.1.4 GRAND AVENUE

This area is centered on Grand Avenue and runs parallel to the Le Sage Riviera Golf Course north of Grand Avenue (Figure 4-1). The western most portion of this area consists of unvegetated sand, while the eastern section is mostly dominated by non-native species including iceplant (i.e., iceplant mats alliance) European sea rocket (i.e., searocket sands alliance), Russian wheat grass stands, and European beach grass swards dominate smaller areas. Native silver dune lupine–mock heather scrub is patchily distributed near the golf course and around Grand Avenue, and there is an arroyo willow thicket south of the intersection of Grand Avenue and Highway 1.

4.1.5 SOUTH OF GRAND AVENUE

This area consists of three primary sections – an unvegetated strip of sand adjacent to the ocean, a foredune area dominated mostly by European beach grass swards, and a backdune area dominated by silver dune lupine–mock heather scrub and arroyo willow thickets. Minor components of the middle section dominated by European beach grass swards consist of other non-native elements including patches of iceplant mats, golden wattle stands, Russian wheat

grass stands, and a single Monterey pine. In addition, there is a large California bulrush marsh in the backdunes amongst the willows.

4.1.6 INTERPRETIVE TRAIL

The interpretive trail area consists of three primary sections- an unvegetated strip of sand adjacent to the ocean, a wide area consisting primarily of silver dune lupine–mock heather scrub, and a large arroyo willow thicket bordering Highway 1 (Figure 4-1). Within the silver dune lupine–mock heather scrub, there are a few scattered Monterey pines, Torrey pines, and small arroyo willow thickets, sometimes with wax myrtle scrub. There are also a several scattered patches of non-native alliances including iceplant mats, Russian wheat grass stands, golden wattle stands, eucalyptus groves, and myoporum groves. There is also a California bulrush marsh amongst the willows in this area.

4.1.7 PIER AVENUE

The area north of Pier Avenue consists of an unvegetated strip of sand adjacent to the ocean, a narrow band of European beach grass swards, a wide golden wattle stand, and then a series of arroyo willow thickets bordering development in the eastern portion of the area (Figure 4-1). There are scattered Monterey pines, Torrey pines, Monterey cypress, and blue gum eucalyptus trees at the eastern edge of the golden wattle stand, as well as a single coast live oak. In addition, there are two small areas of silver dune lupine–mock heather scrub, including one at the northern side of the golden wattle stand and one south of Pier Avenue.

4.1.8 STRAND WAY

This area extends from south of Pier Avenue to just south of Strand Way, and is bisected by a developed area with streets and residences (Figure 4-1). The area west of the housing consists of an unvegetated strip of sand adjacent to the ocean, and a narrow band of vegetation dominated by beach bur (i.e., dune mat alliance) and silver dune lupine–mock heather scrub. The area east of the housing consists of European beach grass swards interspersed with arroyo willow thickets and wax myrtle scrub. There is also a large California bulrush marsh in this area. The area south of the housing is dominated by non-native alliances including iceplant mats, Russian wheat grass stands, and searocket sands. The area south of Strand Way (southeast of the housing) is vegetated primarily with arroyo willow thickets and California bulrush marshes.

4.2 DUNES PRESERVE ZONE

Vegetation in the Dunes Preserve Zone is concentrated along the western and eastern borders of the Dunes Preserve, with a large swath of unvegetated sand in the middle of the Dunes Preserve (Figure 4-2). The portion of Pismo SB adjacent to the Dunes Preserve is open to either street legal vehicles or OHV use, and is unvegetated. Special-status plants (see Chapter 5) observed in the Dunes Preserve Zone during 2012 surveys include red sand verbena, Nuttall's milkvetch (*Astragalus nuttallii* var. *nuttallii*), Monterey Coast paintbrush, Blochman's leafy daisy, suffrutescent wall flower, fuzzy prickly phlox (*Linanthus californicus*), crisp monardella, San

Luis Obispo monardella (*Monardella undulata* ssp. *undulata*), California spine flower (*Mucronea californica*), and Blochman's groundsel.

The northern portion of this zone near Arroyo Grande Creek consists of an unvegetated strip of sand adjacent to the ocean, patches of searocket sands. European beach grass swards interspersed with arroyo willow thickets are present throughout the northern portion and a largely unvegetated sand area is present in the easternmost portion of this section (Figure 4-2). In addition, there is a moderately sized area of silver dune lupine–mock heather scrub in the northeastern portion of this section, and several smaller patches of silver dune lupine–mock heather scrub interspersed throughout the willows. There is a California bulrush marsh just south of Strand Way, with a small area of California blackberry (i.e., coastal brambles alliance) and coyote brush scrub nearby. There is also one Monterey pine tree, one small eucalyptus grove, and one small black cottonwood forest in this section amongst the willows. Salt rush swales and crisp monardella sands occur on the eastern edge of the vegetated area.

In the western portion of the Dunes Preserve, the predominant vegetation types are non-native European beach grass swards closer to the ocean and native arroyo willow thickets bordering the European beach grass to the east. There are smaller patches of iceplant mats, Russian wheat grass stands, searocket sands, or dune mats amongst the European beach grass swards. In addition, areas of silver dune lupine–mock heather scrub, wax myrtle scrub, and black cottonwood forest occur amongst the willows. Salt rush swales occur mostly along the eastern edges of the willows, but in a few other scattered locations as well. There is also one Torrey pine and one Monterey pine growing amongst the willows.

The eastern portion of the Dunes Preserve borders farmland and developed land and is largely occupied by silver dune lupine–mock heather scrub and arroyo willow thickets. There are several small wetlands occupied by black cottonwood forest, California bulrush marsh, field sedge meadows, and salt rush swales amongst the willows. A few areas are occupied by minor shrubland alliances including coyote brush scrub and Blochman's groundsel scrub. Non-native European beach grass swards occur at several locations amongst the silver dune lupine–mock heather scrub. Some sandy edges of the vegetation are colonized by crisp monardella. There is one coast live oak along the northeastern border of this portion of the Dunes Preserve.

4.3 VEGETATION ISLAND ZONE

This zone contains 24 "vegetation islands" ranging in size from 500 square feet to 50 acres (Figure 4-3). No vegetation exists in the open riding and camping area because any vegetation which is not fenced off is not protected from the effects of OHV use and; therefore, does not grow in these areas. Vegetation in this zone is restricted to the eastern side of the dunes, (i.e., the side sheltered from the wind on the leeward side). Species diversity on the vegetation islands varies dramatically according to the size of the islands, with smaller islands containing just a few species while larger islands may contain dozens of species. Restoration efforts have occurred at a number of vegetation islands to try to increase their size and habitat quality. Restoration consists of re-vegetating open dunes with native plants such as silver dune lupine and Blochman's groundsel and control of invasive species such as jubata grass (*Cortaderia jubata*) (Stephanie Little, pers. comm., 2012). With the exception of the 7.5 Revegetation Area, all of the vegetation

islands are located in the backdune area and are dominated by woody vegetation. The 7.5 Revegetation Area is in the foredunes and is dominated by herbaceous vegetation. Special-status plants (see Chapter 5) observed in the Vegetation Island Zone during 2012 surveys include red sand verbena, Monterey Coast paintbrush, Blochman's leafy daisy, suffrutescent wall flower, southwestern spiny rush (*Juncus acutus* ssp. *leopoldii*), dunedelion (*Malacothrix incana*), crisp monardella, Hickman's popcorn flower (*Plagiobothrys chorisianus* var. *hickmanii*), and Blochman's groundsel. Each of the vegetation islands is described individually below, except for the three "Eucalyptus" islands, which are described as a group.

4.3.1 ACACIA

The vegetation at Acacia is on the east (leeward) side of an active dune approximately 40 feet high (Figure 4-3). There is actively drifting sand to the west, south, and north. Arroyo willow thickets dominate the western slope of the dune. As the name implies, the island supports an extensive stand of golden wattle, also known as acacia. Silver dune lupine–mock heather scrub occurs on the eastern half of the vegetation island. Small patches of native California sandaster mats are also present, along with non-native iceplant mats.

4.3.2 BBQ FLATS

The vegetation at BBQ Flats is on the east (leeward) side of an active dune approximately 40 feet high (Figure 4-3). Actively drifting sand lies to the west, south, and north. The slope of the dune is dominated by arroyo willow thickets. At the base of leeward side of dune, the willows spread east and wax myrtle scrub is present. An area of deer weed scrub occurs in between the willow thickets, and there is a restored area of silver dune lupine–mock heather scrub on the south side of the vegetation island. Level ground extends eastward on the north side of the restrooms that are located adjacent to this island, supporting a salt rush swale. Patches of ruderal habitat and a single beach pine are also present. Several small clumps of jubata grass are becoming established. Crisp monardella sands occur in several locations at the edges of this island.

4.3.3 BBQ FLATS SOUTH

The vegetation at BBQ Flats South is on the east (leeward) side of drifting dunes (Figure 4-3). These dunes are likely half as tall as those at BBQ Flats, being no more than 20 feet tall. Arroyo willow thickets dominate the face and base of the dune while the down-wind end of the crescent-shaped patch supports silver dune lupine–mock heather scrub. The central portion of the crescent is a flat characterized by silver dune lupine–mock heather scrub and some ruderal habitat. Also present are small patches of poison oak scrub, Blochman's groundsel scrub, dune mat, and salt rush swale.

4.3.4 BELLYBUTTON

The vegetation at Bellybutton consists of a single round arroyo willow thicket (Figure 4-3). Blochman's leafy daisy and lizard tail were the only other species recorded at this island.

4.3.5 BIG MAC

The vegetation at Big Mac consists of two very small arroyo willows thickets, perhaps consisting of only two individual plants (Figure 4-3).

4.3.6 BOYSCOUT NORTH

The vegetation at Boyscout North is on the east (leeward) side of an active dune that is approximately 60 feet tall (Figure 4-3). The eastern side of the island is dominated by silver dune lupine–mock heather scrub, while the western side of the island is dominated by arroyo willow thickets. There are smaller patches of wax myrtle scrub in the northeastern and southeastern parts of the vegetation island, and there is a salt rush swale along the eastern and northeastern borders of the island. Crisp monardella sands occur on the northeastern and southeastern edges of the island.

4.3.7 BOYSCOUT CAMP

This vegetation island is at the western (windward) end of an extensive system of backdunes leading into stabilized dune habitats (Figure 4-3). It includes the tops of high (80 feet or higher), drifting dunes and low stabilized dunes and dune slack[10]. Extensive areas of dune habitats have been restored or partially restored, with varying levels of success. Actively drifting sand lies to the west, south, and north. Portions of the site were clearly subjected to historic disturbance by OHVs.

The top of the dune and eastern slope (leeward) of the dune supports silver dune lupine–mock heather scrub. The eastern slope of the dune is dominated by arroyo willow thickets, extending into the dune slack. It also contains areas of wax myrtle scrub. The dune slack also supports extensive areas dominated by field sedge meadows and the salt rush swales on slightly more elevated sites, often with a coyote brush scrub overstory. Other native alliances present include California sandaster mats and crisp monardella sands. Non-native alliances present include iceplant mats and perennial veldt grass stands; scattered jubata grass is also present. Other species observed include desert pholisma (*Pholisma arenarium*), and straggly gooseberry (*Ribes divaricatum* var. *publiflorum*).

4.3.8 CATERPILLAR HILL

The vegetation at Caterpillar Hill consists of three small arroyo willow thickets interspersed with crisp monardella sands (Figure 4-3).

4.3.9 COTTONWOOD

This medium sized vegetation island is dominated by woody vegetation alliances (Figure 4-3). Arroyo willow thickets and black cottonwood forests form a closed-canopy woodland that covers the majority of the island. The understory includes California blackberry, poison oak, and creek clematis (*Clematis lingusticifolia*). There are also patches of Blochman's groundsel scrub and

[10]Linear depressions close to sea level in coastal dune systems.

silver dune lupine–mock heather scrub at the south end of the island. There is notable dune movement in the upwind direction (northwest), such that some of the mature woodland is being buried in sand.

4.3.10 ELVIS

The vegetation on Elvis consists of five small arroyo willow thickets (Figure 4-3). Poison oak, yarrow, and Blochman's leafy daisy were the only other species recorded at this island.

4.3.11 EUCALYPTUS NORTH

This medium-sized vegetation island is composed primarily of silver dune lupine–mock heather scrub and arroyo willow thickets, with two patches of wax myrtle scrub amongst the willows. Minor vegetation components include a small patch of Blochman's groundsel scrub and a salt rush swale on the eastern side of the island.

4.3.12 EUCALYPTUS SOUTH

This medium-sized vegetation island is composed primarily of silver dune lupine–mock heather scrub and arroyo willow thickets, with two patches of wax myrtle scrub amongst the willows. Minor vegetation components include small patches of Blochman's groundsel scrub and California sandaster mat at the southern edge of the island and a salt rush swale on the eastern side of the island.

4.3.13 EUCALYPTUS TREE

Eucalyptus tree is dominated by arroyo willow thickets with patches of wax myrtle scrub, and contains a small (approximately 3-10 trees) blue gum eucalyptus grove (Figure 4-3). The extensive arroyo willow thickets are bisected by silver dune lupine–mock heather scrub littered with decomposing silver dune lupine stems. The southwest portion of the island is protected from the wind and species found there include Heerman's lotus (*Acmispon heermannii* var. *heermannii*), Nuttall's milkvetch, and small established patches of deer weed. This island also has small patches of coyote brush scrub, Blochman's groundsel scrub, California sandaster mats, iceplant mats.

4.3.14 HEATHER

This vegetation island is oriented northwest and is densely vegetated with a thick woodland canopy primarily composed of arroyo willow thickets with patches of wax myrtle scrub (Figure 4-3). There is a small area of black cottonwood forest in the northwest corner of the island. In addition, small areas are occupied by other native alliances including coyote brush scrub, poison oak scrub, Blochman's groundsel scrub, and California sandaster mats. Salt rush swales occur at the outer edges of the island.

4.3.15 HUMPBACK

Humpback is a long and narrow, small vegetation island situated on the gradual slope of an active sand dune. It is dominated entirely by arroyo willow thickets.

4.3.16 INDIAN MIDDEN

Indian Midden is at a relatively low elevation and is protected from the wind by the surrounding sand dunes. The eastern side of the island contains silver dune lupine–mock heather scrub, while the western edge of the island contains arroyo willow thickets. There is a large patch of wax myrtle scrub on the western side of the island east of the willow thickets, and two smaller patches of wax myrtle scrub on the eastern side of the island within the silver dune lupine–mock heather scrub. There is also a salt rush swale and a California sandaster mat in the middle of the silver dune lupine-mock heather scrub. Crisp monardella sand is present on the north side of the island.

4.3.17 INDIAN MIDDEN SOUTH

Indian Midden South is a small vegetation island south of Indian Midden. The center portion of this island consists of a mix of arroyo willow thickets and wax myrtle scrub. There are two areas of silver dune lupine–mock heather scrub in the northwest and southeast parts of the island. There is a salt rush swale on the eastern edge of the island, and crisp monardella sand is present east of the swale.

4.3.18 MOYMELL

Moymell consists primarily of arroyo willow thickets and silver dune lupine–mock heather scrub, with a small patch of Blochman's groundsel scrub in the middle. A sand sheet appears to be moving into the vegetated areas, covering established arroyo willow as well as recently planted silver dune lupine.

4.3.19 PAVILION HILL

This large northwest trending vegetation island has three fairly large areas of black cottonwood forest at its center, interspersed with arroyo willow thickets. The black cottonwood forest and arroyo willow thickets are surrounded by silver dune lupine–mock heather scrub in the southern portion of the island, and European beach grass swards in the northern portion of the island. Dune mat occurs at the outer edges of the island. Small areas of coyote brush scrub, Blochman's groundsel scrub, crisp monardella sands, and iceplant mats also occur on this island.

4.3.20 PIPELINE

Pipeline is one of the larger islands and includes predominantly silver dune lupine–mock heather scrub and arroyo willow thickets. Minor alliances include coyote brush scrub, poison oak scrub, iceplant mats, crisp monardella sands, California sandaster mats, and salt rush swales. There is a small area of foredune vegetation on the western side of the island, including sand verbena and

beach bur (i.e., dune mat alliance), with abundant European searocket. The eastern end of the island exhibits a high degree of die-back of mock heather. Southern California dudleya is fairly common in the northeast section of the island. Portions of this island have been restored, and vegetative cover is quite high, particularly in the southwestern portion of the island. Other species present include desert pholisma and fascicled broomrape (*Orobanche fasciculata*). A 1994 aerial image (Google Earth 2014) of this island shows much lower vegetative cover than is present today.

4.3.21 TABLETOP

Tabletop is located on the leeward side of an active sand dune. This vegetation island has areas dominated by arroyo willow thickets interspersed with silver dune lupine–mock heather scrub. There is a small patch of wax myrtle scrub and a small salt rush swale on the southeastern side of the island. There are two areas of crisp monardella sands north and northwest of the island.

4.3.22 WALLFLOWER

Wallflower is a small vegetation island to the south of Tabletop that contains arroyo willow thickets and crisp monardella sands (Figure 4-3).

4.3.23 WORM VALLEY

Worm Valley is a medium sized island located just east of Pavilion Hill (Figure 4-3). It is separated from Pavilion Hill by a 50-80 foot OHV road. Worm Valley features vegetation along a prominent drainage and windward hill that runs in a northwest-southeast direction. The predominant vegetation type is silver dune lupine–mock heather scrub, with small areas of arroyo willow thickets, wax myrtle scrub, and iceplant mats. Worm Valley contains a salt rush swale running from the northwestern end of the site into the middle of the island. Paintbrush (*Castilleja* sp.) and Southern California dudleya are well established along with early succession species like giant eriastrum (*Eriastrum densifolium* ssp. *densifolium*) and Blochman's groundsel.

4.3.24 7.5 REVEGETATION AREA

The 7.5 Revegetation Area is a restored and area of foredune habitat dominated by beach bur and red sand verbena (i.e., dune mat alliance). The terrain consists of undulating dunes and draws. This alliance generally has low species diversity, but dunedelion, Blochman's groundsel, European sea rocket, and beach evening primrose were also recorded. Scattered shrubs in this largely herbaceous vegetation type include mock heather and lizard tail. There are small areas dominated by iceplant mats and Russian wheat grass stands.

4.4 PHILLIPS 66 LEASEHOLD ZONE

The Phillips 66 Leasehold Zone is location in large backdune complex that is dominated by silver dune lupine–mock heather scrub (Figure 4-4). Small to medium sized arroyo willow thickets are also common in this area. Small pockets of other native shrubland include wax

myrtle scrub, coyote brush scrub, California coffee berry scrub, California blackberry (i.e., coastal brambles alliance), Blochman's groundsel scrub, poison oak scrub, California sagebrush–black sagebrush scrub, and giant coreopsis scrub. In addition, small areas of the silver dune lupine–mock heather scrub are interspersed with native herbaceous alliances including California sandaster mats and salt rush swales. There is a small meadow dominated by California spine flower (i.e., wedge-leaved horkelia–California spine flower meadows alliance) surrounded by perennial veldt grass in the eastern portion of this zone. Crisp monardella sands occur at the outer edges of the complex in sparsely vegetated areas. Special-status plants (see Chapter 5) observed in the Phillips 66 Leasehold Zone during 2012 surveys include Nuttall's milkvetch, Monterey Coast paintbrush, coastal goosefoot (*Chenopodium littoreum*), paniculate tarplant (*Deinandra paniculata*), Blochman's leafy daisy, suffrutescent wall flower, Kellogg's horkelia (*Horkelia cuneata* var. *sericea*), fuzzy prickly phlox, Nipomo Mesa lupine, crisp monardella, San Luis Obispo monardella, California spine flower, Hickman's popcorn flower, sand almond (*Prunus fasciculata* var. *punctata*), and Blochman's groundsel.

Non-native and invasive species are common in the Phillips 66 Leasehold Zone. Almost the entire area is heavily invaded by perennial veldt grass in the understory. A large percentage (30-60 percent) of the spaces between the shrubs is occupied with veldt grass. The veldt grass is nearing 50 percent of the total cover in this area. There are several large stands of non-native golden wattle present in the Phillips 66 Leasehold Zone, particularly in the northeastern portion. Two small blue gum eucalyptus groves are present in the northeast and southeast corners of this zone. There is a single Monterey pine in the south end of this zone amongst the willows. Small European beach grass swards and iceplant mats also occur in scattered locations within the zone. There is also a single large coast live oak in the southern part of the zone, surrounded by a heavy perennial veldt grass understory.

There is a large cattail marsh in the southern portion of the Phillips 66 Leasehold Zone. This marsh is largely surrounded by arroyo willow thickets, with small pockets of California blackberry (i.e., coastal brambles alliance) and wax myrtle scrub. Field sedge meadows is another wetland vegetation alliance present in the midwestern portion of the zone.

The southern end of this large inland dune complex contains several areas where tall stephanomeria becomes dominant in the herbaceous layer, co-occurring with California sandaster. Although tall stephanomeria has been used in restoration plantings, the degree of dominance in localized areas indicates that it is becoming well-established. This alliance was mapped as tall stephanomeria meadows, and within the study area it only occurs in the southwestern portion of the Phillips 66 Leasehold Zone.

4.5 NORTH OSO FLACO ZONE

The North Oso Flaco Zone primarily consists of undulating dunes dominated by beach bur and sand verbena (i.e., dune mat alliance; Figure 4-5). Other common dune mat species at North Oso Flaco include Blochman's leafy daisy, Blochman's groundsel, European sea rocket, beach morning glory (*Calystegia soldanella*), beach evening primrose, seacliff buckwheat, and Pacific silverweed. Scattered shrubs in this largely herbaceous vegetation type include mock heather and lizard tail. There are a few scattered arroyo willow thickets and salt rush swales in the eastern

part of this zone. There are also several small non-native iceplant mats scattered throughout and non-native Russian wheat grass stands in the southwest part of the North Oso Flaco Zone. There is at least one extant population of the state-threatened beach spectaclepod in the dune mat vegetation, which is currently threatened in the study area by competition with iceplant. Special-status plants (see Chapter 5) observed in the North Oso Flaco Zone during 2012 surveys include red sand verbena, Nuttall's milkvetch, beach spectaclepod, Blochman's leafy daisy, suffretescent wall flower, dunedelion, and Blochman's groundsel.

A large European beach grass sward occurs south of the Oso Flaco Lake boardwalk in the North Oso Flaco Zone. There is a coyote brush scrub overstory in the area closest to the boardwalk. Small slivers of brass buttons (i.e., fields of fat hen and brass buttons alliance) and California bulrush marsh occur in the area bordering Oso Flaco Creek.

4.6 MAIDENFORM ZONE

Vegetation in this zone is dominated by a large complex of silver dune lupine–mock heather scrub (Figure 4-6). In the geographic center of the Maidenform Zone there is a large woody complex dominated by arroyo willow thickets, with wax myrtle scrub and black cottonwood forest interspersed among the willow. The woody complex is surrounded by salt rush swales as well as silver dune lupine–mock heather scrub.

A large band of silver dune lupine–mock heather scrub trends to the southeast of the woodland. Nearest the southern edge of this band, silver dune lupine dominates in unstable sand and small pockets of crisp monardella are present within the silver lupine. Mock heather dominates the band on the northern edge with California sandaster becoming co-dominant, forming patches of California sandaster mats with greater than 50 percent cover. Throughout this area, large areas of Southern California dudleya are present and appear to be competing with iceplant mats located in this area.

In the southern end of the Maidenform Zone, native alliances mapped include California sandaster mats, silver dune lupine–mock heather scrub, wax myrtle scrub, arroyo willow thickets, and field sedge meadows. Non-native alliances present include iceplant mats. A unique feature of this site, seen at two locations, is a dune slack in the stabilized dune dominated by field sedge with Blochman's leafy daisy as a co-dominant plant. A 1994 aerial image (Google Earth 2014) shows this entire site nearly devoid of any vegetation.

Small areas within the larger silver dune lupine–mock heather scrub are occupied by other vegetation alliances. Blochman's groundsel scrub occurs at two locations in the northern part of the Maidenform Zone. Deerweed scrub occurs in two less densely vegetated portions of the northern and middle parts of the Maidenform Zone. Giant coreopsis scrub occurs in the middle of the Maidenform Zone and is being invaded by iceplant. There is a single Monterey pine in the middle of the Maidenform Zone.

The southwest corner of Maidenform contains arroyo willow thickets interspersed with wetland. There is a small amount of wax myrtle scrub mixed in with the willows. There are some wetlands within the willows supporting salt grass flats, salt rush swales, and California bulrush

marshes. Other wetland plants that occur in these wetlands included marsh pennywort (*Hydrocotyle* sp.), yerba mansa (*Anemopsis californica*), jaumea, southern goldenrod (*Solidago confinis*), field sedge, low bulrush (*Isolepis cernua*), and alkali bulrush (*Bolboschoenus maritimus*). There is a small area occupied by coyote brush scrub at the southwestern border of this zone.

4.7 OSO FLACO LAKE AND CREEK ZONE

4.7.1 OSO FLACO CREEK

The portion of Oso Flaco Creek in the study area extends from the mouth of the creek at the shoreline to approximately one mile upstream to the east (Figure 4-7). The area includes foredunes and backdunes, dune slacks, and stabilized dunes. Native alliances mapped include silver dune lupine–mock heather scrub, arroyo willow thickets, wax myrtle scrub, coastal brambles, deer weed scrub, coyote brush scrub, dune mat, California sandaster mats, crisp monardella sands, salt rush swales, salt grass flats, field sedge meadows, Pacific silverweed marshes, American bulrush marshes, and California bulrush marshes. Non-native alliances present include European beach grass swards (extensive areas with 100 percent cover are present) and iceplant mats. There is also an area dominated by non-native brass buttons near the western portion of the creek; this alliance occurs nowhere else in the study area.

4.7.2 OSO FLACO LAKE

North of the causeway, Oso Flaco Lake consists of a large wetland extending from the base of drifting dunes to actively cultivated agricultural lands (Figure 4-7). It supports extensive emergent freshwater marsh habitats including California bulrush marsh, cattail marsh, and duckweed blooms. Also present are extensive mats of broadfruit bur-reed leaves. This area supports a smaller body of open water than is found at the south portion of the lake. As it receives direct inflows from Oso Flaco Creek, a large area of the lake has filled with sediment, thereby decreasing the amount of open water present and creating suitable habitat for a much more extensive marshland. A sand blow-out on the western shore of the lake supports salt grass flats, which contain patches of jaumea, Pacific silverweed, and field sedge. Other wetland species detected here include saltmarsh baccharis (*Baccharis glutinosa*), low bulrush, and water parsnip (*Berula erecta*). Arroyo willow thickets extend up the adjacent dune slopes as upland habitat.

Oso Flaco Lake south and west of the causeway supports a much more extensive body of freshwater than the north portion of the lake, with emergent marsh vegetation restricted to the margins of the stabilized and non-stabilized dunes. Alliances along the marsh edges include arroyo willow thickets, black cottonwood forest, California bulrush marsh, cattail marsh, and duckweed blooms. The western end of this site includes a narrow outlet channel for Oso Flaco Creek with low-lying adjacent areas that are seasonally inundated or saturated, and wet meadows dominated by arroyo willow thickets, coastal brambles, California bulrush marsh, field sedge meadows, and salt rush swales.

Uplands bordering the northern edge of Oso Flaco Lake include stabilized dune habitat supporting such native alliances as silver dune lupine–mock heather scrub, arroyo willow thickets, wax myrtle scrub, California sandaster mats, salt rush swales, and crisp monardella sands. There is a single Monterey pine amongst the willows south portion of the lake. Scattered patches of Southern California dudleya and giant coreopsis scrub are also present. Non-native alliances present include European beach grass swards and iceplant mats.

Special-status plants (see Chapter 5) observed in the Oso Flaco Lake and Creek Zone during 2012 surveys include red sand verbena, marsh sandwort (*Arenaria paludicola*), Nuttall's milkvetch, Monterey Coast paintbrush, surf thistle, Blochman's leafy daisy, suffretescent wall flower, dunedelion, crisp monardella, Gambel's water cress (*Nasturtium gambelii*), and Blochman's groundsel (Table 5-1).

4.8 SOUTH OSO FLACO ZONE

4.8.1 FOREDUNES

This area includes the western portion of the South Oso Flaco Zone, from Oso Flaco Creek south to the southern border of the study area (Figure 4-8). These foredunes consist primarily of the dune mat alliance, dominated by sand verbena or beach bur. There is a large European beach grass sward in the middle foredunes of the South Oso Flaco Zone, and smaller European beach grass swards elsewhere in the foredunes. Small ice plant mats are also scattered throughout the foredunes. There are a few wetland alliances in the northern foredunes, including wax myrtle scrub, jaumea mats, salt rush swales, and American bulrush marsh. There are also small areas of the foredunes dominated by shrubs, including silver dune lupine–mock heather scrub, arroyo willow thickets, and California coffee berry scrub. Dune mat gives way to a larger shrubland area composed of silver dune lupine–mock heather scrub in the southeastern part of the foredunes.

4.8.2 BACKDUNES

The backdunes of the South Oso Flaco Zone include the southernmost triangular shaped wedge of the Oceano Dunes SVRA east of the coast and the foredunes (Figure 4-8). This extensive vegetated area is largely dominated by silver dune lupine–mock heather scrub. The hill tops of many of these inland ridges are colonized by giant coreopsis, although in most cases this taxon accounts for less than 5-10 percent cover. Within the silver dune lupine–mock heather scrub are smaller areas where other shrub species including California sagebrush (*Artemisia californica*), California spine flower, cardinal catchfly (*Silene lacinata*), sawtooth goldenbush (*Hazardia squarrosa*) or California coffee berry are prominent. Blochman's groundsel scrub also occurs in a few patches in this area. Herbaceous species include wedge-leaved horkelia (as a co-dominant species in mesic valley bottoms), San Luis Obispo monardella, tall stephanomeria, California poppy (*Eschscholzia californica*), Monterey Indian paintbrush, and purple owl's clover (*Castilleja exserta* var. *exserta*). Desert pholisma is a common parasite of mock heather and other woody shrubs in this area.

Large areas of the understory of the silver dune lupine–mock heather scrub are dominated by perennial veldt grass and some smaller areas consist entirely of this non-native invasive grass. There are other areas in the more western part of the backdunes that are dominated by non-native invasive European beach grass swards. There is also a small area of annual brome grassland in the northeastern portion of this zone.

There are arroyo willow thickets at two low-lying locations and under or in front of the willows are wetlands containing black cottonwood, coastal brambles, California bulrush marshes, cattail marshes, mats of bur-reed leaves, salt rush swales, or giant wild rye grassland. The willow thickets are encircled by coyote brush scrub with a dune rush and field sedge understory. There are two coast live oak trees growing at locations near the willows. There are also a few small wedge-leaved horkelia–California spine flower meadows in low lying areas of the backdunes.

There are some large areas of bare sand within the backdunes, many of which are colonized by crisp monardella. Beach bur and sand verbena (i.e., dune mat alliance) are also present in some bare areas.

Special-status plants (see Chapter 5) observed in the South Oso Flaco Zone during 2012 surveys include Nuttall's milkvetch, Monterey Coast paintbrush, surf thistle, La Graciosa thistle, Blochman's leafy daisy, suffretescent wall flower, fuzzy prickly phlox, crisp monardella, San Luis Obispo monardella, California spine flower, short-lobed broomrape (*Orobanche parishii* ssp. *brachyloba*) and Blochman's groundsel (Table 5-1).

Figure 4-1 Pismo Zone Vegetation *Page 48*

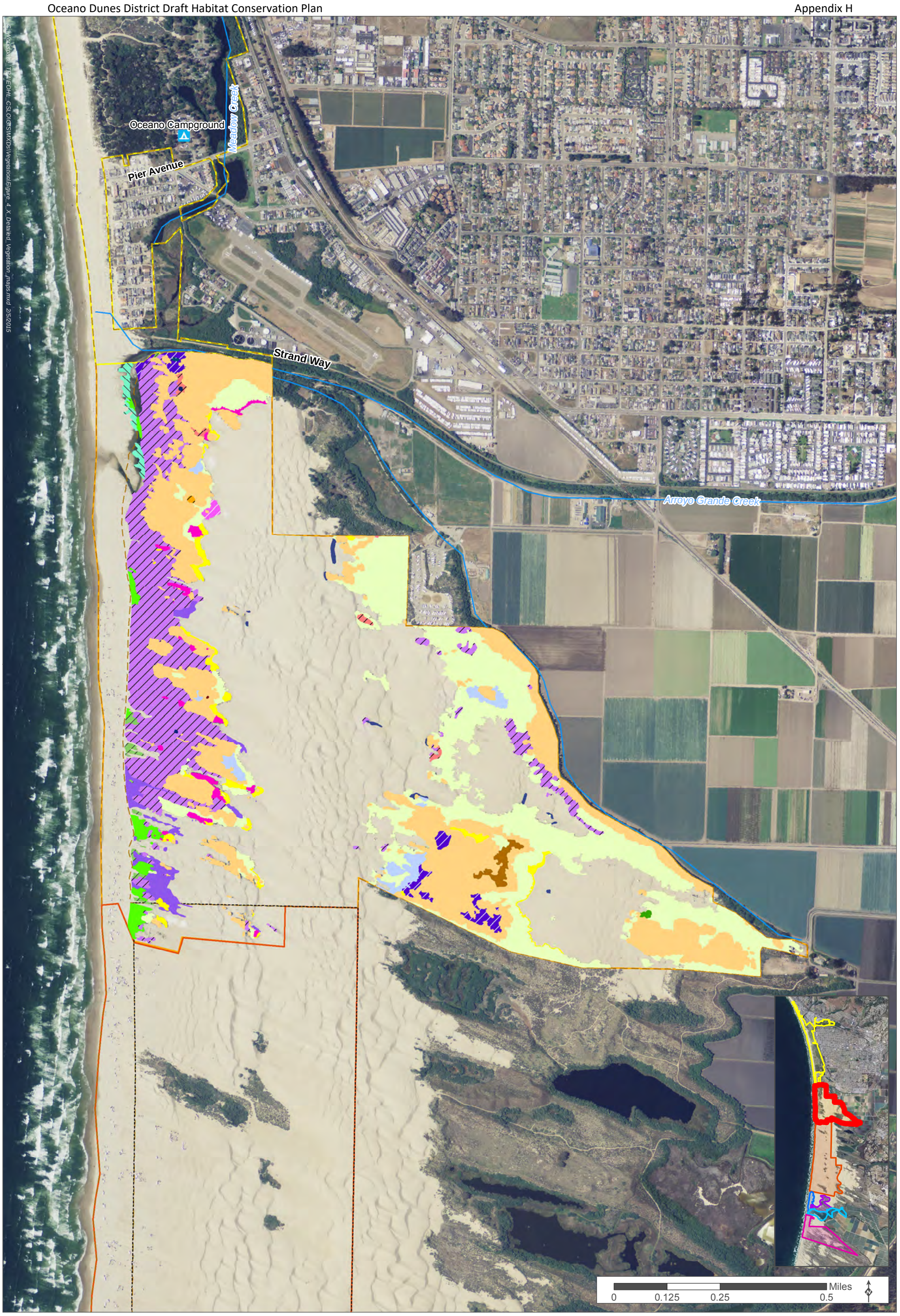


Figure 4-2 Dunes Natural Preserve Zone Vegetation *Page 49*

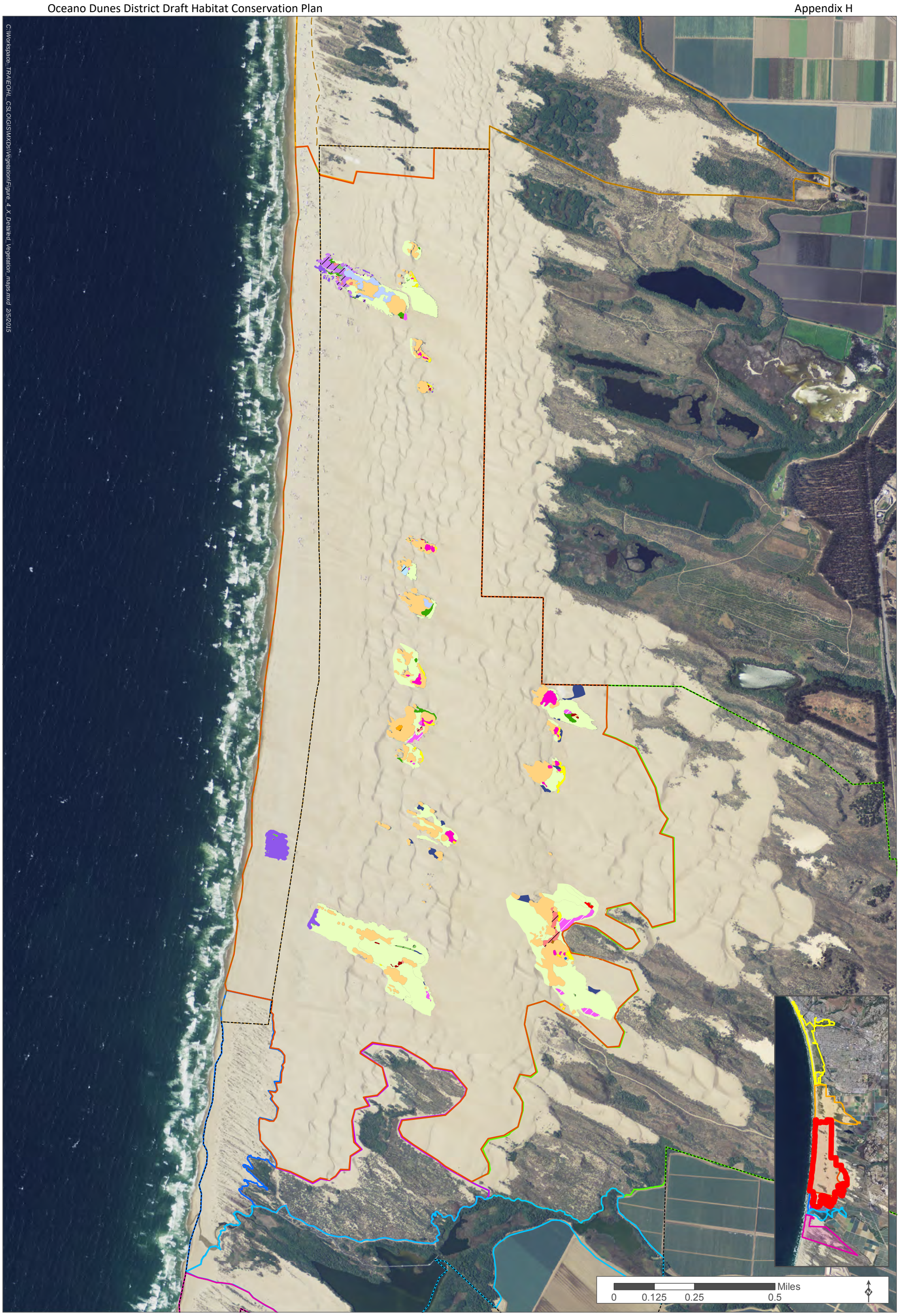


Figure 4-3 Vegetation Island Zone Vegetation *Page 50*

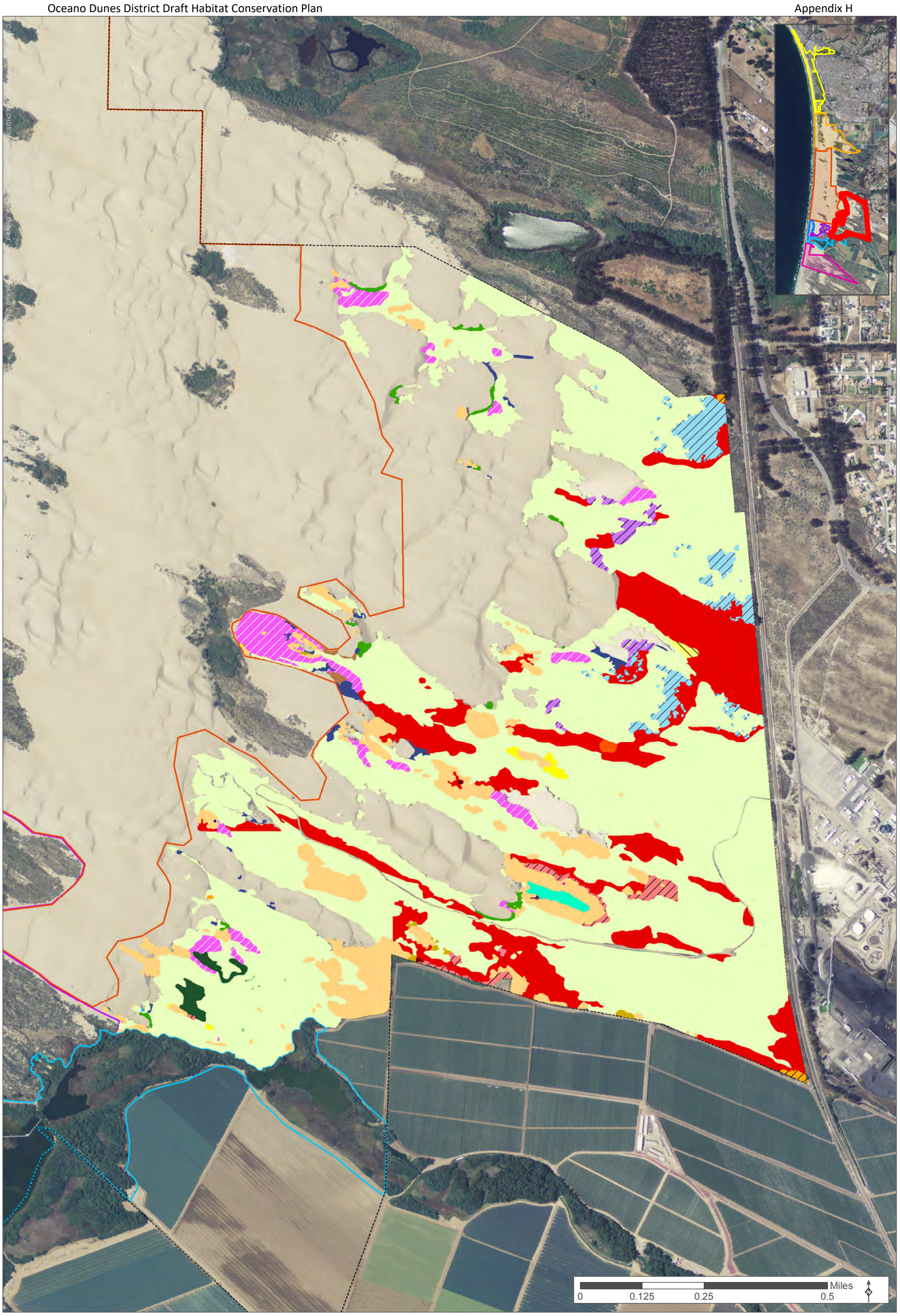


Figure 4-4 Phillips 66 Leasehold Zone Vegetation

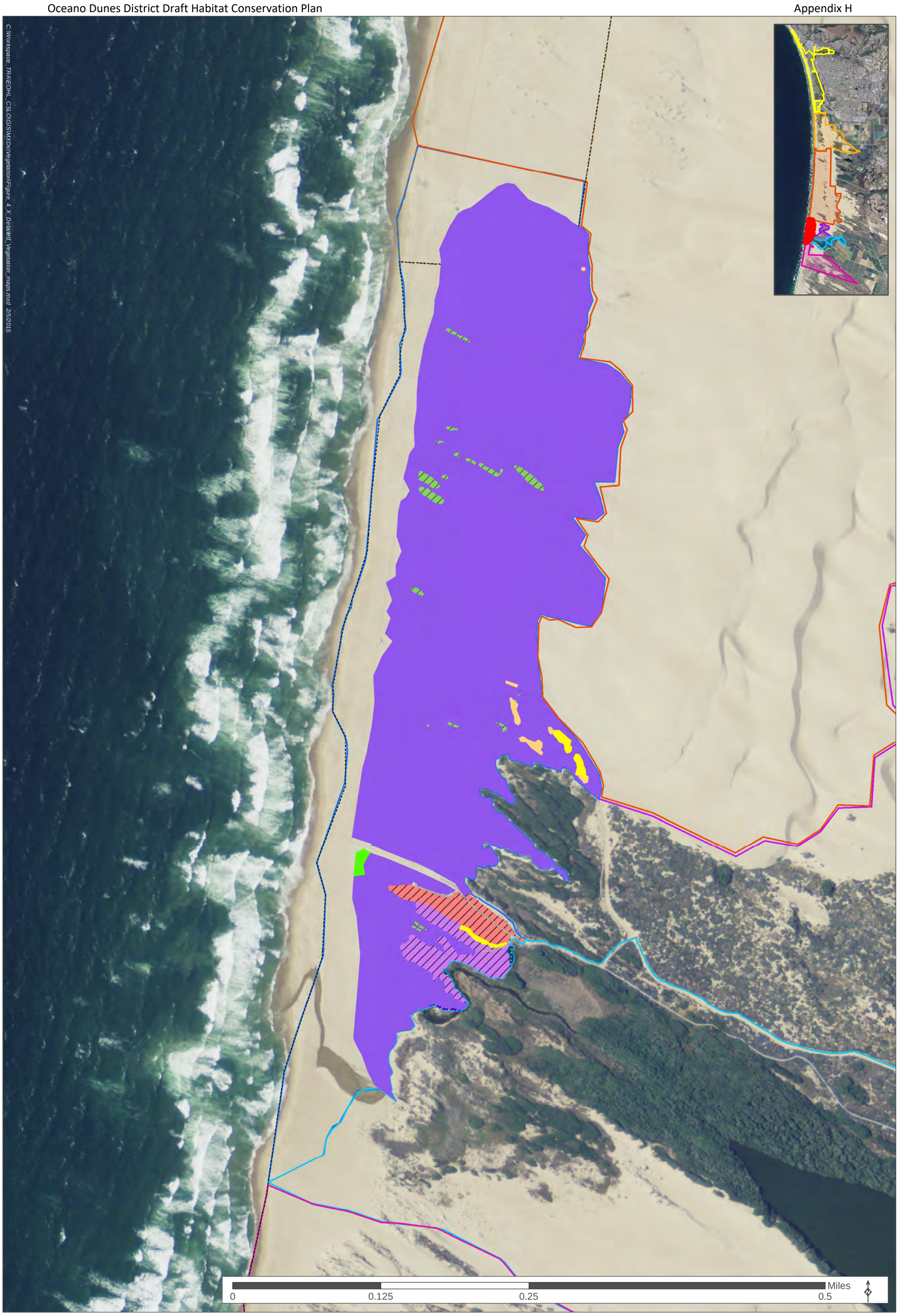


Figure 4-5 North Oso Flaco Zone Vegetation

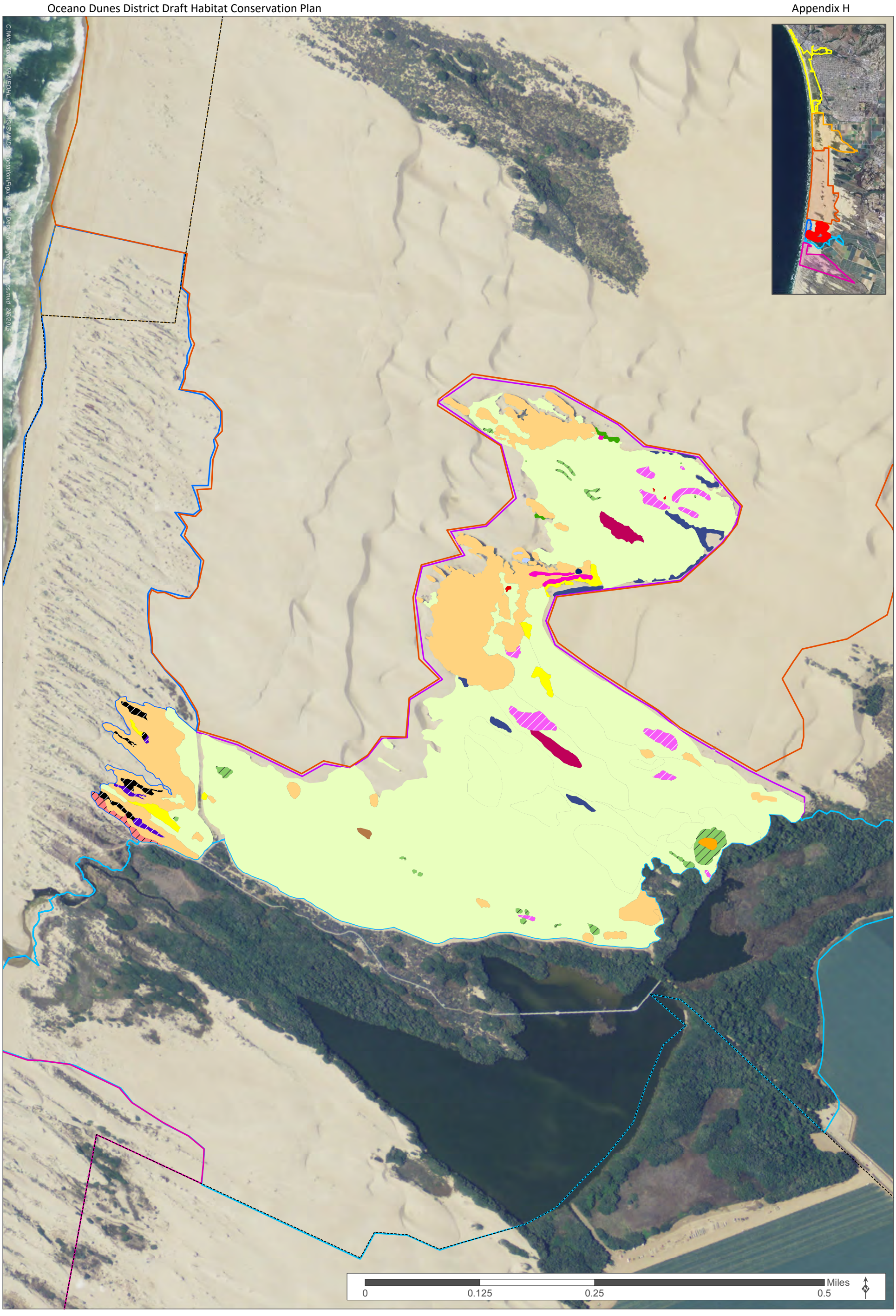


Figure 4-6 Maidenform Zone Vegetation

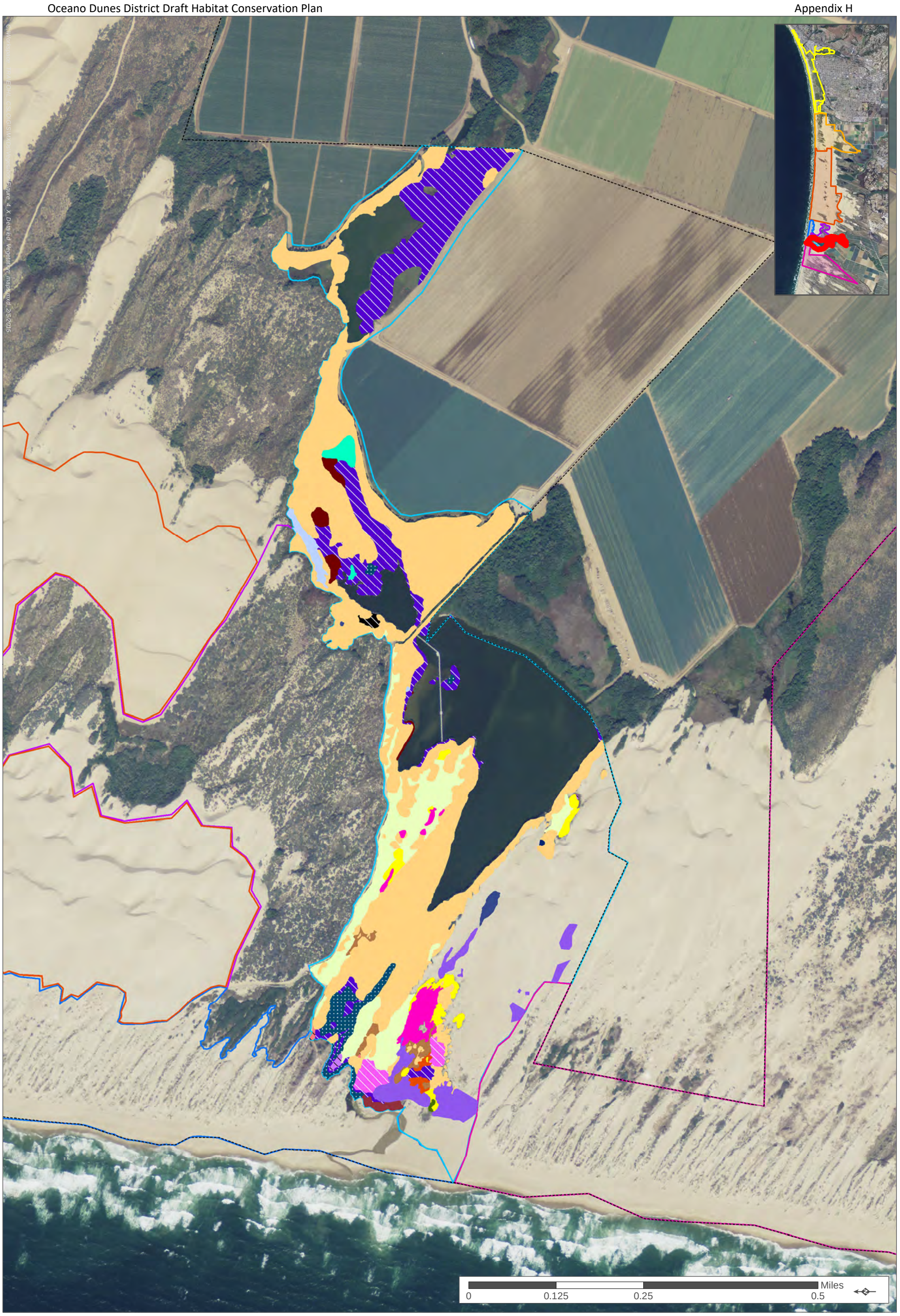


Figure 4-7 Oso Flaco Lake and Creek Zone Vegetation

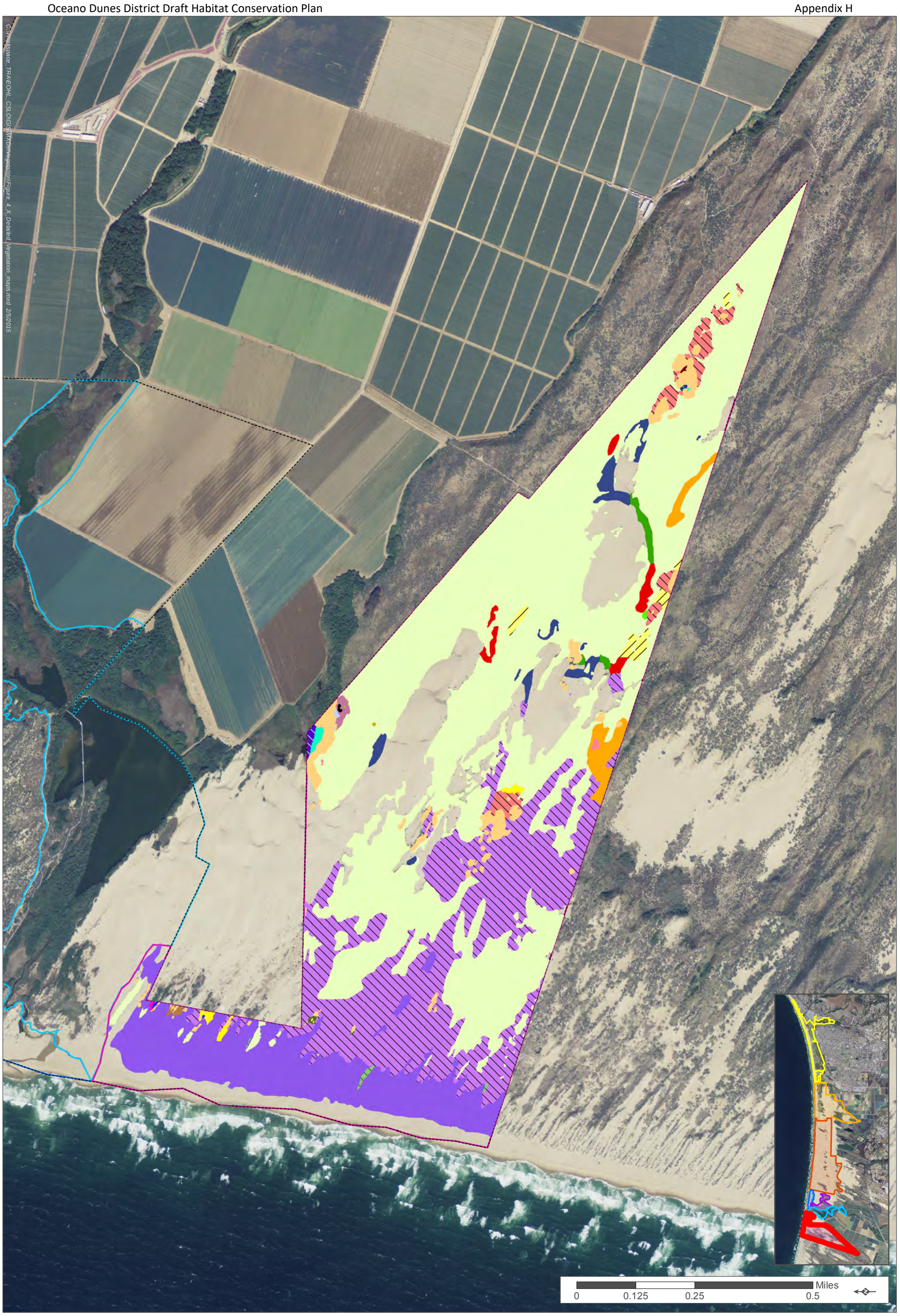


Figure 4-8 South Oso Flaco Zone Vegetation

5.0 SPECIAL-STATUS PLANTS IN THE STUDY AREA

Twenty-seven special-status plant species are known to occur in the study area, and six more have a moderate to high potential to occur based on habitat present in the area and known occurrences nearby. Each of these species are described in the following sections. See Appendix B, Table B for a complete list of special-status plants with the potential to occur in the study area.

5.1 SPECIAL-STATUS PLANTS KNOWN TO OCCUR IN THE STUDY AREA

Twenty-seven special-status plants are known to occur in the study area (Table 5-1). Eighteen of these were observed during the vegetation mapping and two others may have been observed during the mapping (i.e., they were in same location as previously documented occurrences, but were not identified to species). The remaining seven species were not observed during the vegetation mapping, but are known to occur in the study area from past District surveys and/or CNDDB records. Additional rare plant mapping occurred in September 2013 and June 2014 and survey results are discussed below.

Three species observed in the study area, Monterey cypress (CRPR 1B.2), Monterey pine (CRPR 1B.1), and Torrey pine (CRPR 1B.2), are CRPR special-status plants where they naturally occur but are not native to the study area and, thus, are not described below.

Table 5-1. Special-status Plants Observed in the Study Area

Common Name	Scientific Name	Status[a]	Pismo Zone	Dunes Preserve Zone	Vegetation Island Zone	Phillips 66 Zone	North Oso Flaco Zone	Maidenform Zone	Oso Flaco Lake & Creek Zone	South Oso Flaco Zone
Marsh sandwort	*Arenaria paludicola*	FE, SE, CRPR 1B.1							X	
La Graciosa thistle	*Cirsium scariosum* var. *loncholepis*	FE, ST, CRPR 1B.1								X
Gambel's watercress	*Nasturtium gambelii*	FE, ST, CRPR 1B.1							X	
Beach spectaclepod	*Dithyria maritima*	ST, CRPR 1B.1					X			
Nipomo Mesa lupine	*Lupinus nipomensis*	ST, CRPR 1B.1				X				
Surf thistle	*Cirsium rhothophilum*	ST, CRPR 1B.2							X	X
Kellogg's horkelia	*Horkelia cuneata* var. *sericea*	CRPR 1B.1		X		X				

Sand mesa manzanita	*Arctostaphylos rudis*	CRPR 1B.2				X				
Coastal goosefoot	*Chenopodium littoreum*	CRPR 1B.2				X				
Dune larkspur	*Delphinium parryi* ssp. *Blochmaniae*	CRPR 1B.2								X
Blochman's leafy daisy	*Erigeron blochmaniae*	CRPR 1B.2	X	X	X	X	X	X	X	X
Crisp monardella	*Monardella undulata* ssp. *crispa*	CRPR 1B.2	X	X	X	X		X	X	X
San Luis Obispo monardella	*Monardella undulata* ssp. *undulata*	CRPR 1B.2		X		X				X
Red sand verbena	*Abronia maritima*	CRPR 4.2	X	X	X		X		X	
Nuttall's milkvetch	*Astragalus nuttallii* var. *nuttallii*	CRPR 4.2	X	X		X	X	X	X	X
Paniculate tarplant	*Deinandra paniculata*	CRPR 4.2				X				
Suffrutescent wall flower	*Erysimum suffrutescens*	CRPR 4.2	X	X	X	X	X	X	X	X
Southwestern spiny rush	*Juncus acutus* ssp. *leopoldii*	CRPR 4.2		X	X					
Fuzzy prickly phlox	*Linanthus californicus*	CRPR 4.2	X	X		X				X
California spineflower	*Mucronea californica*	CRPR 4.2		X		X				X
Short-lobed broomrape	*Orobanche parishii* ssp. *brachyloba*	CRPR 4.2								X
Hickman's popcorn flower	*Plagiobothrys chorisianus* var. *hickmanii*	CRPR 4.2			X	X		X		
Blochman's groundsel	*Senecio blochmaniae*	CRPR 4.2	X	X	X	X	X	X	X	X
Monterey Coast paintbrush	*Castilleja latifolia*	CRPR 4.3	X	X	X	X		X	X	X
Douglas' spineflower	*Chorizanthe douglasii*	CRPR 4.3			X					
Dunedelion	*Malacothrix incana*	CRPR 4.3			X		X		X	
Sand almond	*Prunus fasciculata* var. *punctata*	CRPR 4.3				X				

[a]Status explanations:
Federal:
FE = Listed as endangered under the Federal Endangered Species Act.
FT = Listed as threatened under the Federal Endangered Species Act.
State:
SE = Listed as endangered under the California Endangered Species Act.
ST = Listed as threatened under the California Endangered Species Act.
California Rare Plant Rank:
1B = Plants Rare, Threatened, or Endangered in California and Elsewhere
2 = Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
4 = Watch List
0.1-Seriously threatened in California
0.2-Fairly threatened in California
0.3- Not very threatened in California

5.1.1 MARSH SANDWORT

Marsh sandwort is a perennial herb in the pink family (Caryophyllaceae). It has rooting, trailing stems and small white flowers which bloom from May through August. It can also reproduce asexually by producing adventitious roots[11] on the trailing stems that establish new plants under suitable conditions. Historically, this species occurred in swamps, marshes, and other wet areas in widely disjunct localities in California and Washington. It occurred in four counties in the coastal region of Washington, as well as in San Francisco, Santa Cruz, San Luis Obispo, and San Bernardino counties in California (U.S. Fish and Wildlife Service [USFWS] 1998).

Since marsh sandwort was federally listed, a natural population was rediscovered at Oso Flaco Lake in 1998 (USFWS 1998). This site is now the only known extant, wild population. This population has been in decline with 85 individuals reported in 1998 and only 25 individuals reported in 2005 (USFWS 2008). There also was a recorded decline in habitat quantity and quality at this location since the population was discovered in 1998. The vegetation has become thicker, denser, and more overgrown, consistent with nutrient loading from agricultural operations upstream of the lake (USFWS 2008).

Marsh sandwort was not observed during the vegetation mapping, but was previously documented at Oso Flaco Lake as described above. A survey for this plant was attempted in 2013; however, presence of the plant could not be confirmed due to problems with accessibility. However, it was determined that habitat, including the *Carex* mat microhabitat used by this species, is still present in locations where marsh sandwort was observed to occur in the past.

5.1.2 LA GRACIOSA THISTLE

La Graciosa thistle is a bushy biennial or short-lived, perennial herb with large, smooth to slightly hairy leaves and clustered heads of white flowers. It is a spreading, mound-like or erect plant in the sunflower family (Asteraceae) that is well armored with spines on the leaves and flower heads. This species is known from coastal San Luis Obispo and Santa Barbara counties from Pismo Beach south to Los Alamos. La Graciosa thistle is associated with mesic areas on the

[11] Roots growing from a location other than underground, such as from a leaf or a stem.

margins of dune swales, dune lakes, marshes, estuaries, coastal meadows, seeps, springs, intermittent streams, creeks, and rivers. This species thrives on sandy soils and is pollinated by hummingbirds and insects (USFWS 2000).

The USFWS designated 41,089 acres as critical habitat for La Graciosa thistle in March 2004 (USFWS 2004). USFWS revised its designation of critical habitat for La Graciosa thistle in 2009 (USFWS 2012). The revised critical habitat designates approximately 24,103 acres of habitat in San Luis Obispo and Santa Barbara counties as critical habitat. The critical habitat is divided into six units. The Callender-Guadalupe Dunes unit is the second largest (9,696 acres) and includes the District. This unit extends along 8.5 miles of coast from Arroyo Grande Creek south to the Santa Maria River. Since federal listing in 2000, populations of this species have severely declined. At the time of listing there were eleven extant occurrences distributed among seven populations. Currently, La Graciosa thistle is considered to be extant at seven occurrences that are distributed among four populations (USFWS 2000).

An unidentified species of thistle (*Cirsium* sp.) was observed during the vegetation mapping in the South Oso Flaco Zone, at a location where La Graciosa thistle had been previously recorded. A subsequent visit in 2013 confirmed the presence of La Graciosa thistle in South Oso Flaco at Surprise Lake (Skinner pers. comm. 2014). This species had been previously recorded in the Phillips 66 Leasehold Zone and in the fore- and backdunes of the South Oso Flaco Zone (CNDDB 2013).

5.1.3 GAMBEL'S WATER CRESS

Gambel's water cress is an herbaceous perennial in the mustard family (Brassicaceae). This species characteristically roots from the stem, which bears scattered compound leaves and dense clusters of white flowers. Gambel's water cress is found in freshwater or brackish marsh habitats at the margins of lakes and along slow-flowing streams. It grows in or just above the water level and requires a permanent source of water (CNPS 2013).

Gambel's water cress was listed as threatened by California in 1990 and endangered by the USFWS in 1993. At the time of federal listing, there were three known populations of Gambel's water cress, all in San Luis Obispo County. Each of these three populations is now considered extirpated. Hybridization and subsequent genetic introgression[12] with the closely related white or common water cress (*Nasturtium officinale*), habitat loss and degradation, biostimulation, sedimentation, encroachment of non-native eucalyptus trees, and drilling of water wells in the immediate watershed are serious threats to Gambel's water cress (CNDDB 2013). All three populations that were discussed in the final listing rule in 1993 (Black Lake Canyon, Oso Flaco Lake, and Little Oso Flaco Lake), are now considered to be "possibly extirpated" (CNDDB 2013), as all individuals appear to show introgression with *N. officinale* (CNDDB 2013). However, it is important to note that while there has been a large change in the vegetation at Oso Flaco Lake due to eutrophication (i.e., artificial or natural addition of substances, such as nitrates

[12] Infiltration of the genes of one species into the gene pool of another through repeated backcrossing of an interspecific hybrid with one of its parents.

and phosphates, to an aquatic system), some suitable habitat still appears to exist there, and it is possible that some pure Gambel's water cress plants may still occur there.

An unknown water cress species was (*Nasturtium* sp.) was observed near Oso Flaco Creek during 2012 vegetation mapping; Gambel's water cress was previously documented near Oso Flaco Creek with the most recent observation in 2005 (CNDDB 2013), although pure stands (not hybridized) may have been extirpated. Gambel's water cress was confirmed to occur at Oso Flaco Lake in fall 2013 (J. Chestnut, pers. comm.), however it is still threatened by lake eutrophication and hybridization.

5.1.4 BEACH SPECTACLEPOD

Beach spectaclepod is a low growing, whitish-flowered perennial herb in the mustard (Brassicaceae) family. It is found in small transverse foredunes within approximately 10-170 feet from the surf. Beach spectaclepod is usually found in areas of these fragile dunes where the sand is relatively unstable. Historically occurring as far south as Los Angeles County and possibly Baja California Norte, Mexico, this species currently occurs in the dunes of San Luis Obispo and Santa Barbara counties and on San Nicholas and San Miguel islands. Several populations are found on Unocal's property in the Guadalupe Dunes just north of the Santa Maria River (CDFG 2004 and CNPS 2013).

In the study area, beach spectaclepod was observed in the North Oso Flaco Zone in the 2012 vegetation survey and in the North Oso Flaco Zone and the South Oso Flaco Zone in the 2013 and 2014 rare plant surveys.

5.1.5 NIPOMO MESA LUPINE

Nipomo Mesa lupine is a low-growing, blue-flowered, annual herb in the pea family (Fabaceae). Nipomo Mesa lupine requires fine-grained, sandy soils of open sites or sparsely vegetated, stabilized dune communities close to the coast. Nipomo Mesa lupine is restricted to dry sandy flats of stabilized coastal dunes that lie west of Nipomo Mesa in San Luis Obispo County. There is no recovery plan or designated critical habitat for this species (USFWS 2000).

In the study area, Nipomo Mesa lupine was only observed in the eastern part of the Phillips 66 Leasehold Zone. It has been documented in the Phillips 66 Leasehold Zone in annual surveys conducted by the Land Conservancy of San Luis Obispo County (Daniel Bohlman, pers. comm. 2013).

5.1.6 SURF THISTLE

Surf thistle is a low-growing, short-lived perennial in the sunflower family (Asteraceae) with white flowers in dense heads. It is characterized by large rosettes of spiny, white-woolly, deeply lobed, and undulating leaves. The deep roots and white-woolly foliage are adaptations to the physical stresses of the dune habitat, such as high light intensity and sand movement and abrasion. Flowering occurs between April and June and occurs only in the narrow strip of coastal habitat between stabilized dunes and windblown beach. Surf thistle is endemic to the dunes of

the central California coast, from the Nipomo Dunes of southern San Luis Obispo County to Point Conception in Santa Barbara County. It grows in coastal foredunes on the slopes of transverse ridges in areas of active sand accumulation. At the southern extreme of its range it is found in sand at the bases or tops of cliffs (CDFG 2004).

In the study area, surf thistle was observed near Oso Flaco Creek in the Oso Flaco Lake and Creek Zone and in the foredunes of the South Oso Flaco Zone during the 2012 vegetation survey and the 2013 and 2014 rare plant surveys. From previous surveys, it is also known to occur in the North Oso Flaco Zone (CDPR 2008).

5.1.7 KELLOGG'S HORKELIA

Kellogg's horkelia is a perennial herb that blooms from April through September. It has white flowers and is in the rose family (Rosaceae). It occurs in closed-cone coniferous forest, maritime chaparral, coastal dunes, and coastal scrub on sandy or gravelly openings from 30-650 feet. It is endemic to California and is possibly threatened by coastal development (CNPS 2013).

Kellogg's horkelia was not observed during the vegetation mapping, but has been documented in the Dunes Preserve Zone and in the Phillips 66 Leasehold Zone by previous District surveys (CDPR 2012), and in the Phillips 66 Leasehold Zone by CNDDB records with the most recent observation in 1998 (CNDDB 2013).

5.1.8 SAND MESA MANZANITA

Sand mesa manzanita (*Arctostaphylos rudis*) is a perennial evergreen shrub in the heath family (Ericaceae) that blooms from November through February. It occurs in maritime chaparral and coastal scrub on sandy soils from 80-1,050 feet. It is endemic to San Luis Obispo and Santa Barbara counties and is threatened by agriculture, road construction, road maintenance, and oil extraction. It has been severely reduced on Nipomo Mesa (CNPS 2013).

Sand mesa manzanita is not known in the study area from CNDDB records, but has been observed previously by District staff (Glick 2013). The closest CNDDB record to the study area is approximately 1.5 miles east at Nipomo Mesa (CNDDB 2013).

5.1.9 COASTAL GOOSEFOOT

Coastal goosefoot is an annual herb in the goosefoot family (Chenopodiaceae) that blooms from April through August. It occurs on sand dunes from 30-100 feet. It is endemic to Los Angeles, Santa Barbara, and San Luis Obispo counties and is known from fewer than 20 occurrences. It is possibly threatened by recreational activities, vehicles, and non-native plants (CNPS 2013).

In the study area, coastal goosefoot was only observed in the southern part of the Phillips 66 Leasehold Zone. It is also known from Oso Flaco Lake based on CNDDB records (CNDDB 2013).

5.1.10 DUNE LARKSPUR

Dune larkspur (*Delphinium parryi* ssp. *Blochmaniae*) is a perennial herb in the buttercup family (Ranunculaceae) that has purple and white or blue and white flowers and blooms from April through May. It occurs in maritime chaparral and on coastal dunes from 0-650 feet. It is endemic to California and is threatened by development (CNPS 2013).

Dune larkspur was not observed during vegetation mapping, but was previously documented in the Phillips 66 Leasehold Zone and at south Oso Flaco Lake in 1998 (CNDDB 2013). From 1998-2011, District staff has observed dune larkspur almost every year within the Phillips 66 Leasehold Zone property and at South Oso Flaco where it has been present near Beigle Road.

5.1.11 BLOCHMAN'S LEAFY DAISY

Blochman's leafy daisy is a perennial rhizomatus[13] herb that blooms from June through August. It is in the sunflower family (Asteraceae) and has light purple flowers. It occurs on coastal dunes and in coastal scrub from 10-150 feet. It is endemic to Santa Barbara and San Luis Obispo counties and is threatened by development, non-native plants, and vehicles (CNPS 2013).

Blochman's leafy daisy is locally common and widespread in the study area, and occurs in all of the vegetation zones in the area. It was previously documented in the area by District surveys (CDPR 2012) and CNDDB records with the most recent observation in 2002 in the vicinity of Oso Flaco Lake (CNDDB 2013).

5.1.12 CRISP MONARDELLA

Crisp monardella is a perennial rhizomatus herb that blooms from April through August. It has purple flowers and is in the mint family (Lamiaceae). It occurs in coastal dunes and sandy scrub from 30-400 feet. It is endemic to Santa Barbara and San Luis Obispo counties and is threatened by vehicles (CNPS 2013).

Crisp monardella is locally common and widespread in the study area, and was observed at the sandy edges of other vegetation in all of the vegetation zones except North Oso Flaco. Crisp monardella is the dominant species in the crisp monardella sands herbaceous alliance. It has been documented in the study area during previous District surveys (CDPR 2012) and in CNDDB records with the most recent observation in 1998 (CNDDB 2013).

5.1.13 SAN LUIS OBISPO MONARDELLA

San Luis Obispo monardella is a perennial rhizomatus herb that blooms from May through September. It has purple flowers and is in the mint family (Lamiaceae). It occurs in coastal dunes and sandy coastal scrub from 30-650 feet. It is endemic to Santa Barbara and San Luis Obispo counties and is threatened by coastal development, vehicles, and potentially non-native plants (CNPS 2013).

[13]A rhizome is a horizontal, usually underground stem that often sends out roots and shoots from its nodes.

In the study area, San Luis Obispo monardella was observed in the Dunes Preserve Zone, in the southern part of the Phillips 66 Leasehold Zone, and in the southern backdunes of the South Oso Flaco Zone. It has also been documented in the Dunes Preserve, near Oso Flaco Lake and the South Oso Flaco Zone with the most recent observation in 1998 (CNDDB 2013).

5.1.14 RED SAND VERBENA

Red sand verbena is a perennial herb in the four o'clock family (Nyctaginaceae) that blooms from February through November. It occurs on coastal dunes from 0-330 feet. It is nearly extirpated in southern California (CNPS 2013).

Red sand verbena was observed in the study area near Strand Way and the interpretive trail in the Pismo Zone, in the western portion of the Dunes Preserve Zone, on Pavilion Hill, Tabletop, and Worm Valley vegetation islands in the Vegetation Island Zone, in the North Oso Flaco Zone, and near Oso Flaco Creek in the Oso Flaco Lake and Creek Zone. It was previously known from the study area from District surveys (CDPR 2012).

5.1.15 NUTTALL'S MILKVETCH

Nuttall's milkvetch is a perennial herb in the pea family (Fabaceae) that blooms from January through November. It occurs in coastal bluff scrub and coastal dunes from 10-400 feet. It is endemic to California and is possibly threatened by foot traffic (CNPS 2013).

Nuttall's milkvetch was observed in the study area in the Dunes Preserve Zone, at Boyscout Camp, Worm Valley, Caterpillar Hill, and Eucalyptus Tree vegetation islands in the Vegetation Island Zone, in the south end of the Phillips 66 Leasehold Zone, in the North Oso Flaco Zone, in the northern part of the Maidenform Zone, in the Oso Flaco Lake and Creek Zone, and in the southwest of the South Oso Flaco Zone. It was previously known from the study area from District surveys (CDPR 2012).

5.1.16 PANICULATE TARPLANT

Paniculate tarplant is an annual herb in the sunflower family (Asteraceae) that blooms from April through November. It occurs in coastal scrub, valley and foothill grassland, and vernal pools, usually on vernally mesic and sometimes on sandy sites, from 80-3,080 feet. It is threatened by development and potentially by road widening. Some historical occurrences have been extirpated by urbanization (CNPS 2013).

In the study area, paniculate tarplant was only observed in the southern part of the Phillips 66 Leasehold Zone. There were no previous records of this species from the study area.

5.1.17 SUFFRUTESCENT WALLFLOWER

Suffrutescent wallflower is a perennial herb in the mustard family (Brassicaceae) that blooms from January through July. It occurs in coastal bluff scrub, maritime chaparral, coastal dunes,

and coastal scrub from 0-500 feet. It is endemic to the southern California coast and is threatened by coastal development, vehicles, and non-native plants (CNPS 2013).

Suffrutescent wallflower is locally common and widespread in the study area, and occurs in all the vegetation zones in the area. It was documented in the area by previous District surveys (CDPR 2012).

5.1.18 SOUTHWESTERN SPINY RUSH

Southwestern spiny rush is a perennial rhizomatous herb in the rush family (Juncaceae) that blooms from March through June. It occurs in coastal dunes (mesic), meadows and seeps (alkaline seeps) and in marshes and swamps (coastal salt) from 10-3,000 feet. It is threatened by urbanization and flood control projects (CNPS 2013).

Southwestern spiny rush was not observed during the vegetation mapping, but has been documented in the Dunes Preserve Zone and at the Eucalyptus Tree vegetation island in the Vegetation Island Zone by previous District surveys (CDPR 2012).

5.1.19 FUZZY PRICKLY PHLOX

Fuzzy prickly phlox is a perennial deciduous shrub in the phlox family (Polemoniaceae) that blooms from March through August. It occurs on coastal dunes from 3-100 feet. It is endemic to Santa Barbara and San Luis Obispo counties (CNPS 2013).

In the study area, fuzzy prickly phlox was observed in the Dunes Preserve Zone, the southern part of the Phillips 66 Leasehold Zone, and in the backdunes of the South Oso Flaco Zone. It has been documented in the past in the Phillips 66 Leasehold Zone during District surveys (CDPR 2012).

5.1.20 CALIFORNIA SPINE FLOWER

California spine flower is an annual herb in the buckwheat family (Polygonaceae) that blooms from March through August. It occurs in chaparral, cismontane woodland, coastal dunes, coastal scrub, and valley and foothill grassland from 0-4,600 feet. It is endemic to California and is threatened by aggregate mining, vehicles, flood control modification, urbanization, water percolation projects, and possibly by non-native plants (CNPS 2013).

In the study area, California spine flower was observed in the Dunes Preserve Zone, in the Phillips 66 Leasehold Zone, and in the South Oso Flaco Zone. California spine flower is a co-dominant species in the wedge-leaved horkelia-California spine flower herbaceous alliance. It was not previously known to occur in the study area.

5.1.21 SHORT-LOBED BROOMRAPE

Short-lobed broomrape is a perennial parasitic herb in the broom-rape family (Orobanchaceae) that blooms from April through October. It occurs in coastal bluff scrub, coastal dunes and coastal scrub from 10-1,000 feet. It is parasitic to shrubs (CNPS 2013).

Short-lobed broomrape was not observed during the vegetation mapping, but was seen near in the South Oso Flaco Zone by Mark Skinner in 2013. It was also previously documented in the South Oso Flaco Zone in 1967 (CNDDB 2013).

5.1.22 HICKMAN'S POPCORN FLOWER

Hickman's popcorn flower is an annual herb in the borage family (Boraginaceae) that blooms from April through June. It occurs in closed-cone coniferous forest, chaparral, coastal scrub, marshes and swamps, and vernal pools from 50-280 feet. It is endemic to California (CNPS 2013).

Hickman's popcorn flower was not observed during the vegetation mapping, but was previously documented in four vegetation islands in the Vegetation Island Zone, in the Phillips 66 Leasehold Zone, and in the Maidenform Zone from previous District surveys (CDPR 2012).

5.1.23 BLOCHMAN'S GROUNDSEL

Blochman's groundsel is a perennial herb in the sunflower family (Asteraceae) that blooms from May through October. It occurs on coastal dunes from 0-330 feet. It is endemic to Santa Barbara and San Luis Obispo counties and is threatened by non-native plants, development, and vehicles (CNPS 2013).

Blochman's groundsel is locally common and widespread in the study area, and occurs in all of the vegetation zones. Blochman's groundsel is the dominant species in the Blochman's groundsel scrub herbaceous alliance. It has been documented to occur in the area in previous District surveys (CDPR 2012).

5.1.24 MONTEREY COAST PAINTBRUSH

Monterey Coast paintbrush is an annual herb in the broomrape family (Orobanchaceae) that blooms from March through May. It occurs in meadows and seeps and in valley and foothill grasslands, sometimes on serpentine soils, from 30-1,300 feet. It is endemic to California and is threatened by development and grazing (CNPS 2013).

Monterey Coast paintbrush is widespread in the study area. It was observed near the interpretive trail and Carpenter Creek in the Pismo Zone, in the Dunes Preserve Zone, throughout the Phillips 66 Leasehold Zone, at six of the vegetation islands in the Vegetation Island Zone, in the Maidenform Zone, near Oso Flaco Creek in the Oso Flaco Lake and Creek Zone, and in the eastern part of the South Oso Flaco Zone. This species is also known from previous District surveys (CDPR 2012).

5.1.25 DOUGLAS' SPINEFLOWER

Douglas' spine flower (*Chorizanthe douglasii*) is an annual herb in the buckwheat family (Polygonaceae) that blooms from April through July. It occurs in chaparral, cismontane woodland, coastal scrub and lower montane coniferous forest on sandy or gravelly soils from 180-5,250 feet. It is endemic to Monterey, San Benito, and San Luis Obispo counties (CNPS 2013).

Douglas' spineflower was not observed in the study area during the vegetation mapping, but was previously documented at the Pavilion Hill vegetation island in the Vegetation Island Zone during a District survey (CDPR 2012).

5.1.26 DUNEDELION

Dunedelion is a perennial herb in the sunflower family (Asteraceae) that blooms from January through October. It occurs on coastal dunes and in coastal scrub from 10-115 feet. It is endemic to California (CNPS 2013).

In the study area, dunedelion was observed at the Pavilion Hill vegetation island and the 7.5 Revegetation Area in the Vegetation Island Zone, in the North Oso Flaco Zone, and near Oso Flaco Creek in the Oso Flaco Lake and Creek Zone. It has been documented near Oso Flaco Creek in previous District surveys (CDPR 2012).

5.1.27 SAND ALMOND

Sand almond is a perennial deciduous shrub in the rose family (Rosaceae) that blooms from March through April. It occurs in maritime chaparral, cismontane woodland, coastal dunes, and coastal scrub on sandy soils from 50-650 feet. It is endemic to Santa Barbara and San Luis Obispo counties (CNPS 2013).

In the study area, sand almond was only observed in the southern part of the Phillips 66 Leasehold Zone. It has been previously documented in the Phillips 66 Leasehold Zone during District surveys (CDPR 2012).

5.2 SPECIAL-STATUS PLANTS WITH THE POTENTIAL TO OCCUR IN THE STUDY AREA

This section describes the special-status plant species known to occur in the region but that have not been documented in the study area. These were assessed for their potential to occur in the study area, based on proximity and habitat availability. The assessment determined whether each species had a high, moderate, or low potential to occur in the study area based on the following criteria:

- **High:** The CNDDB or other reputable documents record the occurrence of the species off-site, but within a 5-mile radius of the study area and within the last 10 years. High-quality suitable habitat is present within the study area.

- **Moderate:** The CNDDB or other reputable documents may record the occurrence of the species near but beyond a 5-mile radius of the study area, or some of the components representing suitable habitat are present within or adjacent to the study area, but the habitat is substantially degraded or fragmented.
- **Low:** The CNDDB or other documents may or may not record the occurrence of the species within a 5-mile radius of the study area. However, few components of suitable habitat are present within or adjacent to the study area.

Based upon the criteria above, there are four special-status plant species with a moderate or high potential to occur in the study area. These species are described in more detail below. Those with a low potential to occur in the study area are included in Table B in Appendix B, but are not described further below. Special-status plant species in the region that have no potential to occur in the study area because the area is outside of the species' geographic or elevation range or because there is no suitable habitat for the species in the area, were excluded from the Table B in Appendix B.

5.2.1 CALIFORNIA SAWGRASS

California sawgrass (*Cladium californicum*) is a perennial rhizomatus herb in the sedge family (Cyperaceae) that blooms from June through September. It occurs in meadows and seeps, or in alkaline or freshwater marshes and swamps, from 200-1,970 feet. It is known from fewer than 20 occurrences and is potentially threatened by land use management (CNPS 2013).

California saw-grass has a high potential to occur in the Oso Flaco Lake and Creek Zone in the study area based on the presence of suitable habitat and a nearby record from the 1990s (CNDDB 2013).

5.2.2 BRANCHING BEACH ASTER

Branching beach aster (*Corethrogyne leucophylla*) is a perennial herb in the sunflower family (Asteraceae) family that blooms from May through December. It occurs in closed-cone coniferous forest and coastal dunes from 10-200 feet. It is endemic to California (CNPS 2013).

Branching beach aster has a moderate potential to occur throughout the study area based on the presence of suitable habitat, although there are no records of this species in the vicinity of the study area (CNDDB 2013).

5.2.3 COAST WOOLLY-HEADS

Coast woolly-heads (*Nemacaulis denudate var. denudate*) is an annual herb in the buckwheat family (Polygonaceae) family that blooms from April through September. It occurs on coastal dunes from 0-330 feet. Populations have been much reduced by coastal development (CNPS 2013).

Coast woolly-heads has a moderate potential to occur throughout the study area based on the presence of suitable habitat, although there are no records of this species in the vicinity of the study area (CNDDB 2013).

5.2.4 SAN BERNARDINO ASTER

San Bernardino aster (*Symphyotrichum defoliatum*) is a perennial rhizomatus herb in the sunflower (Asteraceae) family that blooms from July through November. It occurs near ditches, streams and springs in cismontane woodland, coastal scrub, lower montane coniferous forest, meadows and seeps, marshes and swamps, and vernally mesic valley and foothill grassland from 10-6,700 feet. It is endemic to California (CNPS 2013).

San Bernardino aster has a moderate potential to occur in the study area based on limited suitable habitat and nearby records from 1993 (0.5 mile east of the Dunes Preserve, CNDDB 2013).

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6.2 REFERENCES

6.2.1 REFERENCES

Baldwin, Bruce, G., Douglas H. Goldman, David J. Keil, Robert Patterson, Thomas J. Rosatti, and Dieter H. Wilken. 2012. The Jepson Manual, Vascular Plants of California, Second Edition. University of California Press, Berkeley, 1568 pages.

California Department of Fish and Game (CDFG). 2004. Species Accounts–Plants. Available at: http://www.dfg.ca.gov/wildlife/nongame/t_e_spp/docs/2004/t_eplants.pdf. Accessed May 2013.

California Department of Parks and Recreation (CDPR). 2012. Habitat Monitoring Report (In Progress). Oceano Dunes State Vehicular Recreation Area 2004-2011. Prepared by California Department of Parks and Recreation Off-highway Motor Vehicle Division, Oceano Dunes District. April.

_____. 2008. Rare Plant Surveys for Covered Species under the proposed Oceano Dunes Habitat Conservation Plan (data only, no written report).

Calflora. 2013. Information on California plants for education, research and conservation, based on data contributed by dozens of public and private institutions and individuals, including the Consortium of Calif. Herbaria. Berkeley, California: The Calflora Database. Available: http://www.calflora.org/. Accessed May 2013.

California Invasive Plant Council (Cal-IPC). 2013a. Invasive Plant Definitions. http://www.cal-ipc.org/ip/definitions/index.php. Accessed May 8, 2013.

_____. 2013b. California Invasive Plant Inventory Database. http://www.cal-ipc.org/paf/. Accessed May 8, 2013.

_____. 2006. California Invasive Plant Inventory, Table 2: Species Native to Part of California, but Invasive in Other Parts of the State. http://www.cal-ipc.org/ip/inventory/pdf/Inventory2006.pdf. Accessed May 8, 2013.

California Native Plant Society (CNPS). 2013. Inventory of Rare and Endangered Plants (online edition, v8-01a). California Native Plant Society. Sacramento, CA. http://www.rareplants.cnps.org/. Accessed May 2013.

California Natural Diversity Database (CNDDB). 2013. California Department of Fish and Game, Biogeographic Data Branch. Last updated May, 2013.

Coastal San Luis Resource Conservation District (CSLRCD). 2013. Oso Flaco Lake Watershed. http://www.coastalrcd.org/watershed_osoflaco_lake.php. Accessed May 22, 2013.

Gucker, Corey L. 2009. *Melilotus alba, M. officinalis*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).http://www.fs.fed.us/database/feis/. Accessed May 7, 2013.

National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center. 2011. Coastal California Digital Imagery. Retrieved August 2012 from NOAA Coastal Services Center's Digital Coast Data Access Viewer.

Rischbieter, D. 2009. Lower Arroyo Grande Creek and Lagoon Fishery and Aquatic Resources Summary 2008 Monitoring Report. Oceano Dunes State Vehicular Recreation Area Pismo Dunes State Reserve. California Department of Parks and Recreation, Central Valley District, Columbia, CA.

_____. 2008. Lower Arroyo Grande Creek and Lagoon Fishery and Aquatic Resources Summary 2007 Monitoring Report. Oceano Dunes State Vehicular Recreation Area Pismo Dunes State Reserve. California Department of Parks and Recreation, Central Valley District, Columbia, CA.

Sawyer, John O., Todd Keeler-Wolf, and Julie Evens. 2009. *A Manual of California Vegetation, Second Edition.* California Native Plant Society in collaboration with California Department of Fish and Game, Sacramento.

State Water Resources Control Board. 2010. 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report.

http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml. Accessed August 24, 2012.

U.S. Army Corps of Engineers (USACE). 2012. Arid West 2012 Final Regional Wetland Plant List. http://rsgisias.crrel.usace.army.mil/NWPL/doc/plant_lists/Regions/pdf/AW_2012v1.pdf. Accessed May 8, 2013.

U.S. Fish and Wildlife Service (USFWS). 2012. Critical Habitat Portal. Available online at http://criticalhabitat.fws.gov/crithab/.Accessed October, 2012.

_____. 2008. *Arenaria paludicola* (Marsh Sandwort) 5-Year Review: Summary and Evaluation. Ventura Fish and Wildlife Office, Ventura, CA. June. http://ecos.fws.gov/docs/five_year_review/doc1932.pdf. Accessed May 2013.

_____. 2004. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for *Cirsium loncholepis* (La Graciosa thistle); Final Rule. 69 Fed. Reg. 12553.

_____. 2000. Endangered and Threatened Wildlife and Plants; Final Rule for Endangered Status for Four Plants from South Central Coastal California. 65 Fed. Reg. 14888.

_____. 1998. Recovery Plan for Marsh Sandwort and Gambel's Water cress. September 28, 1998.

6.2.2 PERSONAL COMMUNICATIONS

Bohlman, Daniel, Conservation Director, San Luis Obispo County Land Conservancy, April 16, 2013

Chestnut, John, Botanist, Field meeting, September 2013

Little, Stephanie, Environmental Scientist, California Department of Parks and Recreation, Off-highway Motor Vehicle Recreation Division, Oceano Dunes District, September, 2012.

Skinner, Mark, Environmental Services Intern and Botanist, California Department of Parks and Recreation, Off-highway Motor Vehicle Recreation Division, Oceano Dunes District, February, 2014.

APPENDIX A. PLANT SPECIES RECORDED IN THE STUDY AREA

Table A. Plant Species Observed in the Study Area

Scientific Name	Common Name	Pismo Zone	Dunes Preserve Zone	Vegetation Island Zone	Phillips 66 Leasehold Zone	North Oso Flaco Zone	Maidenform Zone	Oso Flaco Lake & Creek Zone	South Oso Flaco Zone
FERNS									
AZOLLACEAE	**Mosquito Fern Family**								
Azolla filiculoides	mosquito fern	x		x					
DENNSTAEDIACEAE	**Bracken Family**								
Pteridium aquilinum	Western brackenfern								x
EQUISETACEAE	**Horsetail Family**								
Equisetum hyemale var. affine	common scouring rush	x	x						
GYMNOSPERMS									
CUPRESSACEAE	**Cypress Family**								
** Callitropsis [Hesperocyparis] macrocarpa*	Monterey Cypress	x		x					
**Juniperus chinensis*	Chinese Juniper	x							
PINACEAE	**Pine Family**								
**Pinus contorta var. contorta*	*shore pine	x		x					
**Pinus radiata*	*Monterey pine	x	x		x		x	x	
**Pinus torreyana ssp. torreyana*	*Torrey pine	x	x						
MAGNOLIIDS									
SAURURACEAE									
Anemopsis californica	yerba mansa	x				x			
EUDICOTS									
ADOXACEAE	**Muskroot Family**								
Sambucus nigra ssp. caerulea	blue elderberry	x			x				x
AIZOACEAE	**Fig-Marigold Family**								
**Carpobrotus chilensis*	sea fig	x	x	x	x	x	x	x	x
**Carpobrotus edulis*	freeway iceplant	x	x	x		x	x	x	x
**Conicosia pugioniformis*	narrow leaved iceplant	x	x	x	x	x	x	x	x
ANACARDIACEAE	**Sumac or Cashew Family**								
Rhus integrifolia	lemonade berry				x				
Rhus ovata	sugar bush	x							
Toxicodendron diversilobum	poison oak	x	x	x	x	x	x	x	x
APIACEAE	**Carrot Family**								

Scientific Name	**Common Name**	**Pismo Zone**	**Dunes Preserve Zone**	**Vegetation Island Zone**	**Phillips 66 Leasehold Zone**	**North Oso Flaco Zone**	**Maidenform Zone**	**Oso Flaco Lake & Creek Zone**	**South Oso Flaco Zone**
Apiastrum angustifolium	wild parsley			x					
Berula erecta	water parsnip							x	
**Conium maculatum*	*poison hemlock				x			x	x
Daucus pusillus	rattlesnake weed			x					
**Foeniculum vulgare*	*fennel	x							x
ARALIACEAE									
Hydrocotyle verticillata	whorled marshpennywort					x		x	x
**Hedera helix*	English ivy	x							
ASTERACEAE	**Sunflower Family**								
Achillea millefolium	yarrow	x	x	x	x	x	x	x	x
Ambrosia chamissonis	beach bur	x	x	x	x	x	x	x	x
Ambrosia psilostachya	ragweed		x					x	x
Artemisia californica	California sagebrush	x			x			x	x
Artemisia douglasiana	mugwort	x						x	
Artemisia dracunculus	tarragon	x	x		x				x
Baccharis glutinosa	saltmarsh baccharis	x							x
Baccharis pilularis	coyote brush	x	x	x	x	x	x	x	x
Baccharis salicifolia	mule fat	x							
**Calendula officinalis*	*pot marigold	x							
**Carduus pycnocephalus*	*Italian thistle	x							x
**Centaurea melitensis*	*tocalote				x				
Cirsium occidentale var. occidentale	cobweb thistle		x	x	x		x	x	x
Cirsium rhothophilum	**surf thistle**							x	x
**Cirsium vulgare*	*bull thistle				x			x	x
Coreopsis [Leptosyne] gigantea	giant coreopsis	x			x		x	x	x
Corethrogyne filaginifolia	California sandaster	x	x	x	x	x	x	x	x
**Cotula coronopifolia*	*brass buttons							x	
Deinandra paniculata	**paniculate tarplant**				x				
Ericameria ericoides	mock heather	x	x	x	x	x	x	x	x
Erigeron canadensis	horseweed	x		x					x
Erigeron blochmaniae	**Blochman's leafy daisy**	x	x	x	x	x	x	x	x
Erigeron glaucus	seaside daisy	x							
Eriophyllum staechadifolium	lizard tail	x		x	x	x	x	x	x
Gamochaeta purpurea	purple cudweed							x	
Hazardia squarrosa	sawtooth goldenbush	x							x
Helenium puberulum	sneezeweed			x				x	

Scientific Name	Common Name	Pismo Zone	Dunes Preserve Zone	Vegetation Island Zone	Phillips 66 Leasehold Zone	North Oso Flaco Zone	Maidenform Zone	Oso Flaco Lake & Creek Zone	South Oso Flaco Zone
**Helminthotheca echioides*	*bristly ox-tongue	x						x	
Heterotheca grandiflora	telegraph weed	x	x	x	x		x	x	x
Jaumea carnosa	marsh jaumea		x		x	x		x	x
**Lactuca serriola*	*prickly lettuce			x					
Layia hieracioides	tall layia			x	x				
Lessingia pectinata var. *pectinata*	valley lessingia				x				
Logfia filaginoides	California cottonrose								x
Malacothrix californica	California dandelion	x	x				x		x
Malacothrix incana	**dunedelion**			x		x		x	
Pseudognaphalium bioletti	twocolor cudweed						x	x	x
Pseudognaphalium californicum	ladies' cudweed	x	x	x	x	x	x		x
Psuedognaphalium canescens	Wright's cudweed								x
**Pseudognaphalium luteoalbum*	*Jersey cudweed	x		x	x		x		
Pseudognaphalium ramosissimum	pink cudweed	x	x		x	x	x	x	x
Senecio blochmaniae	**Blochman's groundsel**	x	x	x	x	x	x	x	x
**Senecio vulgaris*	*common groundsel			x				x	
Solidago confinis	Southern goldenrod	x	x	x		x	x	x	x
**Sonchus asper*	*prickly sow thistle			x					x
**Sonchus oleraceus*	*common sow thistle	x							x
Stephanomeria virgata	tall stephanomeria				x				x
Xanthium strumarium	cocklebur	x							
BORAGINACEAE	**Borage Family**								
Amsinckia spectabilis var. microcarpa	small fruit seaside fiddleneck			x	x				x
Cryptantha clevelandii	Cleveland's cryptantha				x		x	x	x
Heliotropium curassavicum	heliotrope							x	
Phacelia ramosissima	branching phacelia	x	x	x	x	x	x	x	x
Pholisma arenarium	desert pholisma			x	x				x
Plagiobothrys sp.	popcorn flower				x				
BRASSICACEAE	**Mustard Family**								
**Alyssum sp.*	*alyssum	x							
**Brassica nigra*	*black mustard	x		x	x				x
**Cakile maritima*	*sea rocket	x	x	x		x		x	x
Descurainia pinnata	tansy mustard			x					
Dithyrea maritima	**beach spectaclepod**					x			
Erysimum suffrutescens	**suffrutescent wallflower**	x	x	x	x	x	x	x	x
Nasturtium sp.	unknown cress	x						x	

Scientific Name	**Common Name**	**Pismo Zone**	**Dunes Preserve Zone**	**Vegetation Island Zone**	**Phillips 66 Leasehold Zone**	**North Oso Flaco Zone**	**Maidenform Zone**	**Oso Flaco Lake & Creek Zone**	**South Oso Flaco Zone**
**Raphanus sativus*	*wild raddish	x							
CACTACEAE	**Cactus Family**								
Opuntia sp.	prickly pear								x
CAPRIFOLIACEAE	**Honeysuckle Family**								
Lonicera involucrata var. ledebourii	twinberry honeysuckle	x			x			x	x
Symphoricarpos mollis	trailing snowberry	x							
CARYOPHYLLACEAE	**Pink Family**								
Cardionema ramosissimum	sand Mat				x				x
Silene laciniata var. laciniata	cardinal catchfly	x		x	x			x	x
Spergularia marina	saltmarsh sand spurrey							x	
CASUARINACEAE	**Sheoak Family**								
**Casuarina sp.*	*unknown sheoak	x							
CHENOPODIACEAE	**Goosefoot Family**								
Atriplex leucophylla	beach saltbush								x
**Atriplex prostrata*	*fat hen					x			
Chenopodium californicum	California goosefoot			x	x	x	x	x	
Chenopodium littoreum	**coastal goosefoot**				x				
Chenopodium murale	nettleleaf goosefoot							x	
Chenopodium sp.	unknown goosefoot	x							x
Sarcocornia [Salicornia] sp.	pickleweed	x							
CONVOLVULACEAE	**Morning Glory Family**								
Calystegia soldanella	beach morning glory	x				x		x	x
Cuscuta californica	California dodder	x							
CORNACEAE	**Dogwood Family**								
Cornus sericea	American dogwood	x							
CRASSULACEAE	**Stonecrop Family**								
**Crassula ovata*	*jade plant	x							
Dudleya lanceolata	Southern California dudleya	x	x	x	x	x	x	x	x
Dudleya pulverulenta	chalk dudleya		x						
ERICACEAE	**Heath Family**								
Arbutus meziesii	Pacific madrone	x							
Arctostaphylos osoensis	**oso manzanita**	x							
Arctostaphylos pilosula	**Santa Margarita**	x							

Scientific Name	**Common Name**	**Pismo Zone**	**Dunes Preserve Zone**	**Vegetation Island Zone**	**Phillips 66 Leasehold Zone**	**North Oso Flaco Zone**	**Maidenform Zone**	**Oso Flaco Lake & Creek Zone**	**South Oso Flaco Zone**
	manzanita								
Arctostaphylos rudis	**sand mesa manzanita**	x							
EUPHORBIACEAE	**Spurge Family**								
Croton californicus	California croton	x	x	x	x	x	x	x	x
**Ricinus communis*	*castor bean	x							
FABACEAE	**Legume Family**								
**Acacia longifolia*	*golden wattle	x		x	x				
Acmispon heermannii var. heermannii	Heerman's lotus	x	x	x	x	x		x	x
Astragalus nuttallii var. nuttallii	**Nuttall's milkvetch**		x	x	x	x	x	x	x
Lotus scoparius [Acmispon glaber]	deerweed	x	x	x	x	x	x	x	x
Lupinus arboreus	yellow bush lupine	x	x		x				
Lupinus chamissonis	silver dune lupine	x	x	x	x	x	x	x	x
Lupinus nipomensis	**Nipomo Mesa lupine**				x				
**Melilotus albus*	*white sweetclover	x							
**Melilotus indicus*	*yellow sweetclover							x	
FAGACEAE	**Oak Family**								
Notholithocarpus densiflorus var. densiflorus	tan oak	x							
Quercus agrifolia	coast live oak	x			x				x
FRANKENIACEAE	**Frankenia Family**								
Frankenia salina	alkali heath	x	x						
GARRYACEAE	**Silk Tassel Family**								
Garrya elliptica	coast silktassel	x							
GERANIACEAE	**Geranium Family**								
**Erodium cicutarium*	*red stemmed filaree	x							
Geranium sp.	unknown geranium	x							
GROSSULARIACEAE	**Gooseberry Family**								
Ribes divaricatum var. pubiflorum	straggly gooseberry	x		x	x		x	x	x
Ribes sanguineum	flowering currant	x							
LAMIACEAE	**Mint Family**								
Clinopodium douglasii	yerba buena	x							
Monardella undulata* ssp. *crispa	**crisp monardella**	x	x	x	x		x	x	x
Monardella undulata* ssp. *undulata	**San Luis Obispo monardella**		x		x				x

Scientific Name	**Common Name**	**Pismo Zone**	**Dunes Preserve Zone**	**Vegetation Island Zone**	**Phillips 66 Leasehold Zone**	**North Oso Flaco Zone**	**Maidenform Zone**	**Oso Flaco Lake & Creek Zone**	**South Oso Flaco Zone**
Salvia apiana	white sage	x							
Salvia leucophylla	San Luis purple sage	x							
Salvia mellifera	black sage	x			x				x
Salvia spathacea	hummingbird sage	x							
Salvia sp.	chia	x			x				
Stachys bullata	California hedge nettle	x							
LAURACEAE	**Laurel Family**								
Umbellularia californica	California bay	x							
MALVACEAE	**Mallow Family**								
Fremontodendron californicum	California flannelbush	x							
**Malva sp.*	unknown mallow	x							
MYRICACEAE	**Wax Myrtle Family**								
Morella californica	wax myrtle	x	x	x	x	x	x		
MYRTACEAE	**Myrtle Family**								
**Eucalyptus globulus*	*blue gum	x		x					
**Melaleuca viminalis*	*bottlebrush	x							
*Unknown purple myrtaceae		x							
NYCTAGINACEAE	**Four-O'Clock Family**								
Abronia latifolia	yellow sand verbena	x	x	x	x	x	x	x	x
Abronia maritima	**red sand verbena**	x	x	x		x		x	x
Abronia umbellata	pink sand verbena	x	x	x	x			x	x
ONAGRACEAE	**Evening Primrose Family**								
Camissoniopsis cheiranthifolia var. *cheiranthifolia*	beach evening primrose	x	x	x	x	x	x	x	x
Camissoniopsis micrantha	Spencer primrose	x							
Camissonia strigulosa	contorted primrose			x	x		x		x
Epilobium canum	California fuchsia	x							
Epilobium ciliatum var. watsonii	Watson's willowherb					x		x	x
Oenothera elata var. hookeri	common evening primrose	x	x	x		x		x	
OROBANCHACEAE	**Broomrape Family**								
Castilleja exserta var. exserta	purple owl's clover				x				x
Castilleja latifolia	**Monterey Indian paintbrush**	x	x	x	x		x	x	x
Orobanche fasciculata	fasicled broomrape			x					

Scientific Name	Common Name	Pismo Zone	Dunes Preserve Zone	Vegetation Island Zone	Phillips 66 Leasehold Zone	North Oso Flaco Zone	Maidenform Zone	Oso Flaco Lake & Creek Zone	South Oso Flaco Zone
PAPAVERACEAE	**Poppy Family**								
Eschscholzia californica	California poppy	x			x				x
PLANTAGINACEAE	**Plantain Family**								
Penstemon sp.	penstemon				x	x			
**Plantago major*	*common plaintain	x	x					x	
**Veronica anagallis-aquatica*	water speedwell							x	
PLATANACEAE	**Sycamore Family**								
Platanus racemosa	Western Sycamore	x	x						
POLEMONIACEAE	**Phlox Family**								
Eriastrum densifolium ssp. densifolium	giant eriastrum			x		x	x		
Linanthus californicus	**fuzzy prickly phlox**		x		x				x
POLYGONACEAE	**Buckwheat Family**								
Chorizanthe angustifolia	narrow-leaf spineflower			x	x				x
Eriogonum gracile	slender buckwheat					x			
Eriogonum parvifolium	seacliff buckwheat	x	x	x	x	x	x	x	x
Mucronea californica	**California spineflower**		x		x				x
Persicaria lapathifolia	common knotweed							x	
**Polygonum arenastrum*	*dooryard knotweed							x	
Polygonum sp.	unknown knotweed	x							
**Rumex conglomeratus*	*clustered dock							x	
Rumex salicifolius	willow dock							x	
Rumex sp.	unknown dock	x				x			
RANUNCULACEAE	**Buttercup Family**								
Clematis ligusticifolia	creek clematis	x		x					
RHAMNACEAE	**Buckthorn Family**								
Ceanothus impressus var. nipomensis	Nipomo Mesa ceanothus	x							
Ceanothus sp.	unknown ceanothus	x							
Frangula californica ssp. californica	California coffeeberry	x	x	x	x			x	x
ROSACEAE	**Rose Family**								
Adenostoma fasciculatum	chamise	x							
Cercocarpus betuloides	mountain mahogany	x							
Fragaria chiloensis	beach strawberry	x	x			x		x	x
Heteromeles arbutifolia	toyon	x							x
Horkelia cuneata var. cuneata	wedge-leaved horkelia				x		x		x

Scientific Name	**Common Name**	**Pismo Zone**	**Dunes Preserve Zone**	**Vegetation Island Zone**	**Phillips 66 Leasehold Zone**	**North Oso Flaco Zone**	**Maidenform Zone**	**Oso Flaco Lake & Creek Zone**	**South Oso Flaco Zone**
Potentilla anserina var. pacifica	Pacific silverweed	x	x			x		x	x
Prunus fasciculata var. punctata	**sand almond**				x				
Prunus ilicifolia	hollyleaf cherry	x			x				
Rosa californica	California wildrose	x							
Rubus ursinus	California blackberry	x	x	x	x		x	x	x
RUBIACEAE	**Coffee Family**								
Galium aparine	goose grass			x					
Galium porrigens var. porrigens	climbing bedstraw			x					
SALICACEAE	**Willow Family**								
Populus trichocarpa	black cottonwood	x	x	x			x	x	x
Salix exigua	sandbar willow							x	
Salix lasiolepis	arroyo willow	x	x	x	x	x	x	x	x
Salix sitchensis	Sitka willow			x					
SAPINDACEAE	**Soapberry Family**								
Acer negundo	box elder	x							
SCROPHULARIACEAE	**Figwort Family**								
Diplacus aurantiacus	orange bush monkeyflower		x						
**Myoporum laetum*	*lollypop tree	x							
SOLANACEAE	**Nightshade Family**								
Solanum douglasii	Douglas' nightshade	x	x	x	x			x	x
URTICACEAE	**Nettle Family**								
Urtica dioica	stinging nettle	x	x	x	x			x	x
VERBENACEAE	**Verbena Family**								
Verbena lasiostachys var. scabrida	robust vervain	x							
MONOCOTS									
AGAVACEAE	**Agave Family**								
**Agave americana*	*American century plant	x							
ARACEAE	**Arum Family**								
Lemna minor	duckweed							x	
ARECACEAE	**Palm Family**								
**Phoenix canariensis*	*Canary Island date palm	x							
**Washingtonia robusta*	*Washington fan palm	x							
ASPHODELACEAE	**Aloe Family**								

Scientific Name	Common Name	Pismo Zone	Dunes Preserve Zone	Vegetation Island Zone	Phillips 66 Leasehold Zone	North Oso Flaco Zone	Maidenform Zone	Oso Flaco Lake & Creek Zone	South Oso Flaco Zone
**Aloe maculata*	*soap aloe	x							
CYPERACEAE	**Sedge Family**								
Bolboschoenus maritimus	alkali bulrush					x			
Carex pansa	sanddune sedge				x				
Carex praegracilis	field sedge	x	x	x	x	x	x	x	x
Carex sp.	unknown sedge	x							
Cyperus esculentus	yellow nutgrass	x							
Isolepis cernua	low bulrush					x		x	
Schoenoplectus americanus	American bulrush							x	x
Schoenoplectus californicus	California bulrush	x	x	x	x	x		x	x
Scirpus microcarpus	panicled bulrush	x							
IRIDACEAE	**Iris Family**								
Iris douglasiana	Douglas iris	x							
JUNCACEAE	**Rush Family**								
Juncus effusus var. brunneus	bog rush								x
Juncus lescurii	dune rush	x	x	x	x	x	x	x	x
Juncus sp.	unknown rush	x							
LILIACEAE	**Lily Family**								
**Agapanthus praecox*	*African lily	x							
POACEAE	**Grass Family**								
**Ammophila arenaria*	*European beachgrass	x	x	x	x	x		x	x
**Arundo donax*	*giant reed	x							
**Avena sp.*	*wild oats	x							
Bromus carinatus var. carinatus	California brome	x						x	
**Bromus diandrus*	*ripgut brome			x	x		x	x	x
**Bromus hordeaceus*	*soft chess			x					
**Bromus madritensis var. madritensis*	*foxtail chess			x					
**Bromus madritensis var. rubens*	*red brome			x	x			x	x
**Cortaderia jubata*	*jubata grass	x	x	x	x	x	x	x	x
**Cynodon dactylon*	*Bermuda grass	x							
Distichlis spicata	salt grass	x	x		x	x		x	x
**Ehrharta calycina*	*perennial veldt grass	x	x	x	x			x	x
**Elymus farctus*	*Russian wheatgrass	x	x	x					
Elymus glaucus	blue wildrye								x
Elymus triticoides	beardless wild-Rye							x	
Elymus sp.	unknown rye	x							
**Festuca bromoides*	*brome fescue								x

Scientific Name	**Common Name**	**Pismo Zone**	**Dunes Preserve Zone**	**Vegetation Island Zone**	**Phillips 66 Leasehold Zone**	**North Oso Flaco Zone**	**Maidenform Zone**	**Oso Flaco Lake & Creek Zone**	**South Oso Flaco Zone**
**Festuca myuros*	*rattail sixweeks grass			x					
Festuca octoflora	sixweeks grass			x					
**Hordeum murinum*	Mediterranean barley	x		x					
Koeleria macrantha	June grass								x
Leymus [Elymus] condensatus	giant wild rye				x			x	x
Melica imperfecta	California melic			x	x				x
**Pennisetum clandestinum*	*Kikuyu grass	x							
**Polypogon monspeliensis*	*rabbitsfoot grass			x		x		x	x
**Triticum aestivum*	wheat			x					
TYPHACEAE	**Cattail Family**								
Sparganium eurycarpum var. eurycarpum	broadfruit bur-Reed							x	x
Typha domingensis	southern cattail			x					
Typha latifolia	broadleaf cattail	x					x	x	x
* = Introduced Species **Bold= Special-status Species**									
Total Species									
Total Species Documented =	247	155	66	88	90	55	49	94	107
Total Non-Native Species =	65	45	10	24	13	8	7	21	18
Total Special-status Species=	21	9	9	7	10	4	5	9	9

APPENDIX B. SPECIAL-STATUS PLANT TABLE

Table B. Special-status Plant Species with the Potential to Occur in the Project Area

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
Pismo clarkia *Clarkia speciosa ssp. immaculata*	FE, CRPR 1B.1	Endemic to SLO County.	Chaparral (margins, openings), cismontane woodland or valley and foothill grassland on sandy soils; 82-607 ft. (25-185 m.).	Annual herb, May-Jul.	Low - No native grasslands within project area.	1, 2, 3
Indian Knob mountainbalm *Eriodictyon altissimum*	FE, SE, CRPR 1B.1	Endemic to SLO County.	Chaparral (maritime), cismontane woodland or coastal scrub; 262-886 ft. (80-270 m.).	Perennial evergreen shrub, Mar.-Jun.	Low - Limited suitable habitat and no records from area.	3
Marsh sandwort *Arenaria paludicola*	FE, SE, CRPR 1B.1	Remaining extant occurrences are in SLO and Los Angeles counties.	Sandy openings in marshes and swamps (fresh water or brackish); 10-558 ft. (3-170 m.).	Perennial stoloniferous herb, May-Aug.	Present - Known to occur from CNDDB and District records.	1, 2, 3
Nipomo Mesa lupine *Lupinus nipomensis*	FE, SE, CRPR 1B.1	Endemic to SLO County.	Coastal dunes; 33-164 ft. (10-50 m.).	Annual herb, Dec.-May	Present - Observed in the Phillips 66 Leasehold Zone during 2012 vegetation mapping; previously known from the Phillips 66 Leasehold Zone.	1, 2, 3, 5
Chorro Creek bog thistle *Cirsium fontinale var. obispoense*	FE, SE, CRPR 1B.2	Endemic to SLO County.	Chaparral, cismontane woodland, coastal scrub or valley and foothill grassland in serpintinite seeps and drainages; 115-1,247 ft. (35-380 m.).	Perennial herb, Feb.-Sep.	Low - Limited suitable habitat and no records from area.	2
Gambel's watercress *Nasturtium gambelii*	FE, ST, CRPR 1B.1	Central and southern coast.	Marshes and swamps (freshwater or brackish)	Perennial rhizomatous herb, Apr.-Oct.	Present - Known from Oso Flaco Creek; although pure stands (non-hybridized) might be extirpated.	1, 2, 3, 5

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
La Graciosa thistle *Cirsium scariosum var. loncholepis*	FE, ST, CRPR 1B.1	Endemic to SLO, Santa Barbara and Monterey counties.	Cismontane woodland, coastal dunes, coastal scrub, marshes and swamps (brackish) or valley and foothill grassland on mesic, sandy soils; 13-722 ft. (4-220 m.).	Perennial herb, May-Aug.	Present - Seen in the South Oso Flaco Zone during 2013 rare plant surveys, and in the Phillips 66 Leasehold Zone and South Oso Flaco Zone previously (CNDDB).	1, 2, 3, 5
Morro manzanita *Arctostaphylos morroensis*	FT, CRPR 1B.1	Endemic to SLO County.	Chaparral (maritime), cismontane woodland, coastal dunes (pre-Flandrian) or coastal scrub on Baywood fine sand; 16-673 ft. (5-205 m.).	Perennial evergreen shrub, Dec.-Mar.	Low - Limited suitable habitat and no records from area.	2
Beach spectaclepod *Dithyrea maritima*	ST, CRPR 1B.1	Southern coast and off-shore islands from San Luis Obispo to Los Angeles.	Coastal dunes, coastal scrub (sandy); 10-164 ft. (3-50 m.).	Perennial rhizomatous herb, Mar.-May	Present - Observed in the North Oso Flaco Zone during 2012 vegetation mapping, and in the North and South Oso Flaco Zones previously.	2, 3, 5
Surf thistle *Cirsium rhothophilum*	ST, CRPR 1B.2	Endemic to SLO and Santa Barbara counties.	Coastal bluff scrub or coastal dunes; 10-197 ft. (3-60 m.).	Perennial herb, Apr.-Jun.	Present - Observed in near Oso Flaco Creek during 2012 vegetation mapping, and in the North and South Oso Flaco Zones previously.	2, 3, 5
Blochman's dudleya *Dudleya blochmaniae ssp. blochmaniae*	CRPR 1B.1	Along coast from west of Paso Robles to Mexican border.	Coastal bluff scrub, chaparral, coastal scrub or valley and foothill grassland on rocky, often clay or serpintinite soils; 16-1,476 ft. (5-450 m.).	Perennial herb; Apr.-Jun.	Low - Limited suitable habitat and no records from area.	2, 3

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
Hoover's button-celery *Eryngium aristulatum var. Hooveri*	CRPR 1B.1	Extant occurrences in Alameda, San Benito, San Diego and SLO counties.	Vernal pools, 10-148 ft. (3-45 m.).	Annual/perennial herb, Jul.-Aug.	Low - Limited suitable habitat and no records from area.	2, 3
Kellogg's horkelia *Horkelia cuneata var. sericea*	CRPR 1B.1	Endemic to coast from San Francisco Bay Area to vicinity of Lompoc.	Closed-cone coniferous forest, chaparral (maritime), coastal dunes or coastal scrub in sandy or gravelly openings; 33-656 ft. (10-200 m.).	Perennial herb, Apr.-Sep.	Present - occurs in the Dunes Preserve and in the Phillips 66 Leasehold Zone according to State Parks and CNDDB records	2, 3, 4
Mesa horkelia *Horkelia cuneata var. puberula*	CRPR 1B.1	Endemic to central and southern coast.	Chaparral (maritime), cismontane woodland, coastal scrub on sandy or gravelly soils; 230-2,657 ft. (70-810 m.).	Perennial herb, Feb.-Sep.	Low - Project area probably too low in elevation, closest occurrence is 2 miles north.	2, 3
Aphanisma *Aphanisma blitoides*	CRPR 1B.2	Southern California coast and offshore islands from Santa Maria to Mexican border.	Coastal bluff scrub, coastal dunes or coastal scrub on sandy soils; 3-1,001 ft. (1-305 m.).	Annual herb, Mar.-Jun.	Low - Suitable habitat but no records in the region.	2, 3
Black-flowered figwort *Scrophularia atrata*	CRPR 1B.2	Endemic to SLO and Santa Barbara counties	Closed-cone coniferous forest, chaparral, coastal dunes, coastal scrub or riparian scrub; 33-1,640 ft. (10-500 m.).	Perennial herb, Mar.-Jul.	Low - Mostly occurs on much older sand dunes than are present in the area.	2, 3

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
Blochman's leafy daisy *Erigeron blochmaniae*	CRPR 1B.2	Endemic to SLO and Santa Barbara counties.	Coastal dunes, coastal scrub; 10-148 ft. (3-45 m.).	Perennial rhizomatous herb; Jun.-Aug.	Present - Observed in multiple locations during 2012 vegetation mapping, previously known from study area based on District surveys and CNDDB records.	2, 3, 4, 5
Coast woolly-heads *Nemacaulis denudata var. denudata*	CRPR 1B.2	Central and southern coast.	Coastal dunes; 0-328 ft. (0-100 m.).	Annual herb, Apr.-Sep.	Moderate - Suitable habitat, but no records from area.	2, 3
Coastal goosefoot *Chenopodium littoreum*	CRPR 1B.2	Endemic to SLO, Santa Barbara and Los Angeles counties.	Coastal dunes; 33-98 ft. (10-30 m.)	Annual herb, Apr.-Aug.	Present - Observed in the Phillips 66 Leasehold Zone during 2012 vegetation mapping, and at Oso Flaco Lake previously.	2, 3, v
Congdon's tarplant *Centromadia parryi* ssp. *congdonii*	CRPR 1B.2	Endemic to the San Francisco Bay Area, Monterey coast and SLO County.	Valley and foothill grassland (alkaline); 0-755 ft. (0-230 m.).	Annual herb, May-Nov.	Low - Limited suitable habitat and no records from area.	2, 3
Crisp monardella *Monardella undulata ssp. crispa*	CRPR 1B.2	Endemic to SLO and Santa Barbara counties.	Coastal dunes or coastal scrub; 33-394 ft. (10-120 m.).	Perennial rhizomatous herb, Apr.-Aug.	Present - Observed in multiple locations during 2012 vegetation mapping, previously known from study area.	2, 3, 4, 5

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
Davidson's saltscale *Atriplex serenana var. davidsonii*	CRPR 1B.2	Along coast from Santa Maria to San Diego.	Coastal bluff scrub or coastal scrub on alkaline soils; 33-656 ft. (10-200 m.).	Annual herb, April-Oct.	Low - Limited suitable habitat and no records from area.	2, 3
dune larkspur *Delphinium parryi ssp. Blochmaniae*	CRPR 1B.2	Endemic to SLO, Santa Barbara and Ventura counties.	Chaparral (maritime), coastal dunes; 0-656 ft. (0-200 m.).	Perennial herb, Apr.-May	Present - Observed in the Phillips 66 Leasehold Zone and known to occur south of Oso Flaco Lake from CNDDB records.	2, 3
Hoover's bent grass *Agrostis hooveri*	CRPR 1B.2	Endemic, coastal SLO and Santa Barbara counties.	Closed cone coniferous forest, chaparral, cismontane woodland or valley and foothill grassland usually on sandy soils; 20-689 ft. (6-610 m.).	Perennial herb, Apr.-Jul.	Low - Limited suitable habitat.	2, 3
Jones' layia *Layia jonesii*	CRPR 1B.2	Endemic to SLO County.	Chaparral or valley and foothill grassland or clay or serpentinite soils; 16-1,312 ft. (5-400 m.).	Annual herb, Mar.-May	Low - Limited suitable habitat and no records from area.	2
Mile's milk-vetch *Astragalus didymocarpus var. milesianus*	CRPR 1B.2	Endemic to SLO, Santa Barbara and Ventura counties.	Coastal scrub (clay); 66-295 ft. (20-90 m.).	Annual herb, Mar.-Jun.	Low - Limited suitable habitat and no records from area.	2, 3
Oso manzanita *Arctostaphylos osoensis*	CRPR 1B.2	Endemic to SLO County.	Chaparral or cismontane woodland on dacite porphyry buttes; 95-500 m. (312-1,640 m.).	Perennial evergreen shrub, Feb.-Mar.	Low- Limited suitable habitat and no records from area.	5
Pecho manzanita *Arctostaphylos pechoensis*	CRPR 1B.2	Endemic to SLO and Santa Barbara counties.	Closed-cone coniferous forest, chaparral or coastal scrub on siliceous shale; 410-2,789 ft. (125-850 m.).	Perennial evergreen shrub, Nov.-Mar.	Low - Limited suitable habitat and no records from area.	2, 3

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
San Bernardino aster *Symphyotrichum defoliatum*	CRPR 1B.2	Endemic to southwestern California.	Cismontane woodland, coastal scrub, lower montane coniferous forest, meadows and seeps, marshes and swamps or valley and foothill grassland (vernally mesic) near ditches, streams or springs; 7-6,693 ft. (2-2,040 m.).	Perennial rhizomatous herb, Jul.-Nov.	Moderate - Limited suitable habitat, occurs 0.5 mile east of Dunes Preserve.	2, 3
San Luis Obispo County lupine *Lupinus ludovicianus*	CRPR 1B.2	Endemic to SLO County.	Chaparral or cismontane woodland on sandstone or sandy soils; 164-1,722 ft. (50-525 m.).	Perennial shrub, Apr.-Jul	Low - Limited suitable habitat and no records from area.	2, 3
San Luis Obispo mariposa lily *Calochortus obispoensis*	CRPR 1B.2	Endemic to SLO County.	Chaparral, coastal scrub or valley and foothill grassland often on serpintinite soils; 164-2,395 ft. (50-730 m.).	Perennial bulbiferous herb, May-Jul.	Low - Limited suitable habitat and no records from area.	2, 3
San Luis Obispo monardella *Monardella undulata ssp. undulata*	CRPR 1B.2	Endemic to SLO and Santa Barbara counties.	Coastal dunes or coastal scrub (sandy); 33-656 ft. (10-200 m.).	Perennial rhizomatous herb, May-Sep.	Present - Observed in the Dunes Preserve, Phillips 66 Leasehold Zone and South Oso Flaco Zone during 2012 vegetation mapping; previously known from the Dunes Preserve, Phillips 66 and near Oso Flaco Lake.	2, 3, 5
San Luis Obispo owl's clover *Castilleja densiflora spp. Obispoensis*	CRPR 1B.2	Endemic to SLO County.	Meadows and seeps or valley and foothill grassland sometimes on serpintinite soils; 33-1,312 ft. (10-400 m.).	Annual herb, Mar.-May	Low - Limited suitable habitat and no records from area.	2, 3

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
Sand mesa manzanita *Arctostaphylos rudis*	CRPR 1B.2	Endemic to SLO and Santa Barbara counties.	Chaparral (maritime) or coastal scrub on sandy soils; 82-1,056 ft. (25-322 m.).	Perennial evergreen shrub, Nov.-Feb.	Present - A single individual is present within the Phillips 66 Leasehold Zone.	2, 3, 5
Santa Margarita manzanita *Arctostaphylos pilosula*	CRPR 1B.2	Endemic, occurs in SLO, Santa Barbara and Monterey counties.	Broad-leaved upland forest, closed-cone coniferous forest, chaparral or cismontane woodland sometimes on sandstone; 577-3,609 ft. (170-1,100 m.).	Perennial evergreen shrub, Dec.-May	Low - Limited suitable habitat and no records from area.	2, 3, 5
Brewer's spineflower *Chorizanthe breweri*	CRPR 1B.3	Endemic to SLO and Monterey counties.	Closed-cone coniferous forest, chaparral, cismontane woodland or coastal scrub on serpentinite, rocky or gravelly soils; 148-2,625 ft. (45-800 m.).	Annual herb, Apr.-Aug.	Low - Limited suitable habitat and no records from area.	2, 3
Straight-awned spineflower *Chorizanthe rectispina*	CRPR 1B.3	Endemic to SLO, Santa Barbara and Monterey counties.	Chaparral, cismontane woodland or coastal scrub; 278-3,395 ft. (85-1035 m.).	Annual herb, Apr.-Jul.	Low - Limited suitable habitat and no records from area.	2, 3
California saw-grass *Cladium californicum*	CRPR 2.2	Eastern and southern California.	Alkaline or freshwater meadows and seeps; 197-2,838 ft. (60-865 m.).	Perennial rhizomatous herb, Jun.-Sep.	High - Occurs near project area at a bog near Highway 1.	2, 3
Branching beach aster *Corethrogyne leucophylla*	CRPR 3.2	Endemic to coast from Santa Cruz to Santa Maria.	Closed-cone coniferous forest or coastal dunes; 10-197 ft. (3-60 m.).	Perennial herb, May-Dec.	Moderate - Suitable habitat, but no records from area.	3
Brewer's calandrinia *Calandrinia breweri*	CRPR 4.2	Coastal counties from Santa Rosa to the Mexican border.	Chaparral or coastal scrub on sandy or loamy disturbed sites or burns; 33-4,003 ft. (10-1,220 m.).	Annual herb, Mar.-Jun.	Low - Limited suitable habitat and no records from area.	3

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
California spineflower *Mucronea californica*	CRPR 4.2	Endemic to central and southern California.	Chaparral, cismontane woodland, coastal dunes, coastal scrub or valley and foothill grassland on sandy soils; 0-4,593 ft. (0-1,400 m.).	Annual herb, Mar.-Aug.	Present - Observed in the Dunes Preserve, Phillips 66 Leasehold Zone and South Oso Flaco Zone during 2012 vegetation mapping.	3, 5
Cambria morning-glory *Calystegia subacaulis subsp. Episcopalis*	CRPR 4.2	Endemic to SLO and Santa Barbara counties.	Chaparral, cismontane woodland, coastal prairie or valley and foothill grassland usually on clay soils; 98-1,640 ft. (30-500 m.).	Perennial rhizomatous herb, Mar.-May	Low - Limited suitable habitat and no records from area.	2, 3
Douglas' fiddleneck *Amsinckia douglasiana*	CRPR 4.2	Endemic, west of the Sierras from Monterey County to Santa Barbara & in Tehachapi Ranges.	Cismontane woodland or valley and foothill grassland on Monterey shale; 0-6,398 ft. (0-1,950 m.).	Annual herb, Mar.-May	Low - No suitable habitat.	3
Blochman's groundsel *Senecio blochmaniae*	CRPR 4.2	Endemic to SLO and Santa Barbara counties.	Coastal dunes, 0-328 ft. (0-100 m.).	Perennial herb, May-Oct.	Present - Observed in multiple locations during 2012 vegetation mapping, previously known from study area.	3, 4, 5

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
Fuzzy prickly phlox *Linanthus californicus*	CRPR 4.2	Endemic to SLO and Santa Barbara counties.	Coastal dunes, 3-98 ft. (1-30 m.).	Perennial deciduous shrub, Mar.-Aug.	Present - Observed in the Dune Preserve, Phillips 66 Leasehold Zone and South Oso Flaco Zone during 2012 vegetation mapping; previously known from Phillips 66 Leasehold Zone.	4, v
Hickman's popcorn flower *Plagiobothrys chorisianus var. hickmanii*	CRPR 4.2	Endemic to San Mateo, Santa Clara, Santa Cruz, San Benito, Monterey and SLO counties.	Closed-cone coniferous forest, chaparral, coastal scrub, marshes and swamps or vernal pools; 49-279 ft. (15-185 m.).	Annual herb, Apr.-Jun.	Present - Found in the Maidenform Zone and the Phillips 66 Leasehold Zone during past District surveys.	4
Nuttall's milkvetch *Astragalus nuttallii var. nuttallii*	CRPR 4.2	Endemic to coast from San Francisco to SB County.	Coastal bluff scrub or coastal dunes; 10-394 ft. (3-120 m.).	Perennial herb, Jan.-Nov.	Present - Observed in multiple locations during 2012 vegetation mapping.	3, 4, 5
Paniculate tarplant *Deinandra paniculata*	CRPR 4.2	Several counties in southern California.	Coastal scrub, valley and foothill grassland, and vernal pools, usually on vernally mesic and sometimes on sandy sites; 82-3,084 ft. (25- 940 m.).	Annual herb, Apr.-Nov.	Present - Observed in the Phillips 66 Leasehold Zone during 2012 vegetation mapping.	3, 5
Red sand verbena *Abronia maritima*	CRPR 4.2	Along coast from SLO County to Mexican border.	Coastal dunes, 0-328 ft. (0-100 m.).	Perennial herb, Feb.-Nov.	Present - On-site surveys and CNDDB records.	3, 4, 5

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
Short-lobed broomrape *Orobanche parishii ssp. brachyloba*	CRPR 4.2	Central and southern coast and off-shore islands.	Coastal bluff scrub, coastal dunes or coastal scrub on sandy soils; 10-1,001 ft. (3-305 m.)	Perennial herb (parasitic), Apr.-Oct.	Present - Known to occur south of Oso Flaco Lake from CNDDB records and also seen in 2013 by the South Oso Flaco CXT.	2, 3
Southwestern spiny rush *Juncus acutus ssp. leopoldii*	CRPR 4.2	Central and southern coast.	Coastal dunes (mesic), meadows and seeps (alkaline seeps) or marshes and swamps (coastal salt); 10-2,953 ft. (3-900 m.).	Perennial rhizomatous herb; Mar.-Jun.	Present - Species found during 2004-2010 plant surveys in the study area.	4
Suffrutescent wallflower *Erysimum suffrutescens*	CRPR 4.2	Endemic to and southern coast.	Coastal bluff scrub, chaparral (maritime), coastal dunes or coastal scrub; 0-492 (0-150 m.).	Perennial herb, Jan.-Jul.	Present - Observed in multiple locations during 2012 vegetation mapping, previously known from study area based on District surveys.	3, 4, 5
Douglas's spineflower *Chorizanthe douglasii*	CRPR 4.3	Endemic to SLO, San Benito and Monterey counties.	Chaparral, cismontane woodland, coastal scrub or lower montane coniferous forest on sandy or gravelly soils; 180-5,249 ft. (55-1600 m.).	Annual herb, Apr.-Jul.	Present - Found in 2009 District botanical survey.	4

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
Dunedelion *Malacothrix incana*	CRPR 4.3	Endemic to central and southern coast and off-shore islands.	Coastal dunes or coastal scrub; 7-115 ft. (2-35 m.).	Perennial herb, Jan.-Oct.	Present - Observed in the vegetation islands and near Oso Flaco Creek during 2012 vegetation mapping; previously known from near Oso Flaco Creek.	4, 5
Hoffmann's sanicle *Sanicula hoffmannii*	CRPR 4.3	Endemic to central coast and off-shore islands.	Broad-leafed upland forest, chaparral or coastal scrub often on serpentinite or clay soils; 98-984 ft. (30-300 m.).	Perennial herb, Mar.-May	Low - Limited suitable habitat and no records from area.	3
Monterey Coast paintbrush *Castilleja latifolia ssp. latifolia*	CRPR 4.3	Endemic to central coast.	Closed-cone coniferous forest, cismontane woodland (openings), coastal dunes or coastal scrub on sandy soils; 0-607 ft. (0-185 m.).	Perennial herb (hemiparasitic), Feb.-Sep.	Present - Observed in multiple locations during 2012 vegetation mapping.	4, 5
Sand almond *Prunus fasciculata var. punctata*	CRPR 4.3	Endemic to SLO and Santa Barbara counties.	Chaparral (maritime), cismontane woodland, coastal dunes or coastal scrub on sandy soils; 49-656 ft. (15-200 m.).	Perennial deciduous shrub, Mar.-Apr.	Present - Observed in the Phillips 66 Leasehold Zone during 2012 vegetation mapping; previously known from the Phillips 66 Leasehold Zone.	3, 4, 5
[a] Status explanations:			[b] Potential Occurrence explanations:			

Species	Listing Status[a]	Range in California	Habitat	Life Form/ Blooming Period	Potential to Occur in the Study Area[b]	Sources
Federal: FE = Listed as endangered under the Federal Endangered Species Act. FT = Listed as threatened under the Federal Endangered Species Act. **State:** SE = Listed as endangered under the California Endangered Species Act. ST = Listed as threatened under the California Endangered Species Act. **California Rare Plant Rank:** 1B = Plants Rare, Threatened, or Endangered in California and Elsewhere 2 = Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere 0.1-Seriously threatened in California 0.2-Fairly threatened in California			**Present:** Species was observed on the project site, or recent species records (within five years) from literature are known within the project area. **High:** The CNDDB or other reputable documents record the occurrence of the species off-site, but within a 5-mile radius of the study area and within the last 10 years. High-quality suitable habitat is present within the study area. **Moderate:** CNDDB or other reputable documents may record the occurrence of the species near but beyond a 5-mile radius of the study area, or some of the components representing suitable habitat are present within or adjacent to the study area, but the habitat is substantially degraded or fragmented. **Low:** The CNDDB or other documents may or may not record the occurrence of the species within a 5-mile radius of the study area. However, few components of suitable habitat are present within or adjacent to the study area.			

Sources

1. U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office. 2012. Species Lists: Oceano (221D), Pismo Beach (221B), Arroyo Grande NE (221A), Tar Spring Ridge (220B), Nipomo (220C), Santa Maria (195B), Guadalupe (196A) and Point Sal (196B) Quads. Last updated July 27, 2012. http://www.fws.gov/sacramento/es_species/Lists/es_species_lists-form.cfm. Accessed August 7, 2012.
2. California Natural Diversity Database (CNDDB). 2012. California Department of Fish and Game, Biogeographic Data Branch. Last updated July, 2012.
3. California Native Plant Society Inventory of Rare and Endangered Plants. 2012. Oceano and Point Sal Quads.http://www.rareplants.crpr.org/result.html?adv=t&quad=35120A5:1. Accessed August 15, 2012.
4. California Department of Parks and Recreation. 2012. Habitat Monitoring Report (In Progress). Oceano Dunes State Vehicular Recreation Area 2004-2011. Prepared by California Department of Parks and Recreation Off-highway Motor Vehicle Division, Oceano Dunes District. March.
5. California Department of Parks and Recreation OHMVR Division, Oceano Dunes District. 2012. Vegetation mapping. September 10-14.

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Appendix I. SNPL Breeding Season Window Survey Protocol

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APPENDIX J[1]

MONITORING GUIDELINES FOR THE WESTERN SNOWY PLOVER, PACIFIC COAST POPULATION

Contents

Introduction

Western snowy plover populations must be monitored to determine progress toward recovery. Monitoring will be most efficient when its elements relate specifically to recovery objectives. Several types of biological monitoring are expected to provide information that will allow assessment of the recovery effort. However, a single monitoring prescription cannot address the varied research and management needs throughout the western snowy plover range. This protocol provides general guidance so each monitoring effort can be consistent with all others, even when specific methods differ from site to site. These guidelines relate to Federal requirements, but prospective surveyors must also assure that their activities comply with requirements under state law.

[1]Note: These Guidelines are Appendix J from Volume 2 of the 2007 Recovery Plan for the Pacific Coast Population of the Western Snowy Plover

Two types of monitoring relate directly to recovery criteria:

Population:	Distribution and abundance.
Demographics:	Reproductive success, adult survival, juvenile survival, dispersal.

Other types of monitoring relate indirectly to recovery criteria:

Habitat:	Availability, suitability, enhancements.
Disturbance:	People, pets, vehicles, kites, horses, etc.
Predators:	Presence and impacts of corvids, gulls, raptors, shrikes, coyotes, foxes, skunks, house cats, opossums, other avian and mammalian predators.

Training and Qualifications

Prospective snowy plover surveyors should have good vision, the ability to spend several hours in the sun, and the ability to walk long distances in loose sand. In addition, the U.S. Fish and Wildlife Service has developed minimum training requirements for western snowy plover survey, management, and research activities. Five activity levels are recognized:

Level 1 Winter surveys, or surveys outside known nesting areas.
Level 2 Breeding season surveys and censuses.
Level 3 Erecting exclosures around nests.
Level 4 Breeding season studies or surveys that include handling eggs.
Level 5 Banding and color marking adults or chicks.

While activity levels 1 through 5 are increasingly intrusive, they are not strictly sequential. For example, a field worker may receive training and be certified at level 3, but cannot participate in level 1 or 2 activities without training specific to those levels.

No section 10(a)(1)(A) permit is required for Level 1 activities, but training is encouraged. Level 2, 3, 4, and 5 activities require a section 10(a)(1)(A) permit from the U.S. Fish and Wildlife Service. Field workers must be certified at the appropriate activity level to qualify for a permit, or to work independently under the holder of an existing permit.

Classroom instruction (or equivalent field instruction) will be made available for those involved with snowy plover surveys, management, and research (recovery task 1.1.5). At least 4 hours of instruction are required, on topics including:

1. Biology, ecology, and behavior of snowy plovers;

2. Identification of adult plovers, their young, and their eggs;
3. Threats to plovers and their habitats;
4. Survey objectives, protocols, and techniques;
5. Regulations governing the salvage of carcasses or eggs;
6. Special conditions of the existing Recovery Permit;
7. Other activities (for example: banding, determining incubation stage, erecting exclosures).

In addition, field instruction is required for activity levels 2, 3, 4, or 5. Instruction should take place under the direct supervision of a 10(a)(1)(A) permit holder. Activities for field training include:

1. Locating, identifying, and monitoring nests (levels 2, 4, and 5);
2. Handling eggs and capturing and handling adults or chicks (levels 4 and 5);
3. Erecting exclosures around nests (level 3).
4. Specifics on the target activity for which a permit has been issued;
5. Practical field exercises;
6. Field review of appropriate classroom topics.

Previous experience with snowy plovers, piping plovers, or other closely-related species will not substitute for the training described above. Further detail on obtaining permits, or becoming certified to work under an existing permit, is available through these offices:

CALIFORNIA

U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825
(916) 414-6600

U.S. Fish and Wildlife Service
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003
(805) 644-1766

U.S. Fish and Wildlife Service
Arcata Fish and Wildlife Office
1125 16th Street, Room 209
Arcata, California 95521-5582
(707) 822-7201

U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road
Carlsbad, California 92011
(760) 431-9440

OREGON

U.S. Fish and Wildlife Service
Newport Fish and Wildlife Office
2127 S.E. OSU Drive
Newport, Oregon 97365-5258
(541) 867-4550

U.S. Fish and Wildlife Service
Oregon State Office
2600 SE 98th Avenue, Suite 100
Portland, Oregon 97266
(503) 231-6179

WASHINGTON

U.S. Fish and Wildlife Service
Western Washington Office
510 Desmond Dr SE, Suite 102
Lacey, Washington 98503
(360) 753-9440

Responsibilities

For effective rangewide monitoring, the network of participants must understand their roles and responsibilities. The following framework is suggested.

The *recovery leader* (recovery task 7) facilitates the work of recovery unit working groups to ensure comparable and consistent monitoring is undertaken throughout the Pacific coast range of the western snowy plover. The recovery leader also produces an annual report that describes results of monitoring throughout the population's range.

Recovery unit working groups (recovery task 3.1.1) should ensure thorough coverage of important sites in their units. They should collate data, prepare summary reports, and ensure appropriate data are submitted to the recovery leader.

Coordinators are landowners, land managers, wildlife managers, or other individuals responsible for monitoring activities at one or more sites. They recruit and train observers for their site(s) and ensure data are reported to recovery unit working groups. They coordinate with recovery unit working groups, beach managers, enforcement leaders, and other affected people to ensure an effective, responsive, and safe survey and management effort. Coordinators may also be observers.

Observers are field workers responsible for completing surveys and reporting results promptly to coordinators.

Population Monitoring

Population monitoring will provide information on distribution and abundance at all breeding and wintering locations listed in Appendix B. Results will be used to assess progress toward recovery criterion 1 and to guide local management, protection assessments, and planning.

The primary source of population data will be two annual, rangewide "window surveys" using the methods outlined below. The breeding season window survey should take place between late May and mid-June. The winter season window survey should take place between December 1 and January 31. Breeding season surveys sample the coastal population of the western snowy plover, while winter season surveys also include individuals from the inland population that winter on Pacific beaches intermingled with coastal population birds. Surveys at adjacent

sites should occur on or near the same date, to avoid double-counting individuals moving among sites. All sites occupied in recent years should be surveyed within the window period. Unoccupied sites with suitable habitat should be surveyed as time permits.

Although not all plovers are detected during window surveys, an index of abundance will be obtained for each surveyed site. To relate population indices to recovery criteria, site-specific correction factors will need to be determined. Recovery task 4.3.1 will guide the effort to produce correction factors that will improve abundance estimate accuracy and usefulness.

Methods for Window Surveys

The current survey protocol for the breeding season window survey is reproduced below (Attachment J-1). The protocol for winter window surveys (see Attachment J-2) is generally similar, but during this period no nesting activity is in progress and surveyors collect data on habitat type where plovers are seen in order to assess habitat associations in the nonbreeding season. Sample field survey forms (Attachments J-3 and J-4) are also included below.

Demographic Monitoring

Population demographic monitoring will provide information on reproductive success, adult and juvenile survival, and dispersal. Results will be used to assess progress toward recovery (criterion 2) and to refine the Population Viability Analysis.

Precise data on productivity, survival, and dispersal will require most plovers within the studied population to be uniquely identifiable by color bands. Recovery task 4.3.2 will guide the effort to establish appropriate sampling methods for annually estimating reproductive success.

While the duration and intensity of monitoring required to obtain precise demographic data will be impractical at some plover nesting sites, coarse data are valuable and should be collected. Such data may be obtained through nest searches, nest monitoring, and careful population monitoring. At sites with limited resources, monitors should focus on accurate population monitoring, as described above, but should also attempt to record these breeding parameters:

Egg-laying dates
Number of nests
Number of eggs per nest
Egg-loss dates and causes

Hatching dates
Number of eggs hatched
Hatching success = number of eggs hatched/total number of eggs laid
Clutch success = number of clutches with at least 1 egg hatched/total number of nests
Age (in days) of chicks or juveniles at last observation
Fledging success = number of juveniles capable of flight or reaching age 28 days/number of eggs hatched
Reproductive success = number of chicks fledged/number of males
Causes of chick loss

Reporting

A repository for survey data has been established within the U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office. Initially, only window survey data will be deposited. Other information (demographic data, for example) should be retained by coordinators and shared with recovery unit working groups. As survey procedures are developed and refined, additional data will be centralized by the recovery leader.

Reports of window survey data should include:

- Location and location code (Appendix B, or assigned by Arcata Fish and Wildlife Office for new locations);
- Survey date, start time, end time, high tide time, tidal stage, wind speed;
- Survey coordinator and observers;
- Number of adult males, adult females, unsexed adults, and chicks and juveniles.

Standard field survey forms have been developed (Attachments J-2 and J-3). Winter window survey data should be reported before February 15; summer window survey data should be reported before July 1. Data should be submitted to coordinators and/or recovery unit working groups for compilation and submittal to the recovery leader at the U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office.

Each year, the recovery leader will tabulate, summarize, and share window survey results with participants and other interested parties.

Reporting Color Bands

Color band reports should be submitted to the recovery unit working group, the Point Reyes Bird Observatory, or the Bird Banding Laboratory. Standard U.S.

Fish and Wildlife Service aluminum band numbers should be reported to the Bird Banding Laboratory.

USGS Biological Resources Division
Bird Banding Laboratory
12100 Beech Forest Road, Suite 4037
Laurel MD 20708
1-800-327-2263
bbl@usgs.gov

Point Reyes Bird Observatory
4990 Shoreline Hwy
Stinson Beach CA 94970

Coordinating with Other Projects

Snowy plovers share some of their breeding and wintering sites with other sensitive species, such as least terns or marine mammals. Where these species are found in, or adjacent to, snowy plover sites, survey coordinators, researchers, and land managers should plan ahead to avoid conflicts and should consult with recovery unit working groups.

Public Interactions

Snowy plover observers often encounter members of the public while in the field. When responding to public questions or complaints, field workers are distracted from the task at hand, which can compromise the accuracy and safety of surveys.

Observers should carry educational pamphlets for distribution to curious members of the public, but should refrain from conversing at length about plovers or other issues until surveys are complete.

Field workers observing illegal, prohibited, or unauthorized activities should notify law enforcement authorities as soon as possible. Observers should carry a contact list and a communication device (e.g., 2-way radio, cellular phone) for this purpose.

Habitat Monitoring

Habitat is an important factor limiting snowy plover abundance, distribution, and productivity. Careful assessment of habitat characters include determining

substrate characteristics and composition of vegetation in both managed and unmanaged areas. These must be the topic of specific habitat monitoring and research. Field workers are encouraged, however, to describe in general terms any changes in the quality or quantity of snowy plover habitat in monitored areas.

Disturbance Monitoring

Human-related activities directly and indirectly affect snowy plover abundance, distribution, and productivity. Effects of various types (e.g., people, pets, vehicles, kites, horses) and levels of disturbance must be determined through dedicated research. Field workers are encouraged, however, to describe in general terms the nature and extent of human-related disturbances in monitored areas.

Predator Monitoring

Observing predation on snowy plovers, or their eggs or chicks, is a rare event. However, some sign of predator identity is often available at plundered nests and should be noted by observers. Predator presence in monitored areas should also be noted (e.g., corvids, gulls, raptors, other avian predators, coyotes, foxes, house cats, opossums, other mammalian predators). Extensive predator monitoring is beyond the scope of snowy plover surveys, but should be undertaken when predator removal is considered, or when specific detail on predators is needed.

Suggested Readings

The preceding sections are necessarily abbreviated. Further information and guidance will be obtained during certification training sessions. In addition, the following reading should contribute to a better understanding of plover monitoring methods.

Blodget, B. G., and S. M. Melvin. 1996. Massachusetts tern and piping plover handbook: A manual for stewards (first edition). Massachusetts Division of Fisheries and Wildlife, Westborough. ~100 pp.

Although this document pertains to least terns and piping plovers, it contains instructive material on census techniques (8 pages), form instructions (3 pages), nest-finding procedures, and addressing enforcement issues.

Goldin, M. R. 1994. Recommended monitoring and management methodology and techniques for piping plovers (*Charadrius melodus*). Unpublished report to U.S. Fish and Wildlife Service, Hadley, Massachusetts. The Nature Conservancy, Providence, Rhode Island. 15 pp + attachments.

Personable instructions for field workers in the piping plover range. Includes "The Three Plover Commandments: I. Thou shalt be very, very patient and never disturb or harass a plover intentionally; II. Thou shalt never, ever walk through a plover nesting area without first looking wherest thou places each and every foot, each and every step of the way; III. Thou shalt record data simply and meticulously."

ATTACHMENT J-1

WESTERN SNOWY PLOVER BREEDING WINDOW SURVEY PROTOCOL - FINAL DRAFT

03/05/07

ELISE ELLIOTT-SMITH, USGS Forest and Rangeland Ecosystem Science Center, 3200 SW Jefferson Way, Corvallis, OR 97331, USA. email: eelliott-smith@usgs.gov Phone: (541)-758-7390 Fax: (541)758-8806
SUSAN M. HAIG, USGS Forest and Rangeland Ecosystem Science Center, 3200 SW Jefferson Way, Corvallis, OR 97331, USA.

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BACKGROUND AND INTRODUCTION

The Pacific Coast population of the Western Snowy Plover (*Charadrius alexandrinus nivosus*) was listed as threatened in 1993 under the U.S. Endangered Species Act. Since then, population recovery status has been assessed annually through range-wide breeding and winter season window surveys. The primary purpose of the breeding survey is to obtain a minimum estimate of the number of breeding plovers at current, historic, and potential breeding sites over time. An auxiliary purpose is to re-sight banded individuals. The breeding window survey provides information on the regional distribution and abundance of Snowy Plovers. Surveys are conducted during non-migratory periods, over a narrow time frame to minimize the chance of recounting birds moving between sites.

Since all plovers are not detected on a single survey, window surveys do not represent a total count, but give an index of population size. This protocol aims to standardize breeding season survey methodology to minimize geographic and annual disparity in the quality of the count. Despite all attempts to standardize survey methodology, it must be stressed that window survey results are only an index. Underlying any comparison of indices is the assumption that detection rate does not vary from one count to the next. However, there is likely some annual variability in the proportion of plovers detected during the window survey. Thus, comparisons of survey results across the population range and between years should be limited. Assuming this

protocol is followed strictly every year and assuming no unusual weather events, disturbance, or change in habitat or management actions, these window survey results should successfully identify a major change in Snowy Plover abundance or distribution.

Should there be any range-wide or extensive change in nest monitoring, habitat, or habitat management, it will be essential to assess detectability in conjunction with this window survey. If detection rates change greatly, comparison of indices would be rendered meaningless. For example, currently many sites are surveyed during the window survey by nest monitors. However, if nesting was no longer being monitored, the window survey would be conducted entirely by "naïve" observers (those unfamiliar with the number of pairs at a site and their specific nest locations). We would expect that a "naïve" observer might detect a lower proportion of birds than someone with prior knowledge of the birds and nest locations. Hence, this "naïve" count is likely to be lower than prior counts, not due to a negative trend in plover population size, but rather due to a decline in detection rate. Only by assessing detectability can we conclusively determine whether such a change represents an actual decline in population size.

Incorporating methods to assess detectability might also be useful in determining whether these methodologies are sufficient to detect small changes in population size and in accurately interpreting trends. In the past, banding observations and results from intensive nest monitoring have been used to interpret window survey indices and determine a correction factor. It may also be possible to get a statistical measure of detectability and error on past window surveys using a "double sampling" or "repeated measures" approach, assuming additional site surveys were conducted around the time of the window survey. In the future, a "double sampling" approach should be considered as a method to assess detectability, since unlike other methods (i.e., distance sampling, double observer) it would not require any change in the survey methodology. It would only require that at least two surveys be conducted within a short time frame, according to the methodology described in this protocol. If this approach is chosen, but it is not possible to conduct multiple surveys at all sites, it is important that the subset of sites be randomly selected.

TIMING AND METHODOLOGY

The survey window is one week long and specific dates are chosen each year by the U. S. Fish and Wildlife Service (FWS), to fall sometime between May 24 and June 7. Survey coordinators for each designated survey area should provide survey protocol and maps to trained surveyors. For each survey site, the amount of area covered should be standardized in addition to the site name. The most appropriate survey conditions and number of surveyors should be decided by field tests and be consistent from year to year. It is important to cover a site with the same number of surveyors each year to make consecutive counts as comparable as possible. Surveying at high tide is optimal as it will allow for more thorough coverage. Do not attempt to survey during a high or rising tide if there is any chance that surveyor's safety will be jeopardized (i.e., difficult passage through a narrow or rocky region during incoming tide). To maximize detection surveys should be conducted during good weather and high visibility. On sunny days, visibility is best early in the morning or in the evening; visibility may be good at any hour on an overcast day. Rainy, foggy, or excessively windy conditions (15 mph or greater) are not suitable for surveying, however a slight drizzle or strong breeze (5-10 mph) is acceptable.

At most sites, a minimum of two surveyors is recommended to complete each

survey; one surveyor will suffice at very narrow beaches (less than 50 m wide). Reading band combinations should be attempted AFTER the birds encountered have been tallied and recorded, and ONLY if band-reading does not detract from the accuracy of the bird count. The following methodology should be used:

1. **All beaches should be covered in the same manner - in one pass.** There should be one very careful pass to tally the number of birds on each beach segment, as this is the most consistent approach over long periods of time.
2. **Surveyors should walk in unison along the entire length of the beach as designated on map(s) provided by the survey coordinator.** One surveyor should walk along the wrackline (high tide line) while the second surveyor walks along the base of the foredune. The person closest to the foredune should always walk slightly ahead of the other surveyor (approximately 25 m). If only one person is conducting the survey, they should walk the wrackline along the survey length and in a zig-zag pattern through wider portions of route, to ensure complete coverage.
3. **On mud flats, salt pans, and other non-beach habitats, surveyors should cover habitat in a similar manner - in one pass, walking in unison.** If habitat is relatively linear, it should be covered as described for beach surveys. If habitat is very broad, surveyors should simultaneously walk as many parallel transects as is necessary to cover all habitat, with transects no more than 50 m apart. These transects should run parallel to any shoreline. If there are not enough surveyors to accomplish this, then surveyors may zig-zag instead of walking a straight transect line. Remember that the number of surveyors and methodology used must remain constant from one year to the next.
4. **Surveyors should alternate between walking and scanning for Snowy Plovers with binoculars.** While walking, surveyors should scan the area 20 m ahead and to either side. Every 50 m, surveyors should stop and scan at least 100 m ahead of them with binoculars (distance may be shorter based on site-specific conditions). This way habitat is searched at least twice and from different angles increasing the chances of detecting birds. If one observer has a spotting scope, they should follow the binocular scan with a scan through the scope as far ahead as possible. If a bird is sighted far ahead, look for distinguishing landmarks that will enable finding its location. Birds may hide as they are approached, making them difficult to see.
5. **Surveyors closest to the foredune should watch the ground carefully for plover tracks, nests, and chicks while walking.** Their ability to search with the naked eye for plovers is much more constrained than the person's at the wrack line. Consequently, the pace of the survey needs to be slow enough to allow the person closest to the foredune to watch the ground and make frequent short stops to look ahead for plovers. Surveyors risk trampling chicks which are much harder to detect than nests. If surveyors detect males or females performing distraction displays, they should recognize they are probably very close to chicks and should move away with extreme caution, looking very carefully where each foot is placed.
6. **If there is a very broad area of beach, the person walking near the foredune should walk in a zig-zag pattern through that location.**

Alternatively, two or more observers could walk parallel through the area. There is a risk of stepping on a nest or chick in either instance, and surveyors should be as careful about this as when they walk at the base of the foredune, as described earlier. If the foredune is low and/or gently sloping, hummocky areas with little or no vegetation should also be checked for plovers.

7. **In certain situations it may be necessary to drive all or a portion of the length of the survey route**. If this is necessary, the survey must be conducted in the same manner every year (driving the same portions each year). Clearly delineate the portions driven on the map and the portions covered by foot. Also make a note of the time spent surveying by vehicle and by foot. Drive slow enough not to flush plovers or other shorebirds **(5-10 mph)**. The survey will not be considered complete unless all suitable habitat is surveyed. In order to do this it may be necessary to walk some portions of the route that are not accessible by vehicle. An example would be a spit with a large amount of logs, or wide, hummocky section of beach.
8. **A one-way pass of the survey route is considered sufficient, and surveyors may either exit the beach at the same access point or at a different access point from the one used to enter beach**.

The surveyor(s) may attempt to read bands ONLY after birds at a given location on the survey route have been accurately counted and recorded. When reading color bands, the following methodology should be used:

1. When a plover is sighted at close range, check for color bands and record combination if present before notifying other observers (See *Reading color bands*). If a plover is seen at too great a distance for reading color bands, notify other team members immediately by radio, hand signals, voice, or by walking towards them. While keeping track of plover, coordinate with team members and try to approach the bird from different angles; this will increase the likelihood of color bands being visible to at least one observer.
2. Unless the surveyor is very experienced in reading color bands and familiar with the specific color banded individuals at their survey site, other surveyor(s) on the team should try to read each birds band combination; this is an important accuracy check. This may be done be using a spotting scope if available, or by approaching birds closely and using binoculars.
3. In certain circumstances, it may be desirable to approach birds in order to read the bands (i.e., make roosting birds stand up), but in others it is desirable not to try and read bands at all (i.e., birds performing distraction displays). Simply avoiding birds whose bands can not be read, and returning to the site a second time to attempt to read bands could lead to further disturbance. If it is permissible to approach roosting birds by making them stand, great care must be taken not to cause them to fly ahead of the observer as it will confound the count going forward. DO NOT APPROACH a bird on a nest or an adult with chicks. DO NOT APPROACH a female head-bobbing, a male tail-dragging, birds copulating, nest scraping, birds performing a broken wing display, or an adult with chicks. These are strong indicators that birds are breeding in the area or will breed soon and it is very important that you DO NOT DISTURB them; leave the area quickly and carefully.

4. Spend no more than 5 minutes obtaining any single color band combination and if there are multiple color-banded individuals in an area, limit the time spent band reading to no more than 15 minutes. This limitation is necessary because spending long amounts of time in any one area may result in an increased detection rate (relative to other areas and relative to past and future surveys). After determining color band combinations, carefully walk around birds and continue the survey.

Data collection must be standardized for all surveys and for all sites. The following methodology should be used at all beach segments:

1. Field data should be collected on a datasheet, and location of plovers and area covered should be marked on a map.
2. At the beginning of the survey the recorder should fill out preliminary portions of the data sheet or within their notebook record: date, survey location, observers, start time, weather, and tides (See Appendix A).
3. While it is best for one member of the team to act as official recorder, all members of the team must have a pencil and data sheet or field notebook so that they can record sex, age, and color combination, if applicable, for each bird.
4. Record the sex as male (M), female (F), or unknown/uncertain (U). Report the age as Adult (A), Juvenile (J) (similar to adult but edges of back feathers and wing coverts are pale), Chick (C) (incapable of flight) or Unknown (U).
5. If two or more birds are seen, record any birds that are seen standing less than 3 m apart as a possible pair. Also record any nests or breeding behavior (See *Notifications*).
6. Where there are relatively few birds observed, make note of plumage characteristics (i.e., very pale neck band) so that it may be distinguished from other unbanded birds. Plumage differences between some males and females are difficult to discern, particularly if birds are not seen together. Collection of this data may be time-consuming if there are a lot of plovers and should not be done if it detracts from the accuracy of the bird count.
7. Record end time upon leaving the beach, or leaving the portion of beach within survey route.
8. Indicate on a map the area of coverage in addition to the location of plovers seen. If driving, indicate the section that was driven, and what section, if any, was surveyed on foot. Also make a note on the data sheet of the time spent surveying by vehicle and the time spent surveying by foot.
9. Submit a data sheet and map with specific locations to the FWS within a week after the survey.

ADDITIONAL DATA COLLECTION AND NOTIFICATIONS

Human use/recreational activities: Note information such as presence of beachwalkers, number of dogs (on-leash and off-leash), number of horses, number of all-terrain vehicle/off-road vehicles, street legal vehicles, and activities such as surf-fishing, kite-flying, clamming, camping, etc.

Predator monitoring: Egg and chick predators are one of the primary threats to Snowy Plovers on the Oregon Coast, and to the persistence of the entire Pacific Coast

population. Therefore, during all surveys it is important to collect information on predator presence in the survey area. The most common and visible nest predators are corvids (crows and ravens). Periodically count the total number of corvids seen in the survey area while scanning with binoculars. To avoid recounting the same bird twice, do not sum the number of corvids seen from different places along the survey route unless you are relatively certain that they are different birds. Usually this means the surveyor will record the maximum corvids seen from any one point along the survey route.

Record any additional predators or evidence seen. Record owls, hawks, foxes, skunks, racoons, opossums, coyotes or other predators. If a surveyor is familiar with mammal tracks, predator tracks can also be reported.

Notifications: Report immediately: 1) any illegal activity to law enforcement; or 2) any illegal activity to the appropriate state or federal agency if the activity is in violation of any state or federal laws concerning protected species (i.e., Migratory Bird Treaty Act, Endangered Species Act).

Report to the FWS immediately after the survey (providing band combination if known): 1) any dead or injured bird; 2) any birds observed at unoccupied beaches or in areas where they haven't been seen in recent years; 3) any nests with eggs or adults with chicks; or 4) any females head-bobbing, males tail-dragging, or birds copulating or nest scraping. These are strong indicators that birds are breeding in the area or will breed soon and the reproductive status of individuals may not be known by officials.

Report birds with bands and/or uncertain band status immediately after the survey to the lead person designated as the one to whom observers report color bands combinations in each survey region. This should be the most knowledgeable person about the likely band combinations that could be seen and the importance of the particular combinations should they be reported. It may be necessary to reschedule a visit to the site to check or re-check bands.

SURVEYOR EDUCATION AND PREPAREDNESS

Equipment: Required equipment includes a good pair of binoculars (suggested magnification 8-10x and aperture of at least 40 mm.), waterproof field notebook or clipboard and data sheets, site map, pencil, and timepiece. A spotting scope is recommended. If a spotting scope and tripod are needed, please contact the FWS as soon as possible. Suggested equipment includes a cell phone, contact list, rain jacket, and rain pants. Optional equipment includes a global positioning devise (GPS unit).

Qualifications and training: Required qualifications for Snowy Plover surveyors are the ability to walk several miles in dry sand, have good vision, and be familiar with identification of Snowy Plovers and other similar species Semipalmated Plovers, Sanderling, Killdeer). The following suggested training complies with recommendations and regulations set forth in the Western Snowy Plover (*Charadrius alexandrinus nivosus*) Pacific Coast Population Draft Recovery Plan. Given funding limitations, it may not be possible to adhere to all of the following suggestions. However, at the very least, four hours of field instruction should be required for every individual that searches for or monitors nests.

Based on the Draft Recovery Plan, four hours of classroom instruction is strongly recommended for individuals conducting Breeding Window Surveys. Topics to be covered during classroom instruction are taken directly or adapted from the Draft Recovery Plan and may include:

1. Biology, ecology, and behavior of Snowy Plovers.
2. Identification of adult plovers, their young, and their eggs.
3. Threats to plovers and their habitats.
4. Survey objectives, protocols, and techniques.
5. Regulations governing the salvage of carcasses or eggs.
6. Special conditions of the existing recovery permit.
7. Other activities (for example: reading color bands, tracking, predator identification, determining incubation stage, erecting exclosures).

It is strongly recommended that surveyors receive field instruction if:

1. They have never previously participated in any type of Snowy Plover survey,
2. They do not have extensive field experience distinguishing between Snowy Plovers and other shorebird species (for example: killdeer, semipalmated sandpipers, sanderlings),
3. They have little or no experience around nesting plovers, or,
4. They have no experience reading color bands

Inexperienced surveyors should partner with experienced surveyors regardless of training until they are comfortable with snowy plover identification and survey methods.

Reading color bands: Throughout the plovers range, all sites have the potential to have color banded birds. Color bands allow biologists to keep track of productivity, movement patterns, and survivorship. Aluminum bands, provided by the U.S. Fish and Wildlife Service, are used in addition to plastic bands; both are usually covered with colored tape.

Most birds have two color bands on each lower leg. Both the bands on a leg may be the same or different colors. Birds sometimes lose bands so that they could have only one band on one leg and two on another, or only one band on either leg. Some birds have a single band of two colors on one leg. These are created by wrapping a thin strip of tape that is different in color from the underlying band on the top, bottom, or center of the color band. Thus a single band could be described as white over red or if the red tape were in the middle as white/red/white (W/R/W).

Colors frequently seen are aqua (A, light blue), dark blue (B), dark green (G), lime (L, light green), red (R), yellow (Y), and white (W). Other colors used on the Pacific Coast but not as frequently seen in Oregon are: orange (O), violet (V), pink (P), brown (N), and black (K). Tape occasionally peels off revealing metallic (silver) band (S).

Color bands are read top down from the belly to the foot of the bird (Figure 1). Colors on the birds left leg are read first, then the colors on the right leg are read. For example, if a bird has two aqua bands on its right leg and a white band on top of a red band on its left, its combination would be: white, red, aqua, aqua. This combination would be recorded WR:AA

ATTACHMENT J-2

WESTERN SNOWY PLOVER WINTER WINDOW SURVEY PROTOCOL
FINAL DRAFT
03/05/07

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BACKGROUND AND INTRODUCTION

The Pacific Coast population of the Western Snowy Plover (*Charadrius alexandrinus nivosus*) was listed as threatened in 1993 under the U.S. Endangered Species Act. Since then, population recovery status has been assessed annually through range-wide breeding and winter season window surveys. The primary purpose of the winter survey is to obtain a minimum estimate of the number of wintering plovers at current, historic, or potential wintering sites over time. An auxiliary purpose is to re-sight banded individuals. The winter survey is conducted during a migratory period, when inland and coastal plovers can overlap in distribution and can not be distinguished visually. Therefore, the winter survey does not represent a count of the Pacific Coast population, but a minimum count of coastal and inland birds combined.

Since all plovers are not detected on a single survey, window surveys do not represent a total count, but give an index of population size. This protocol aims to standardize winter season survey methodology to minimize geographic and annual disparity in the quality of the count. Despite all attempts to standardize survey methodology, it must be stressed that window survey results are only an index. Underlying any comparison of indices is the assumption that detection rate does not vary from one count to the next. However, there is likely to be some annual variability in the proportion of plovers detected during the window survey. This may be particularly true during winter, since cold, wet, and windy weather are associated with low detectability

and yet such conditions may be unavoidable. Furthermore, double counting is likely to be a larger problem during winter, because birds may be in larger aggregations and may move more frequently or over a larger geographic area than during the nesting season. Thus, the window survey may be useful in identifying occupied sites, tracking banded populations, and possibly detecting large shifts in distribution. However, comparisons of survey results across the population range and between years should be limited.

TIMING AND METHODOLOGY

Surveys are conducted sometime between December 1 and January 31, during a one week window chosen by the U.S. Fish and Wildlife Service (FWS). Survey coordinators for each designated survey area should provide survey protocol and maps to trained surveyors. For each survey site, the amount of area covered should be standardized in addition to the site name. The most appropriate survey conditions and number of surveyors should be decided by field tests and be consistent from year to year. It is important to cover a site with the same number of surveyors each year whenever possible to make consecutive counts as comparable as possible. Most sites are extremely difficult to access during winter high tides as waves often beat against the foredune create dangerous situations. Therefore, surveys should not be attempted if the surveyor's safety is in jeopardy (i.e., difficult passage through a narrow or rocky region during incoming tide). To maximize detection, surveys should be conducted during good weather and high visibility. On sunny days, visibility is best early in the morning or late evening; visibility may be good at any hour on an overcast day. Cold, foggy, rainy, or excessively windy (15 mph or greater) conditions are not suitable for surveying, however a light drizzle or strong breeze (5-10 mph) is acceptable.

At most sites, a minimum of two surveyors is recommended to complete each survey; one surveyor will suffice at very narrow beaches (less than 50 m wide). Reading band combinations should be attempted AFTER the birds encountered have been tallied and recorded, and ONLY if band-reading does not detract from the accuracy of the bird count. The following methodology should be applied:

1. **All beaches should be covered in the same manner - in one pass.** There should be one very careful pass to tally the number of birds on each beach segment as this is the most consistent approach over long periods of time.
2. **Surveyors should walk in unison along the entire length of site as designated on the survey map.** One surveyor should walk along the wrackline (high tide line) while the second surveyor walks along the base of the foredune. The person closest to the foredune should always walk ahead of the surveyor at the wrackline (approximately 25 m). If only one person is conducting the survey, walk the wrackline along the survey length and in a zig-zag pattern through wider portions of route, to ensure complete coverage.
3. **Surveyors should alternate between walking and scanning for Snowy Plovers with binoculars.** While walking, surveyors should scan the area 20 m ahead and to either side. Every 50 m surveyors should stop and scan at least 100 m ahead of them with binoculars (distance may be shorter based on site-specific conditions). This way habitat is searched at least twice and from different angles increasing the chances of detecting birds. If one observer has a spotting scope, they should follow the binocular scan with a scan through the scope as far ahead as possible. If a bird is sighted far ahead, look for distinguishing landmarks that will enable finding its location. Birds may

hide as they are approached, making them difficult to see.

4. **Surveyors closest to the foredune should watch the ground carefully for plover tracks while walking.** Their ability to search is much more constrained than the person's at the wrack line. Consequently, the pace of the survey needs to be slow enough to allow the person closest to the foredune to watch the ground and make frequent short stops to look ahead for plovers.
5. **If there is a very broad area of beach, the person walking near the foredune should walk in a zig-zag pattern through that location.** Alternatively, two or more observers could walk parallel through the area. If the foredune is low and/or gently sloping, hummocky areas with little or no vegetation should also be checked for plovers.
6. **In certain situations it may be necessary to drive all or a portion of the length of the survey route.** If this is necessary, the survey must be conducted in the same manner every year (driving the same portions each year). Clearly delineate the portions driven on the map and the portions covered by foot. Also make a note of the time spent surveying by vehicle and by foot. Drive slow enough not to flush plovers or other shorebirds **(5-10 mph)**. The survey will not be considered complete unless all suitable habitat is surveyed. In order to do this it may be necessary to walk some portions of the route that are not accessible by vehicle. An example would be a spit with a large amount of logs, or wide, hummocky section of beach.
7. **A one-way pass of the survey route is considered sufficient, and surveyors may either exit the beach at the same access point or at a different access point from the one used to enter beach.**

The surveyor(s) may attempt to read bands ONLY after birds at a given location on the survey route have been accurately counted and recorded. When reading color bands, the following methodology should be used:

1. When a plover is sighted at close range, check for color bands and record combination if present before notifying other observers (See *Reading color bands*). If a plover is seen at too great a distance for reading color bands, notify other team members immediately by radio, hand signals, voice, or by walking towards them. While keeping track of plover, coordinate with team members and try to approach the bird from different angles; this will increase the likelihood of color bands being visible to at least one observer.
2. Unless the surveyor is very experienced in reading color bands and familiar with the specific color-banded individuals at their survey site , the other surveyor(s) on the team should try to read each birds band combination; this is an important accuracy check. This may be done be using a spotting scope if available, or by approaching birds closely and using binoculars.
3. In certain circumstances, it may be desirable to approach birds in order to read the bands (i.e., make roosting birds stand up). This is more desirable than avoiding the birds and returning to the site a second time to attempt to read bands as this would lead to further disturbance. If it is permissible to approach roosting birds by making them stand, great care must be taken not to cause them to fly ahead of the observer as it will confound the count going forward.
4. Spend no more than 5 minutes obtaining any single color band combination

and if there are multiple color-banded individuals in an area, limit the time spent band reading to no more than 15 minutes. This limitation is necessary because spending long amounts of time in any one area may result in an increased detection rate (relative to other areas and relative to past and future surveys). After determining color band combinations, carefully walk around birds and continue the survey.

Data collection must be standardized for all surveys and for all sites. The following methodology should be used at all beach segments:

1. Field data should be collected on a datasheet, and location of plovers and area covered should be marked on a map.
2. At the beginning of the survey the recorder should fill out preliminary portions of the data sheet or within their notebook record: date, site, start time, weather, high tide time, approximate wind direction and speed, and observers (See Appendix A).
3. While it is best for one member of the team to act as official recorder, all members of the team must have a pencil and data sheet or field notebook so that they can record sex for each bird.
4. Record the sex as male (M), female (F), Hatch Year (HY; chick or juvenile, appearing similar to adult but edges of back feathers and wing coverts are pale), or unknown (U). Hatch year birds reach adult status by Jan 1. Unless the surveyor is confident they can make the determination between hatch year or adult status based on plumage, it is not necessary to distinguish adult from hatch year and record on data sheets.
5. Mark the location of bird(s) on the map and record coordinates if a GPS unit is available. If two or more birds are seen, record which birds were seen together.
6. Record end time upon leaving the beach, or leaving the portion of beach within survey route.
7. Indicate on a map the area of coverage in addition to locations or birds seen. If driving, indicate the section that was driven, and what section, if any, was surveyed on foot. Also make a note on the data sheet of the time spent surveying by vehicle and the time spent surveying by foot.
8. Submit data sheet to the FWS by February 15th

ADDITIONAL DATA COLLECTION AND NOTIFICATIONS

Habitat information: To increase understanding of Snowy Plover winter habitat associations, winter window surveyors should record the specific habitat where plovers are seen and the general beach habitat in the vicinity of plover sightings (See Appendix A). Record plover location as: wet sand, wrackline, mid-beach (above wrackline but below the base of foredune), or foredune (at the base of a foredune, on a foredune, or at a break in the foredune). Record general habitat type as: linear beach, estuary mouth, overwash area (break in foredune), restoration plot, or barrier island/peninsula

General site information is necessary to compare use and availability, and to evaluate the potential habitat at sites where birds are not detected. Please estimate the percentage of survey beach that is greater than 50 m in width (from high tide line to foredune). If all habitat is less than 50 m in width, estimate the maximum beach width. Record the general types of beach habitat found at the survey site (as described above).

Human use/recreational activities: Note information such as presence of beachwalkers, number of dogs (on-leash and off-leash), number of horses, number of all-terrain vehicle/off-road vehicles, street legal vehicles, and activities such as surf-fishing, kite-flying, clamming, camping, etc.

Predator monitoring: Egg and chick predators are one of the primary threats to Snowy Plovers on the Oregon Coast, and to the persistence of the entire Pacific Coast population. Therefore, during all surveys it is important to collect information on predator presence in the survey area. The most common and visible nest predators are corvids (crows and ravens). Periodically count the total number of corvids seen in the survey area while scanning with binoculars. To avoid recounting the same bird twice, do not sum the number of corvids seen from different places along the survey route unless you are relatively certain that they are different birds. Usually this means the surveyor will record the maximum corvids seen from any one point along the survey route.

Record any additional predators or evidence seen. Record owls, hawks, foxes, skunks, racoons, opossums, coyotes, or other predators. If a surveyor is familiar with mammal tracks, predator tracks can also be reported.

Notifications: Report immediately: 1) any illegal activity to law enforcement; or 2) any illegal activity to the appropriate state or federal agency if the activity is in violation of any state or federal laws concerning protected species (i.e., Migratory Bird Treaty Act, Endangered Species Act).

Report to the FWS immediately after the survey if you see a dead bird, one that appears injured, or if you observe a bird in an area where they haven't been seen in recent years. Report birds with bands and/or uncertain band status immediately after the survey to the lead person designated as the one to whom observers report color bands combinations in each survey region. This should be the most knowledgeable person about the likely band combinations that could be seen and the importance of the particular combinations should they be reported. It may be necessary to reschedule a visit to the site to check or re-check bands.

SURVEYOR EDUCATION AND PREPAREDNESS

Equipment: Required equipment includes a good pair of binoculars (suggested magnification 8-10x and aperture of at least 40 mm.), waterproof field notebook or clipboard and data sheets, site map, pencil, and timepiece. A spotting scope is recommended. If a spotting scope and tripod are needed please contact the FWS as soon as possible. Suggested equipment includes a cell phone, contact list, rain jacket, and rain pants. Optional equipment includes a global positioning devise (GPS unit).

Qualifications and training: Required qualifications for Snowy Plover surveyors are the ability to walk several miles in dry sand, have good vision, and be familiar with identification of Snowy Plovers and other similar species Semipalmated Plovers, Sanderling, Killdeer). The following suggested training complies with recommendations and regulations set forth in the Western Snowy Plover (*Charadrius alexandrinus nivosus*) Pacific Coast Population Draft Recovery Plan. Given funding limitations, it may not be possible to adhere to all of the suggestions listed below. Based on the Draft Recovery Plan, four hours of classroom instruction is strongly recommended for individuals conducting Winter Window Surveys. Topics to be covered during classroom instruction are taken directly or adapted from the Draft Recovery Plan and may include:

1. Biology, ecology, and behavior of Snowy Plovers.
2. Identification of adult plovers.

3. Threats to plovers and their habitats.
4. Survey objectives, protocols, and techniques.
5. Regulations governing the salvage of carcasses.
6. Special conditions of the existing recovery permit.
7. Other activities (for example: reading color bands, tracking, predator identification, determining incubation stage, erecting exclosures).

It is strongly recommended that surveyors receive field instruction if:

1. They have never previously participated in any type of Snowy Plover survey,
2. They do not have extensive field experience distinguishing between Snowy Plovers and other shorebird species (for example: killdeer, semipalmated sandpipers, sanderlings), or,
3. They have no experience reading color bands

Inexperienced surveyors should partner with experienced surveyors regardless of training until they are comfortable with snowy plover identification and survey methods.

Reading color bands: Throughout the plovers range, all sites have the potential to have color banded birds. Color bands allow biologists to keep track of population numbers, productivity, movement patterns, and survivorship. Aluminum bands, provided by the U.S. Fish and Wildlife Service, are used in addition to plastic bands; both are usually covered with colored tape.

Most birds have two color bands on each lower leg. Both the bands on a leg may be the same or different colors. Birds sometimes lose bands so that they could have only one band on one leg and two on another, or only one band on either leg. Some birds have a single band of two colors on one leg. These are created by wrapping a thin strip of tape that is different in color from the underlying band on the top, bottom, or center of the color band. Thus a single band could be described as white over red or if the red tape were in the middle as white/red/white (W/R/W).

Colors frequently seen are lime (L, light green), aqua (A, light blue), red (R), yellow (Y), dark blue (B), dark green (G), and white (W). Other colors used on the Pacific Coast but not as frequently seen in Oregon are: orange (O), violet (V), pink (P), brown (N), and black (K). Tape occasionally peels off revealing metallic (silver) band (S).

Color bands are read top down from the belly to the foot of the bird (Figure 1). Colors on the birds left leg are read first, then the colors on the right leg are read. For example, if a bird has two aqua bands on its right leg and a white band on top of a red band on its left, its combination would be: white, red, aqua, aqua. This combination would be recorded WR:AA

Appendix J. Declining Amphibian Task Force Fieldwork Code of Practice

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The Declining Amphibian Task Force Fieldwork Code of Practice

A code of practice, prepared by the Declining Amphibian Task Force (DAPTF) to provide guidelines for use by anyone conducting field work at amphibian breeding sites or in other aquatic habitats. Observations of diseased and parasite-infected amphibians are now being frequently reported from sites all over the world. This has given rise to concerns that releasing amphibians following a period of captivity, during which time they can pick up unapparent infections of novel disease agents, may cause an increased risk of mortality in wild populations. Amphibian pathogens and parasites can also be carried in a variety of ways between habitats on the hands, footwear, or equipment of fieldworkers, which can spread them to novel localities containing species which have had little or no prior contact with such pathogens or parasites. Such occurrences may be implicated in some instances where amphibian populations have declined. Therefore, it is vitally important for those involved in amphibian research (and other wetland/pond studies including those on fish, invertebrates and plants) to take steps to minimize the spread of disease and parasites between study sites.

1. Remove mud, snails, algae, and other debris from nets, traps, boots, vehicle tires and all other surfaces. Rinse cleaned items with sterilized (e.g. boiled or treated) water before leaving each study site.

2. Boots, nets, traps, etc., should then be scrubbed with 70% ethanol solution (or sodium hypochlorite 3 to 6%) and rinsed clean with sterilized water between study sites. Avoid cleaning equipment in the immediate vicinity of a pond or wetland.

3. In remote locations, clean all equipment as described above upon return to the lab or "base camp". Elsewhere, when washing machine facilities are available, remove nets from poles and wash with bleach on a "delicates" cycle, contained in a protective mesh laundry bag.

4. When working at sites with known or suspected disease problems, or when sampling populations of rare or isolates species, wear disposable gloves and change them between handling each animal. Dedicate sets of nets, boots, traps, and other equipment to each site being visited. Clean and store them separately and the end of each field day.

5. When amphibians are collected, ensure the separation of animals from different sites and take great care to avoid indirect contact between them (e.g. via handling, reuse of containers) or with other captive animals. Isolation from un-sterilized plants or soils which have been taken from other sites is also essential. Always use disinfected/disposable husbandry equipment.

6. Examine collected amphibians for the presence of diseases and parasites soon after capture. Prior to their release or the release of any progeny, amphibians should be quarantined for a period and thoroughly screened for the presence of any potential disease agents.

7. Used cleaning materials (liquids, etc.) should be disposed of safely and if necessary taken back to the lab for proper disposal. Used disposable gloves should be retained for safe disposal in sealed bags.

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